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 2/2025

Transboundary pollution by heavy metals and POPs

Status Report 2/2025

MSC-E & CCC & CEIP

EMEP Status Report 2/2025

Transboundary pollution by heavy metals and POPs

Oleg Travnikov, Isabel Garcia Arevalo, Jan Gačnik,
Reza Gholizadeh, Mikhail Kleimenov, Viktória Koncz

Meteorological Synthesizing Centre – East (MSC-E), Jožef Stefan Institute, Slovenia

Stephan Poupa, Ullrich Bernhard, Robert Wankmüller,
Sabine Schindlbacher, Oscar Redeyoff

Centre on Emission Inventories and Projections (CEIP), Umweltbundesamt GmbH, Austria

Wenche Aas, Helene Lunder Halvorsen, Katrine Aspmo Pfaffhuber

Chemical Coordinating Centre (CCC), NILU, Norway

Executive summary

Heavy metals and persistent organic pollutants (POPs) are highly toxic compounds with serious impacts on human health and ecosystems. Addressing environmental pollution from these contaminants is a key focus of various international frameworks, including the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP or Air Convention). The Convention's Protocols on Heavy Metals and POPs identify several priority 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). Within the PAH group, four compounds are specifically prioritised: 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 implementing 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 delivers essential information on emissions, monitoring, and modelling of transboundary pollution. Research and operational assessments of heavy metal and POP pollution are carried out by specialised EMEP Centres, including the Centre on Emission Inventories and Projections (CEIP), the Chemical Coordinating Centre (CCC), and the Meteorological Synthesizing Centre-East (MSC-E).

This Status Report provides an overview of the activities undertaken by three EMEP Centres – CEIP, CCC, and MSC-E – focusing on the research and assessment of heavy metal and POP pollution in 2023, in accordance with the 2024-2025 workplan for implementing the Air Convention (ECE/EB.AIR/154/Add.1). 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

Since EMEP began collecting emission data, the completeness and consistency of submissions have improved significantly. In 2025, 94% of Parties submitted data to CEIP: 46 reported emissions of priority heavy metals (Cd, Hg, Pb), 40 provided data on five additional metals (As, Cr, Cu, Ni, Se, Zn), and 45 reported on POPs, including total PAHs, PCDD/Fs, HCB, PCBs, and additional PAHs (BaP, BbF, BkF, IP). Despite this progress, the quality and completeness of submissions remain uneven. Some countries still rely on outdated versions of the EMEP/EEA Guidebook, and reported data carry relatively high uncertainties.

Emission trends for priority heavy metals and POPs differ significantly between EMEP West and East. In the West, reporting is generally complete, and most countries show consistent declines since 2000: PCDD/F, HCB, and PCB emissions dropped by 75%, 97%, and 77%, respectively, while PAHs fell by 24%. These reductions are mainly linked to industrial, waste, and stationary combustion sectors, though some countries, such as Albania, North Macedonia, and Serbia, reported increases. In contrast, reporting in the East remains incomplete and inconsistent, with trends heavily influenced by data from individual countries, notably Kazakhstan, Ukraine, Georgia, and Armenia. For heavy metals, EMEP West shows a steady downward trend, while EMEP East remains unstable due to reporting gaps and isolated extreme values.

Fossil fuel combustion and industrial processes are the dominant sources of heavy metals and POPs. For heavy metals, industry accounts for about 35% of Cd emissions, 45% of Pb emissions, and 52% of Hg emissions, while public power and heat production contribute up to 29% of Cd and 24% of Hg emissions. For POPs, the ‘other stationary combustion’ sector, primarily coal and wood stoves in households, is the largest source: contributing 76% of total PAH emissions, 37% of PCDD/F emissions, and 27% of HCB emissions. Industry is also significant, accounting for 12% of PAH, 33% of PCDD/F, 22% of HCB, and 82% of PCB emissions.

For 2023, high-resolution GNFR grids were prepared for heavy metals (Cd, Hg, Pb) and POPs (BaP, BbF, BkF, IP, PCDD/Fs, HCB) based on CEIP’s gridding system, which prioritises reported data but integrates global datasets where necessary. MSC-E further pre-processed the data to incorporate intra-annual variations, vertical distributions, and Hg speciation, ensuring compatibility with the modelling system.

Monitoring

Heavy metals and persistent organic pollutants (POPs) have been included in EMEP’s monitoring programme since 1999, with earlier data available for some sites dating back to 1976. The programme, coordinated with other international frameworks such as HELCOM, AMAP, and OSPARCOM, defines compulsory monitoring for key POPs (PAHs, PCBs, HCB, CHLs, HCHs, DDT/DDE) and priority heavy metals (Hg, Cd, Pb), while other trace elements and emerging contaminants are reported voluntarily. All data are accessible via the EBAS database. In 2023, 71 sites reported heavy metals, with 40 measuring both aerosols and precipitation, while mercury was monitored at 27 sites across 23 Parties. POPs were reported by 17 Parties from 38 sites, with most measuring both aerosols and deposition; five Parties monitored only PAHs at 20 sites.

In 2023, over 30 trace elements were reported to EMEP, with Pb, Cd, As, Ni, Zn, Cu, and Cr measured at more than 50 sites and V, Mn, Co, Hg, and Fe at 20 or more. The highest aerosol concentrations of As, Cd, and Pb were observed around the British Channel, Cyprus, and Eastern Europe, while precipitation levels peaked mainly in Eastern Europe and parts of Spain. For mercury, the highest gaseous and elemental concentrations were recorded at the Waldhof site in Germany and an Arctic site in Norway, with elevated levels generally across central Europe. POP monitoring coverage varied: PAHs, such as benzo(a)pyrene, were measured at 36 sites, while legacy POPs (PCBs, HCHs, DDTs) were monitored at 18 sites and emerging contaminants, like dechlorane plus and PFOA, only at a few Nordic locations. Overall, POP concentrations typically decrease from southern and southeastern Europe towards the north.

Hexachlorobenzene (HCB) has been monitored under EMEP since 1993 and remains a concern as concentrations at several sites remain stable or even rise despite declining emissions. Primary sources have decreased, but secondary emissions from contaminated surfaces and climate-driven re-volatilization play an increasing role. While overall levels show a slow decline, elevated concentrations persist at some sites, especially in the Arctic and near historical sources, highlighting the influence of long-range transport and seasonal variability.

Polychlorinated biphenyls (PCBs), once widely used in equipment, paints, and construction materials, continue to emit at low levels from remaining applications and improper disposal. Long-term monitoring of PCB-153 shows a significant overall decline due to regulatory measures, but recent trends have flattened as emissions increasingly stem from diffuse or secondary sources. Re-volatilization from contaminated soils, water, and snowpacks contributes to ongoing atmospheric levels, with concentrations peaking in summer and declining more slowly in warmer regions, including the Arctic.

Status of HM and POP air pollution in 2023

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 2023.

In 2023, total atmospheric deposition showed distinct spatial patterns across pollutants. Pb and Cd deposition peaked in Central Europe, with additional hotspots in Central Asia due to dust resuspension, while Hg deposition was highest in the Caucasus, Türkiye, Central Europe, and parts of the Arctic. PAH deposition concentrated in Central Europe, especially Poland, Czechia, Germany, Serbia, and Bosnia and Herzegovina, with much lower levels in Scandinavia, France, Spain, and the UK. PCDD/Fs showed elevated deposition in South-Eastern Europe, particularly Türkiye and the Balkans, while PCB-153 peaked in Central and Southern Europe. In contrast, HCB displayed a more uniform distribution, with elevated fluxes in Central Europe, the Eastern Mediterranean, and the Russian Arctic.

Seasonal patterns varied by pollutant. PAHs peaked in winter due to domestic heating, with a smaller spring maximum from enhanced dry deposition. Pb and Cd deposition peaked in spring, linked to precipitation, while Hg showed maxima in spring and summer due to atmospheric depletion events and oxidation processes. PCDD/Fs and PCB-153 both reached highest levels in summer, driven by temperature-dependent re-volatilisation, while HCB followed a similar cycle with deposition lowest in winter and highest in midsummer, particularly in colder regions where removal from the atmosphere is more efficient.

Pollutant deposition across the EMEP region showed strong spatial variability and diverse source contributions. Central and Balkan countries experienced the highest fluxes of heavy metals and POPs, while northern Europe had the lowest. For Hg, transboundary transport dominated, with most EMEP countries receiving over half of their deposition from outside the region. PAHs were mainly driven by local emissions, whereas secondary re-volatilisation was the primary contributor for PCB-153 and HCB, highlighting the growing importance of secondary sources and long-range transport in shaping overall deposition patterns.

Source attribution of heavy metals and POPs across the EMEP region showed strong variability between pollutants and countries. For Pb and Cd, domestic emissions dominate deposition in larger countries with significant sources, such as Poland, Germany, Spain, and the UK, while transboundary transport is the main contributor in smaller states and regions with low national emissions, like Monaco, Liechtenstein, and parts of Central Asia. Hg deposition is largely driven by transboundary transport, exceeding 50% in 40 EMEP countries, though nations with high emissions, such as Poland, Czechia, and Italy, show stronger domestic contributions. For PAHs and PCDD/Fs, domestic emissions are the primary source in many Central and Eastern European countries, but long-range transport plays a major role elsewhere, contributing over half of total deposition in most EMEP countries. PCB-153 and HCB deposition, by contrast, are strongly influenced by secondary re-volatilisation and transboundary transport, with more than 50% of deposition originating from external sources in most countries, particularly smaller or less industrialised ones. Overall, the findings highlight the dual importance of national emissions and long-range transport in shaping pollution patterns across the region.

Modelled concentrations and deposition fluxes of heavy metals and POPs showed overall good agreement with EMEP measurements. Air concentrations of most pollutants, including Pb, Cd, Hg, PAHs, PCB-153, and HCB, were generally well reproduced, with high spatial correlations and model estimates typically within a factor of two of observations. While some underestimation occurred for wet deposition of Cd, PAHs, and certain sites, the models successfully captured the main spatial patterns and seasonal variations, providing reliable support for assessing pollution levels and transboundary transport across the EMEP region.

Research and developments

MSC-E continues research to improve GLEMOS model parameterisations and performance for simulating heavy metal and POP pollution. Current work includes reassessing dust suspension effects on heavy metals, developing integrated approaches for PAH source apportionment, and preparing detailed country-scale analyses, including a pilot study for Slovenia and the Western

Balkans. Additionally, a new bias-correction method for reactive mercury has been developed, and multi-media modelling of legacy POPs has been re-established to support operational assessments and refine long-term environmental simulations.

Wind resuspension is a major source of atmospheric dust and heavy metals, potentially contributing over 50% of annual Pb and Cd deposition in EMEP countries. MSC-E tested three dust suspension schemes using GLEMOS, simulating Saharan dust events in 2022. All schemes reproduced observed patterns, with GLEMOS showing slightly better agreement with measurements. Results indicate that during intense dust episodes, secondary emissions can dominate Pb pollution, exceeding 60% of total deposition in some regions. Further refinement of resuspension modelling is needed to improve estimates of secondary emissions.

A study integrating chemical transport modelling and moss biomonitoring was conducted to improve PAH source attribution and assess spatial distribution across Europe. While models offer broad temporal and spatial coverage, mosses complement them by providing cost-effective, long-term, and spatially extensive data, including in remote areas. Using data from the 2015/2016 European moss survey, modelled PAH deposition was compared with moss concentrations, showing good agreement, particularly for particle-bound compounds like B(a)P and B(k)F. Source attribution combined model simulations with molecular diagnostic ratios and Positive Matrix Factorization (PMF), revealing that pyrogenic sources, mainly biomass and coal combustion, dominate PAH pollution, while fossil fuel-related inputs are smaller but persistent. Species-specific moss responses provided additional insights, capturing both local and long-range pollution patterns, thus improving model validation.

MSC-E has launched a pilot study to assess PAH pollution in Slovenia and the Western Balkan countries, integrating national datasets, emissions inventories, high-resolution modelling, and moss biomonitoring, with active participation from national experts. The study focuses on collecting detailed measurement and emissions data, performing nested simulations down to a few kilometres resolution, and evaluating seasonal and spatial variations in PAH levels. Preliminary results show that Slovenia's annual B(a)P concentrations are generally below the EU target value but exceed WHO guidelines during winter, mainly due to emissions from residential combustion, which is identified as the dominant PAH source across the region. Industrial emissions contribute significantly in some areas, while road transport and waste play smaller roles. High-resolution modelling highlights transboundary influences from neighbouring countries and reveals that sensitive ecosystems, such as Triglav National Park and key lakes, are also affected, underlining the need for targeted emission reduction strategies.

Biases in reactive mercury (RM) measurements caused by the commonly used KCl-coated denuder method lead to systematic underestimation of gaseous oxidised mercury (GOM) and RM levels. To address this, an empirical correction model was developed using ozone concentration and specific humidity, improving the reliability of long-term RM datasets (2010-2020) for chemical transport model evaluation. Corrected data indicate highest RM concentrations at high-altitude and urban sites, though global coverage remains limited, especially in Europe and Asia. Comparison with multi-model simulations shows improved agreement after applying the correction, reducing biases and enhancing correlations. The findings highlight the need for more accurate, long-term speciated mercury measurements in Europe and recommend including RM observations in the EMEP monitoring programme to strengthen mercury pollution assessments.

Long-term global simulations using the GLEMOS model were conducted to assess the dispersion, accumulation, and intermedia cycling of key persistent organic pollutants (POPs), including HCB, PCB-153, and PCDD/Fs, across the atmosphere, soil, vegetation, and oceans. For HCB, emissions peaked in the late 1970s before declining sharply due to bans, but historical accumulation in soil now drives substantial re-emissions, making soils a significant secondary source. PCB-153 shows similar persistence, with emissions peaking in the 1970s and soils acting as major long-term reservoirs, resulting in ongoing cycling despite reduced emissions. PCDD/F emissions have decreased by about 25% since 2002 due to improved source controls, stabilising atmospheric levels and deposition fluxes by 2008. Across all pollutants, higher concentrations are generally observed in Europe, South and East Asia, and parts of the Caucasus, while the Southern Hemisphere and remote regions remain comparatively less affected. These findings provide essential boundary conditions for regional modelling within the EMEP domain and highlight the long-lasting influence of legacy emissions on current contamination levels.

Cooperation

MSC-E continues its scientific collaboration with various international and national bodies, aiming to improve research and assessment approaches applied by the Centre and to disseminate scientific knowledge gained under the Convention. These bodies include the EMEP Task Forces, the International Cooperative Programmes of the Working Group on Effects (WGE), the Minamata Convention on Mercury, the Baltic Marine Environment Protection Commission (HELCOM), the Arctic Monitoring and Assessment Programme (AMAP), and other international organisations.

The Centre contributed to the work of the Task Force on Measurements and Modelling (TFMM) by participating in the Task Force's twenty-sixth meeting (Potsdam, Germany, 5-7 May 2025). MSC-E presented an overview of its ongoing research and model development activities, with a focus on studies of heavy metal wind re-suspension, mercury atmospheric chemistry and air-surface exchange processes, PAH pollution, including a country-scale pilot study for Slovenia and the Western Balkan countries, and multimedia modelling of POPs. Additionally, representatives of the Centre shared details of studies on the model evaluation of wind-blown mineral dust and its impact on heavy metal pollution in Europe, as well as source apportionment of PAH pollution in selected EMEP countries based on model simulations and moss measurements.

MSC-E continues its collaboration with the Task Force on Hemispheric Transport of Air Pollution (TF HTAP), contributing to the Multi-Compartment Mercury Modelling and Analysis Project (MCHgMAP), which evaluates global mercury pollution and the effectiveness of mitigation policies under the Air Convention and Minamata Convention. MSC-E plays a key role in designing modelling experiments, harmonising approaches for estimating atmospheric-ocean mercury exchange, and analysing results. Multi-model simulations for 2010–2020 reveal strong latitudinal variations in Hg concentrations, with elevated levels in industrial and artisanal gold-mining regions, while wet deposition patterns are influenced by emissions, atmospheric chemistry, and precipitation, and total deposition peaks over vegetated areas. Preliminary findings highlight major mercury hotspots in Asia, Africa, and South America, though many remain under-monitored. MSC-E also participated in the 2025 TF HTAP meeting, presenting MCHgMAP results, contributing to discussions on wildfire-related mercury and POP emissions under the FIRES project, and engaging in a new initiative to assess global PFAS contamination.

The Centre participated in the 38th ICP-Vegetation Task Force meeting in Tirana (10-12 February 2025), presenting applications of moss biomonitoring for model evaluation and integrated analyses of heavy metal and POP pollution in the EMEP region. Highlights included the use of moss data to assess spatial patterns, temporal trends, hotspots, and source attribution, as well as preliminary results from the 2020 moss survey and a study combining moss biomonitoring with modelling for PAH source attribution across Europe. The collaboration with ICP-Vegetation is key to improving pollution assessments, especially in regions with limited air monitoring, such as Eastern Europe and the Western Balkans.

MSC-E, under its long-term collaboration with HELCOM, evaluated atmospheric inputs of Cd, Hg, and B(a)P to the Baltic Sea for 1990–2022. Emissions of these pollutants from HELCOM countries declined by 65%, 66%, and 25%, respectively, with the largest Hg emissions in 2022 coming from Russia, Germany, and Poland. Model results show that atmospheric deposition to the Baltic Sea decreased by 78% for Cd, 41% for Hg, and 42% for B(a)P, with faster reductions in the early years. In 2022, the highest Cd deposition occurred in the Sound sub-basin, while Germany and Poland were the main contributors of Hg and Cd deposition, and Poland, Finland, and Russia dominated B(a)P inputs.

Future directions

MSC-E's future activities, aligned with its revised mandate and the 2026-2027 workplan, will focus on advancing the GLEMOS model with updates to key processes, improved POP multi-media modelling, and open-source code distribution. Research will address heterogeneous Hg chemistry, dust impacts, and gas-particle partitioning of POPs. Planned work includes a country-scale PAH pollution assessment for Slovenia and the Balkans, participation in TFMM and TF HTAP initiatives, contributions to the MCHgMAP project, wildfire impact studies, and preparatory modelling of PFAS. MSC-E will also continue joint analyses with ICP-Vegetation and collaborate with HELCOM and OSPAR on heavy metal and POP pollution in marine environments.

Contents

Introduction

Heavy metals and persistent organic pollutants (POPs) are highly toxic compounds with serious impacts on human health and ecosystems. Addressing environmental pollution from these contaminants is a key focus of various international frameworks, including the UNECE Convention on Long-range Transboundary Air Pollution (CLRTAP or Air Convention). The Convention's Protocols on Heavy Metals and POPs identify several priority 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). Within the PAH group, four compounds are specifically prioritised: 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 implementing 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 delivers essential information on emissions, monitoring, and modelling of transboundary pollution. Research and operational assessments of heavy metal and POP pollution are carried out by specialised EMEP Centres, including the Centre on Emission Inventories and Projections (CEIP), the Chemical Coordinating Centre (CCC), and the Meteorological Synthesizing Centre-East (MSC-E).

Under the revised mandate (ECE/EB.AIR/144/Add.1), MSC-E is responsible for providing scientific support to the Convention through model-based assessments of transboundary pollution by heavy metals and POPs. This work includes preparing input datasets for modelling, such as anthropogenic and geogenic emissions, meteorological parameters, atmospheric concentrations of chemical reactants, and particulate matter, conducting global and regional simulations of pollution levels and transboundary transport, and evaluating modelling results against observational data.

This report provides an overview of the activities undertaken by three EMEP Centres – CEIP, CCC, and MSC-E – focusing on the research and assessment of heavy metal and POP pollution in 2023, in accordance with the 2024-2025 workplan for implementing the Air Convention (ECE/EB.AIR/154/Add.1). The report is organised into six chapters. Chapter 1 reviews the status of emissions reporting and preparation of data for modelling. Chapter 2 describes observational data from the EMEP monitoring network. Chapter 3 presents model assessment results for 2023. Chapter 4 details ongoing research and model development. Chapter 5 summarises current and planned cooperation of MSC-E with EMEP Task Forces and other international organisations. Finally, Chapter 6 outlines future research priorities.

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). In addition in line with the Article 8 of the Convention (*UNECE*, 1979) and Annex I of the EB Decision 2022/2 all pollutants mentioned in EB Decision 2022/2 have to be reported, unless the information is not available or the EB Decision lists them as "if a Party considers it appropriate". The substances for which there are existing reporting obligations in the Convention and the protocols include: SOx, NOx, NMVOCs, NH3, 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 2025

The completeness and consistency of submitted data have improved significantly since EMEP began collecting information on emissions (Fig. 1.1). Fourty-eight (94%) Parties submitted data to CEIP in 2025[1], Forty-six Parties reported data on priority heavy metals (Cd, Hg, Pb), from which 43 Parties provided the full time series. Forty 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). Fourty-five Parties reported data on POPs (total PAHs, PCDD/Fs, HCB, PCBs), and all of them also reported data on additional PAHs (BaP, BbF, BkF, IP).

The quality of submitted data across countries varies significantly. 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 still an issue especially for heavy metal and POPs reporting. Detailed information on recalculations,

1 The original submissions from the Parties can be accessed via the CEIP website on https://www.ceip.at/status-of-reporting-and-review-results/2025-submission

completeness and key categories, plus additional review findings, can be found in the annual CEIP technical inventory review reports and its Annexes (CEIP, 2025)[2,3].

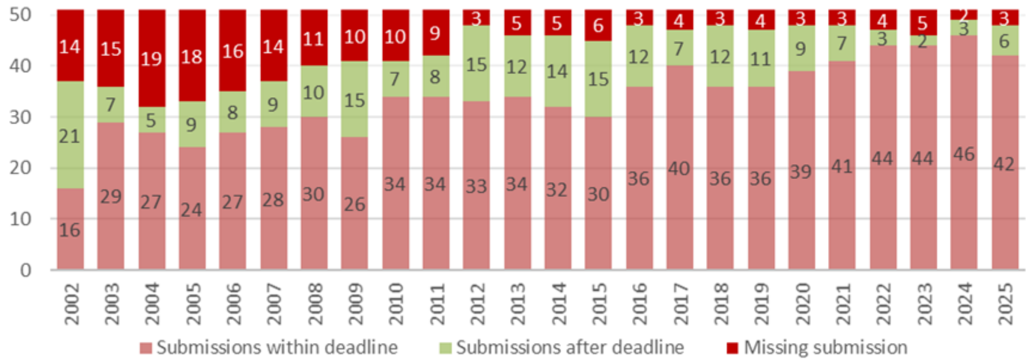


Fig. 1.1. *Number of Parties reporting emission data to EMEP since 2002, as of 18 June 2025.*

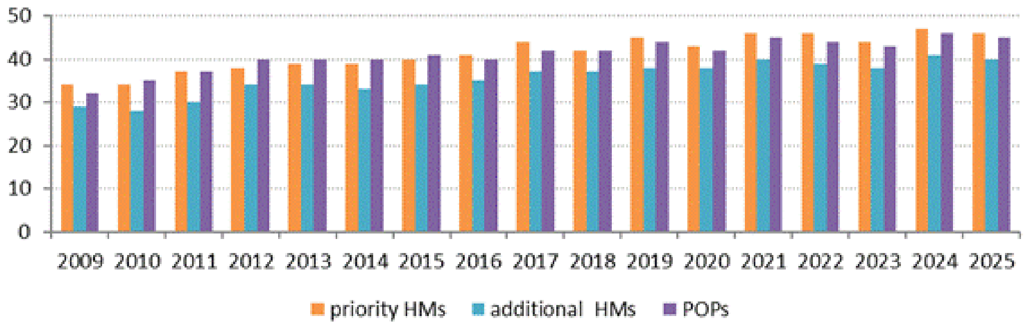


Fig. 1.2. *Number of Parties reporting of heavy metals and POPs to EMEP since 2009, as of 18 June 2025.*

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

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

3 https://www.ceip.at/status-of-reporting-and-review-results/2025-submission

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 2023 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	278	300	146	144	946	8 093	4 052	12 287
2001	282	303	149	146	956	7 213	4 173	11 174
2002	279	299	146	141	941	7 002	894	10 180
2003	287	305	148	146	966	7 716	450	9 235
2004	286	304	148	144	964	7 515	390	8 393
2005	297	312	152	148	991	6 805	350	7 801
2006	309	322	156	153	1 020	6 083	344	7 407
2007	302	314	154	153	1 002	5 237	326	6 857
2008	315	329	160	160	1 033	4 399	285	6 339
2009	310	318	153	157	983	2 690	265	5 591
2010	330	339	160	167	1 062	2 820	292	5 177
2011	302	309	147	153	977	2 688	377	4 820
2012	315	324	153	162	1 014	2 684	305	4 515
2013	309	318	150	160	993	2 541	369	4 162
2014	281	288	137	144	907	2 433	403	3 920
2015	282	289	138	146	914	2 482	283	3 772
2016	287	294	141	148	931	2 395	352	3 588
2017	280	287	137	144	924	2 397	371	3 495
2018	279	292	142	146	923	2 427	295	3 371
2019	256	269	130	137	850	2 286	264	3 218
2020	251	262	126	134	821	2 221	187	3 016
2021	255	267	129	139	849	2 293	162	3 017
2022	232	245	119	129	774	2 117	152	2 763
2023	216	227	111	119	718	2 032	132	2 811
Relative change 2000 to 2023	-22%	-24%	-24%	-17%	-24%	-75%	-97%	-77%
Change 2000 to 2023	-62	-73	-36	-25	-227	-6 061	-3 919	-9 476

From 2000 to 2023, **PCDD/F** emissions have been reduced by 75% (-6061 g I-TEQ) with major reductions between 2000 and 2010 (-65%). Major reductions are reported by Bulgaria (-2 735 g I-TEQ), France (-461 g I-TEQ), Slovakia (- 929 g I-TEQ), Romania (- 564 g I-TEQ) and Portugal (-305 g I-TEQ). All countries except Albania (+3328%), Macedonia (+67%), the Netherlands (+14%) and Serbia (+40%) reported decreasing emissions since the year 2000.

The strongest PCDD/F emissions reductions since the year 2000 occurred in GNFR-sectors *D_Fugitive* (-2716 g I-TEQ), *A_PublicPower* (-1162 g I-TEQ), *J_Waste* (-1398 g I-TEQ) and *B_Industry*

(-160 g I-TEQ). PCDD/F emissions from *C_OtherStationaryComb* have the highest share (38%) in 2023 but have been reduced by only -160 g I-TEQ since 2000.

From 2000 to 2023, **HCB** emissions have been reduced by 97% (-3919 kg) with major reductions between 2000 and 2002 (-78%, -3158 kg) which is mainly due to the reporting of Germany for G-NFR sector B_Industry (-2860 kg). All countries except Bulgaria, Latvia, Lithuania, Montenegro, Malta and Slovakia reported decreasing emissions since the year 2000. From 2002 to 2023, HCB emissions decreased by 85% (-762 kg) with the largest decreases reported by Czechia (-228 kg), Hungary (-119 kg) and Portugal (-102 kg). In 2023, HCB emissions from *A_PublicPower* have the highest share (36%, 47 kg), followed by *B_Industry* (28%, 37 kg), *C_OtherStationaryComb* (17%, 23 kg) and *J_Waste* (13%, 17 kg).

From 2000 to 2023, **PCB** emissions have been reduced by 77% (-9476 kg) with major reductions in sector *B_industry* (-8033 g) and *J_Waste* (-960 kg). All countries except Greece, North Macedonia and Norway reported decreasing emissions since the year 2000.

From 2000 to 2023, **PAH** emissions have been reduced by 24% (-227 t) with major reductions in sector *B_Industry* (-82 t) and *C_OtherStationaryComb* (-101 t). All countries except Germany, Finland, Italy, Montenegro and Serbia reported decreasing emissions since the year 2000.

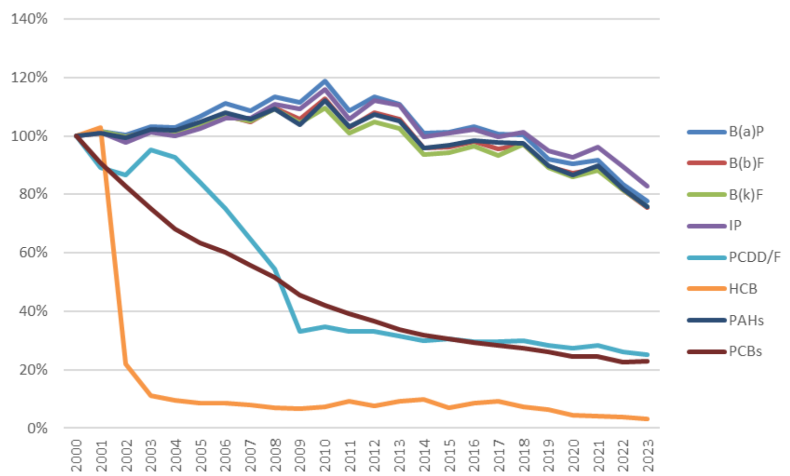


Fig. 1.3. *Emission trends of POPs 2000-2023 in the EMEP West area (reported data)*

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 2020-2023 and unreasonably high levels of PCBs for 2000-2023 in G-NFR sector *B_Industry*. Kazakhstan reported complete time series but comparatively high values of PAH. Armenia reported incomplete data for 2007 to 2016 and complete data for 2018 to 2022.

Figure 1.4 shows emission trends of POPs 2002-2023 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 are dominated by the reporting of Kazakhstan. The trend (e.g., the strong increase in 2015) and absolute values of B(a)P emissions and other PAH components (e.g., the drop in 2021 for B(k)F), are also dominated by the reporting of Kazakhstan. The peak of PCB emissions 2021 is due to the reporting of Kazakhstan.

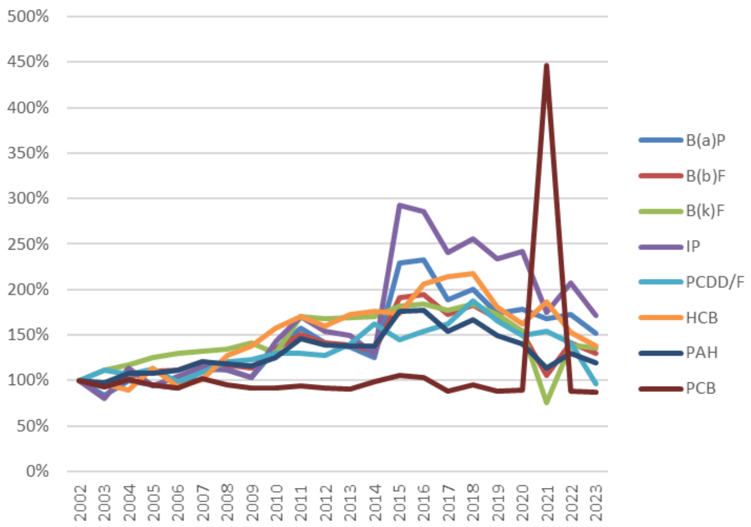


Fig. 1.4. *Emission trends of POPs 2002-2023 in the EMEP East area (reported data) excluding the Russian Federation, Ukraine, HCB from Kazakhstan, HCB from Georgia and PCDD/F from Kazakhstan.*

1.2.3. EMEP West area – priority heavy metals

Priority heavy metals of the EMEP West area show a rather smooth downwardstrend and a dip in the year 2009, which reflects the economic recession leading to lower industrial production in that year (Figure 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, Albania, 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 2023 Hg emissions (-9.3%) is dominated by Germany (-17%) and Poland (-14%).

The decreasing Pb emissions trend 2019 to 2020 (-12%) is mainly due to lower emissions reported by France (-13%), Germany (-9%), Spain (-17%), United Kingdom (-16%), Italy (-12%), Poland (-7%) and Serbia (-30%). The decrease in 2023 Pb emission (-4,7%) is mainly due to the United Kingdom (-11%), Poland (-10%) and Romania (-25%) while Spain show a large increase (+16%).

The decreasing Cd emissions trend 2018 to 2020 (-9%) is mainly due to lower emissions reported by Germany (-8%), Spain (-13%), Poland (-9%), the Netherlands (-21%), Italy(-11%), Greece (-24%) and the United Kingdom (-10%). The decrease in 2023 Cd emission (-5%) is mainly due to Germany (-12%), Poland (-9%) and the United Kingdom (-7%) while Serbia shows a large increase (+26%).

Table 1.2 and Fig. 1.5 show reported data and trends for priority heavy metals 2000 to 2023 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	127	107	4 494
2001	121	102	3 448
2002	117	101	2 889
2003	110	97	2 744
2004	104	93	2 518
2005	100	90	2 346
2006	99	88	2 290
2007	94	83	2 220
2008	89	79	2 075
2009	80	68	1 726
2010	80	70	1 784
2011	80	70	1 496
2012	75	68	1 439
2013	72	65	1 404
2014	72	62	1 408
2015	70	60	1 390
2016	70	57	1 332
2017	71	55	1 365
2018	72	55	1 342
2019	68	49	1 302
2020	65	44	1 151
2021	65	47	1 265
2022	62	42	1 244
2023	59	39	1 185
Relative change 2000 to 2023	-53%	-64%	-74%
Change 2000 to 2023	-68	-69	-3 309

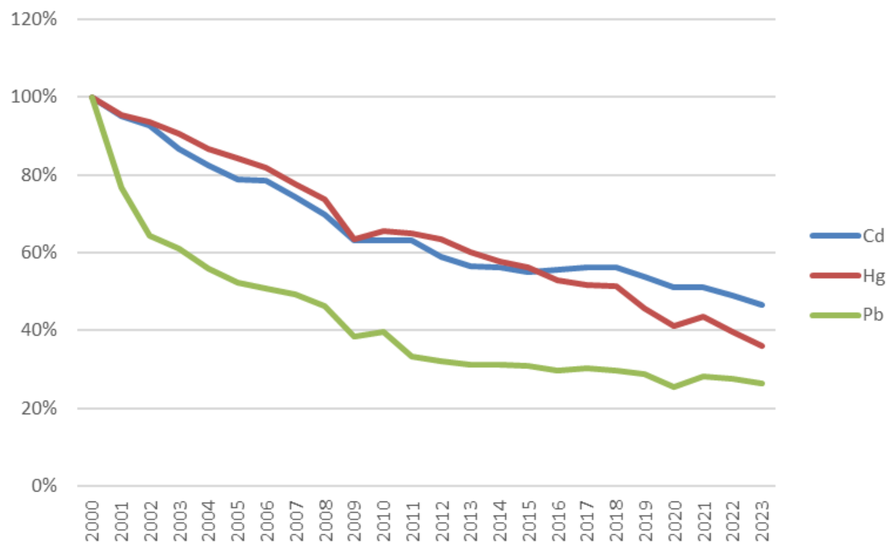


Fig. 1.5. *Emission trends of priority heavy metals 2000-2023 in the EMEP West area (reported data).*

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 Fig. 1.6 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 and Armenia did not report for 2000-2015 except for the years 2002, 2003, 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 2021 Cd emissions is mainly due to reporting of Ukraine for GNFR sectors *B_Industry* and *A_PublicPower* and the drop in 2023 emissions is mainly due to the non-reporting of Türkiye for GNFR sector *J_Waste*.

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 2021 is mainly due to very high emissions reported by Ukraine for 2020 for GNFR sector *B_Industry*.

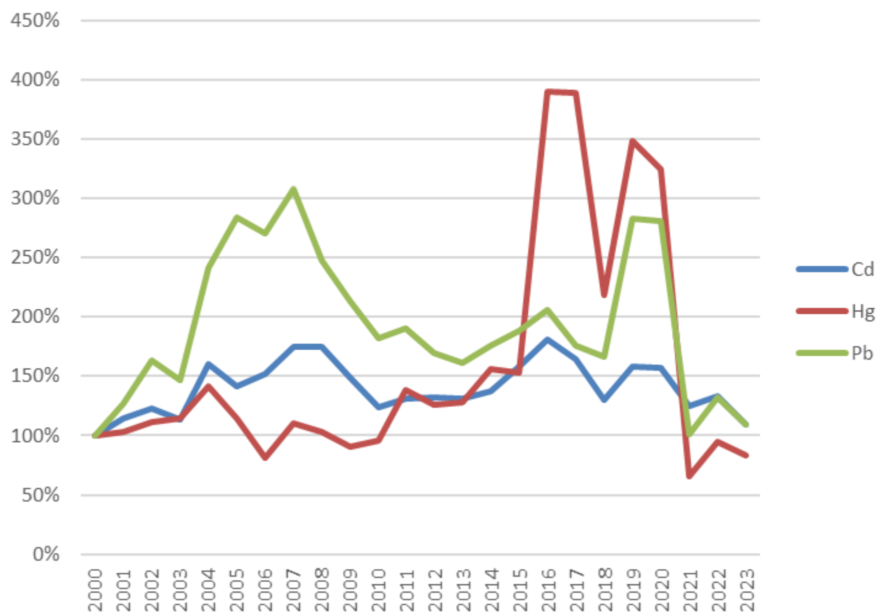


Fig. 1.6. *Emission trends of priority heavy metals 2000-2023 in the EMEP East area (reported data) excluding the Russian Federation.*

1.3. Comparison of 2022 data reported in 2024 and in 2025

Emission data for 2022 reported in 2025 were compared with 2022 emissions reported in 2024. For 19 countries, data changed by more than ±15 % for at least one pollutant (see Figure 7 and Annex A.2). Armenia, Azerbaijan, Kyrgyzstan and Türkiye were the only countries that did not revise heavy metals or POPs emissions for 2022.

Albania, Montenegro, Slovakia and Ikraine revised individual pollutants by more than 250% (see right part of Fig. 1.7, which is displayed in logarithmic scale).

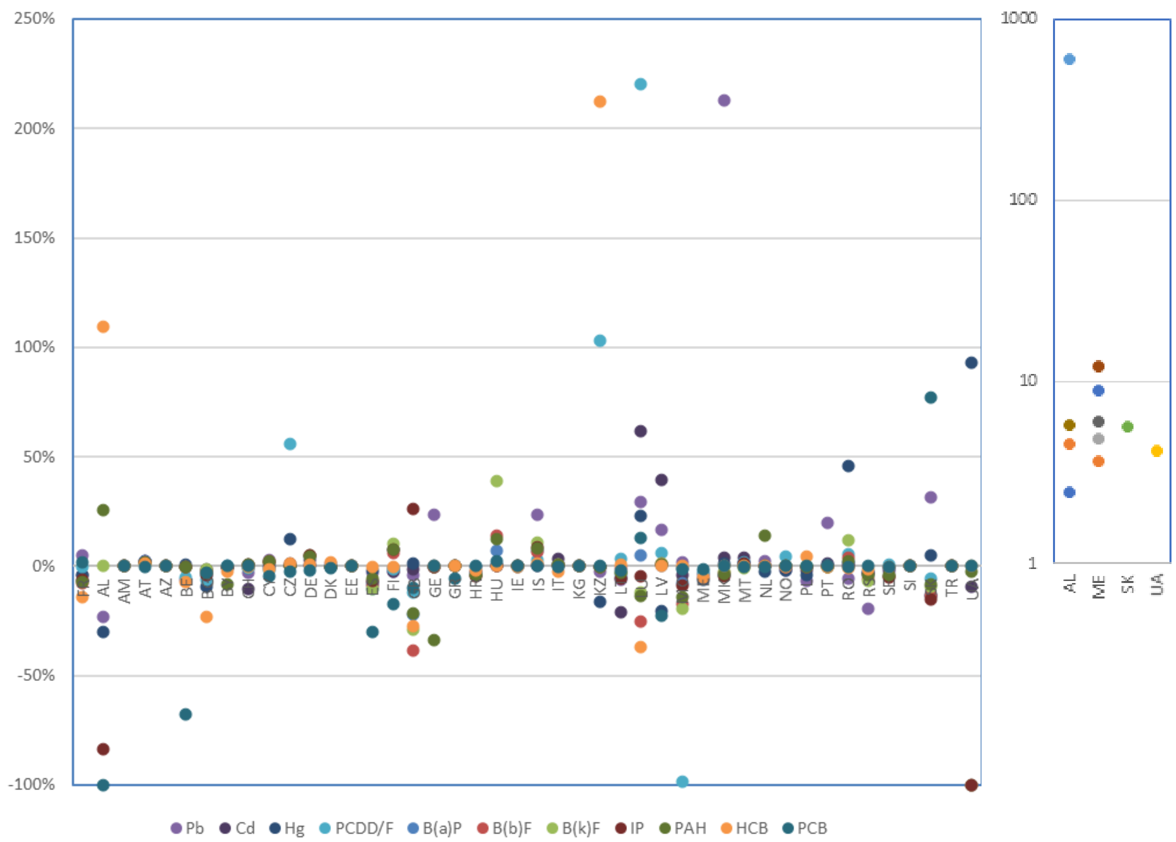


Fig. 1.7. *Recalculations between the 2025 and 2024 submission for 2022 values (reported data). The separate chart on the right shows countries and pollutants with recalculations > 250%, expressed as factors in logarithmic scale.*

1.4. Data sets for modellers in 2023

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 a).

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. 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 Appendix A.3.

4 NFR – Nomenclature for Reporting

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.

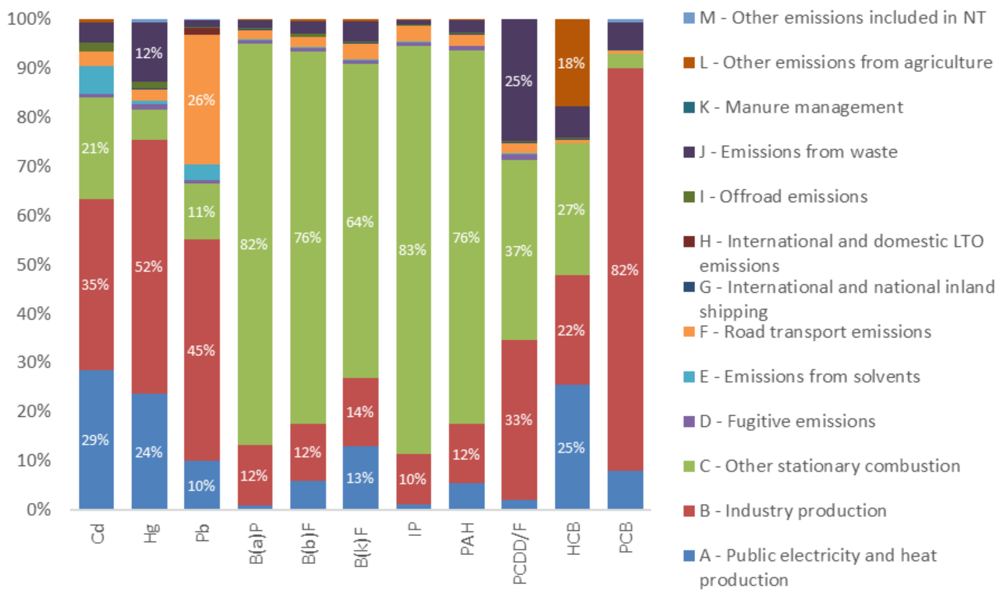


Fig. 1.8. *GNFR sector contribution to national total emissions in 2023, EMEP area without sea regions (only percentages above 10% are labelled).*

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 35 % of **Cd** emissions, followed by 29% from public power and heat plants. Energy industries (mainly from coal power plants) emit about 24% of total **Hg** emissions and manufacturing industries emit about 52% of total emissions. About 45% of **Pb** emissions are released by the industry production sector and road transport (leaded gasoline) contributes 26%.

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 76% of total PAH emissions. The main source of PAH emissions are coal and wood stoves/boilers in households. About 12% of PAH emissions are related to the industry production sector. Sector 'other stationary combustion' sector contributes 37% to 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 25% to PCDD/F emissions of which Spain contributes to about 20%. With 27% 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 share of 22%. Another large source of HCB emissions is the agriculture sector with a share of 18%. The dominating sector for **PCB** emissions is the industrial sector, which contributes 82% 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.

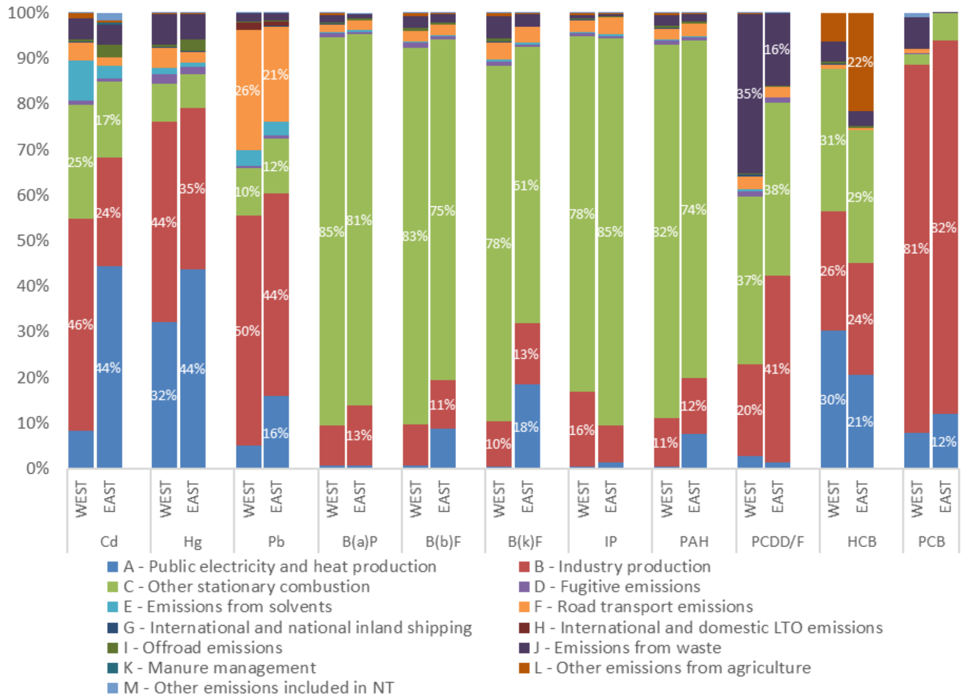


Fig. 1.9. *GNFR sector contribution to national total emissions in 2023 for the EMEP West and EMEP East areas (Only percentages above 10% are labelled. 'Remaining Asian Areas' are included in the EMEP East region and North Africa is included in the EMEP West region).*

1.4.2. Reporting of gridded data

After the submissions in 2017 and 2021, 2025 was the third year for which EMEP countries were obliged to report gridded emissions in the grid resolution of 0.1°x0.1° (long/lat). 37 of the 48 countries which are considered as a part of the EMEP area reported sectoral gridded emissions in the new resolution until June 2025.

The majority of gridded sectoral emissions in 0.1°x0.1° (long/lat) resolution have been reported for the years 2015 (34 countries), 2019 (33 countries) and 2023 (31 countries). For 2020 by 8 countries, for 2016 and 2018 by five countries as well as for 2017, 2021 and 2022 by four countries. Compared to the 2017 reporting, gridded data are available for 15 additional countries in 2025.

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[5]. An overview of gridded data in 0.1°x0.1° (long/lat) resolution reported in 2017, 2021 and 2025 is provided in Table 1.3.

Table 1.3. *Gridded emissions reported until 2017, 2021 and 2025*

Country	**2017** Gridded data available for the years…	**2021** Gridded data available for the years…	**2025** Gridded data available for the years…	**Comments**
Austria	2015	2000, 2005, 2010, 2015, 2019	2000, 2005, 2010, 2015, 2019, 2023	
Belgium	2015	2015, 2019	2015, 2019, 2023	
Belarus		2019	2019, 2023	Reported gridded data was replaced by CAMS proxies
Bulgaria	2015	2015, 2019	2015, 2019, 2023	
Croatia	1990, 1995, 2000, 2005, 2010, 2015	1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019, 2020, 2023	
Cyprus		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019, 2023	
Czechia	2015	2015, 2019	2015, 2019, 2023	
Denmark	2015	2015, 2019	2015, 2019, 2023	
Estonia		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019, 2023	

5 https://www.ceip.at/status-of-reporting-and-review-results/2025-submission

Country	**2017** Gridded data available for the years…	**2021** Gridded data available for the years…	**2025** 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, 2023				
France		2015, 2019	2015, 2019, 2023	
North Macedonia		2015, 2019	2015, 2019	
Georgia		2015	2015	
Germany		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019, 2020, 2023	
Greece		2015, 2019	2015, 2019, 2023	
Hungary	2015	2015, 2019	2015, 2019	
Iceland		2015, 2019	2015, 2019, 2023	For 2015 and 2019 gridded data was reported only for POPs
Ireland	2015	2015, 2019	2015, 2019, 2023	
Italy		2015, 2019	2015, 2019	Reported gridded data was replaced by Copernicus Atmospheric Monitoring Service (CAMS) and EDGAR proxies
Kazakhstan			2023	Reported gridded data was replaced by EDGAR proxies
Latvia	2015	2015, 2019	2015, 2019, 2023	
Lithuania	2015(a)	2015, 2019	2015, 2019, 2023	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, 2023	
Malta		2016, 2019	2016, 2019, 2023	
Monaco	2014, 2015	2014-2019	1990, 1995, 2000, 2005,	

Country	2017 Gridded data available for the years…	2021 Gridded data available for the years…	2025 Gridded data available for the years…	Comments
			2010, 2014 - 2023	
Netherlands		1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019, 2023	
Norway	1990, 1995, 2000, 2005, 2010, 2015	1990, 1995, 2000, 2005, 2010, 2015, 2019	1990, 1995, 2000, 2005, 2010, 2015, 2019, 2023	
Poland	2014, 2015	2014, 2015, 2018, 2019	2014, 2015, 2018, 2019, 2023	
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			2015, 2020, 2023	Reported gridded data was replaced by CAMS proxies
Slovakia	2015	2015, 2019	2015, 2019, 2023	
Slovenia	2015	2015, 2019	2015, 2019, 2023	
Spain	1990-2015	1990-2019	1990-2023	
Sweden		1990, 2000, 2005, 2010, 2015, 2019	1990, 2000, 2005, 2010, 2015, 2019, 2020, 2023	

1.4.3. Gridded data of 2023 in resolution 0.1° x 0.1° (long/lat)

This year, gap-filling and gridding was done for the year 2023 in 0.1°x0.1° longitude/latitude resolution on GNFR sector level.

The 0.1°x0.1° 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 2023 is shown in Figure 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°x0.1° (long/lat) resolution is available, Global unintentional POP Emissions data from the Emission Database for Global Atmospheric Research (EDGAR v6.0, JRC) 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°x0.1° (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 8.1 (JRC) is used as a proxy.

Reported gridded data in 0.1°x0.1° (long/lat) resolution was used from Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Malta, Monaco, Netherlands, North Macedonia, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

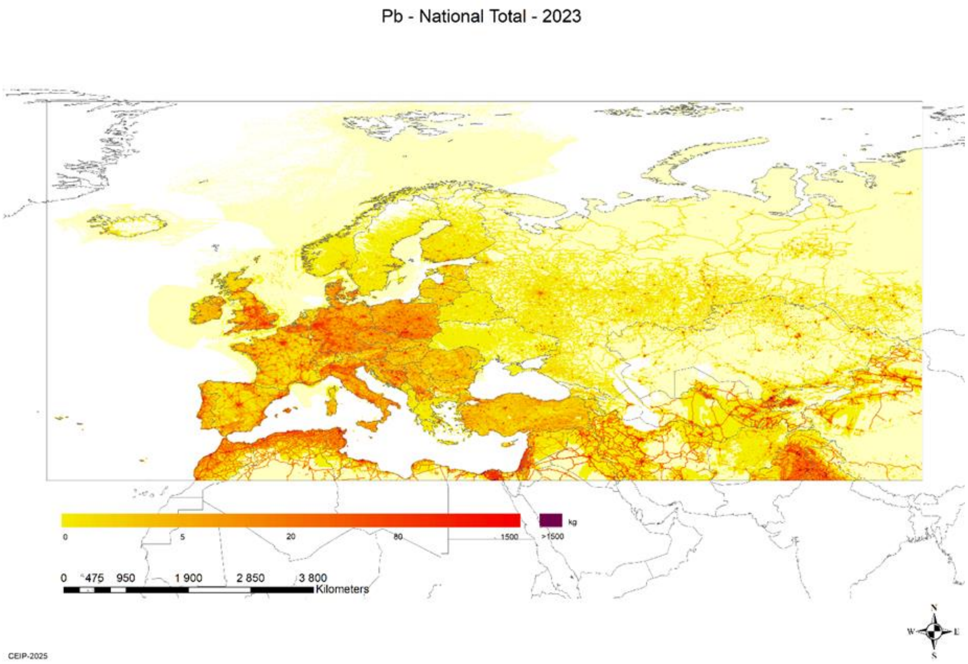


Fig. 1.10. *Visualized gap-filled and gridded Pb emissions in 2023 in 0.1°x0.1° long-lat resolution.*

1.4.4. Significant changes in data set for modellers between 2023 and 2022

National totals of gap-filled data used in models in the year 2025 with national totals of gap filled-data used in 2024 are compared (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 2023 from 2022 greater than ± 15%.*

Country	Pollutant	Change	Comment[6]
Albania	Cd	62%	new reported
	Hg	-70%	new reported
	Pb	-83%	new reported
Georgia	PAH	-39%	reported (with some gapfilling)
Spain	PAH	-26%	reported (including gapfilling of iron and steel industries)
Türkiye	Hg	104%	Use of IIASA GAINS data for Hg (new)
Czech Republic	PAH	-17%	reported (with some gapfilling)
Luxembourg	PCB	38%	reported
Lithuania	PAH	-23%	reported (with some gapfilling)
Bulgaria	PAH	-22%	reported (with some gapfilling)
Republic of Moldova	HCB	-19%	reported
	Hg	-30%	reported
	PAH	-34%	reported (with some gapfilling)
	Pb	-20%	reported
	PCB	-38%	reported
Turkmenistan	Cd	-48%	gapfilled
	Hg	-48%	use of IIASA GAINS data for Hg (new)
	PAH	24%	gapfilled
Tajikistan	Cd	1387%	factor 0.56 of Hg emissions
	Hg	1387%	use of IIASA GAINS data for Hg (new)
Bosnia and Herzegovina	Hg	-72%	use of IIASA GAINS data for Hg (new)
Russian Federation	Hg	128%	use of IIASA GAINS data for Hg (new)
Russian Federation in the extended EMEP domain	Hg	470%	use of IIASA GAINS data for Hg (new)
Norway	PAH	-18%	reported (with some gapfilling)

Country	Pollutant	Change	Comment
Albania	Cd	62%	new reported
	Hg	-70%	new reported
	Pb	-83%	new reported
Georgia	PAH	-39%	reported (with some gapfilling)
Spain	PAH	-26%	reported (including gapfilling of iron and steel industries)
Türkiye	Hg	104%	Use of IIASA GAINS data for Hg (new)
Czech Republic	PAH	-17%	reported (with some gapfilling)
Luxembourg	PCB	38%	reported
Lithuania	PAH	-23%	reported (with some gapfilling)
Bulgaria	PAH	-22%	reported (with some gapfilling)
Republic of Moldova	HCB	-19%	reported
	Hg	-30%	reported

6 'New reported' means, that 2022 data has been gap-filled and 2023 data has been reported.

1.5. Pre-processed emissions data for model assessment

The gridded emissions data were additionally pre-processed by MSC-E to include additional parameters, such as intra-annual variations, vertical distribution of emissions, and chemical speciation of Hg. The required temporal and vertical disaggregation was generated using the emission pre-processing tool developed at MSC-E for the GLEMOS modelling system. A detailed description of the emission pre-processing procedure is provided in (Ilyin et al., 2018).

Emissions of PCBs and HCB were further refined using a combination of officially reported data and expert estimates. Since reported PCB inventories provide only total emissions without specifying individual congeners, the congener-specific global inventory by Breivik et al. [2007] was used for modelling. PCB-153 was selected as an indicator to represent transboundary transport and PCB-related pollution, with its spatial distribution based on reported gridded data or, where unavailable, allocated using population density.

Reported HCB emissions are subject to considerable uncertainty due to incomplete coverage of potential sources [Breivik et al., 2004], which may lead to underestimation of atmospheric releases. To address this, an alternative scenario estimating the upper limit of direct anthropogenic emissions was developed following the methodology applied in (*Ilyin et al.*, 2022), incorporating country-reported uncertainty estimates. Under this scenario, total HCB emissions in the EMEP region were, on average, a factor of 2.85 higher than those reported in official inventories.

Figures 1.11-1.13 present maps of spatial distributions of anthropogenic emission fluxes for Pb, Cd, Hg, B(a)P, the sum of four PAHs, PCDD/Fs, HCB, and PCB-153 across the EMEP region, which were used in the model simulations for 2023.

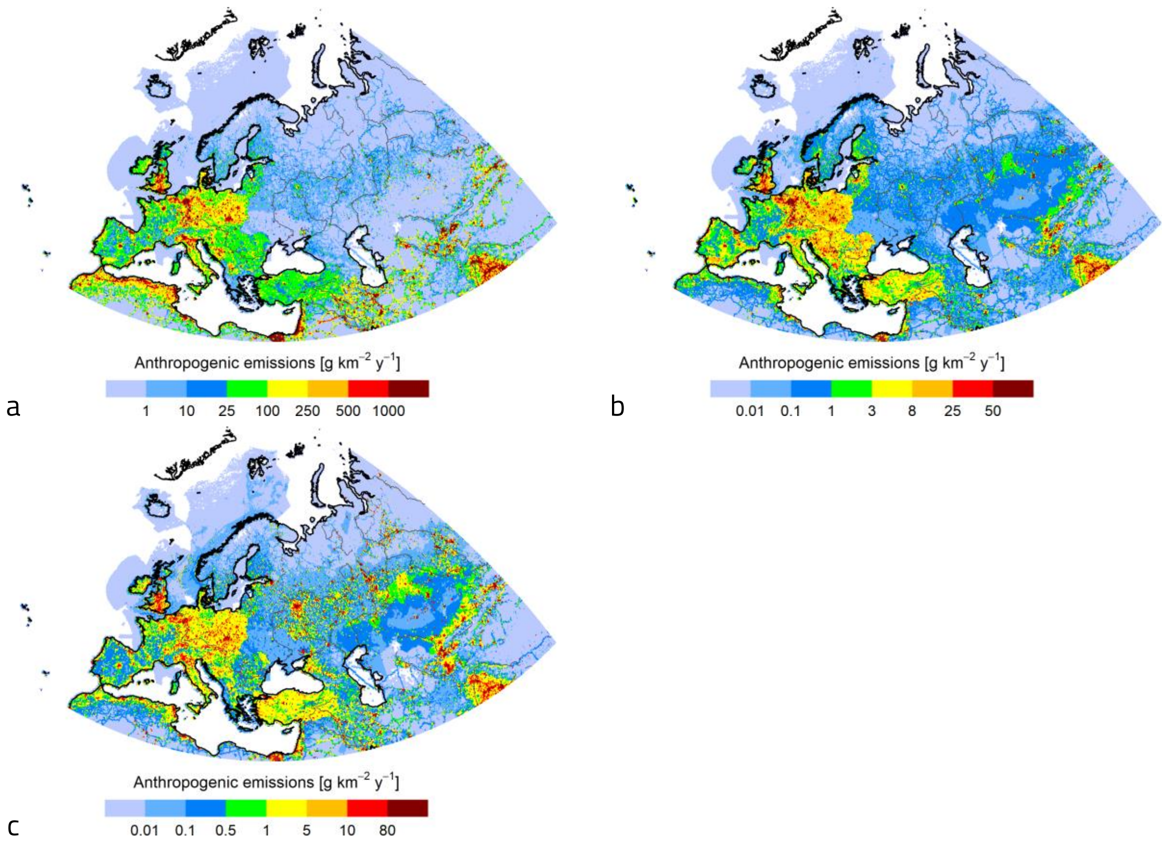


Fig. 1.11. *Annual anthropogenic emissions of Pb (a), Cd (b), and Hg (c) in 2023*

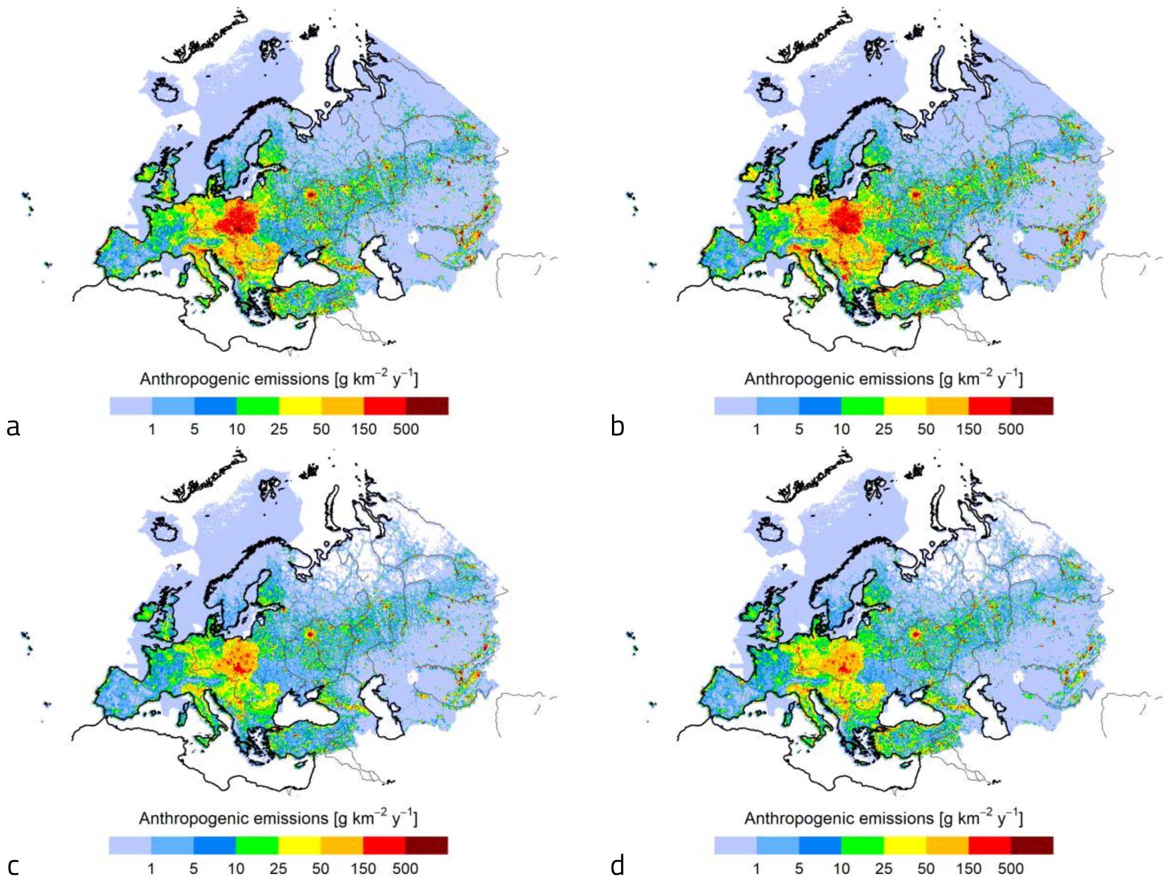


Fig. 1.12. *Annual anthropogenic emissions of B(a)P (a), B(b)F (e), B(k)F (c), and IP (d) in 2023*

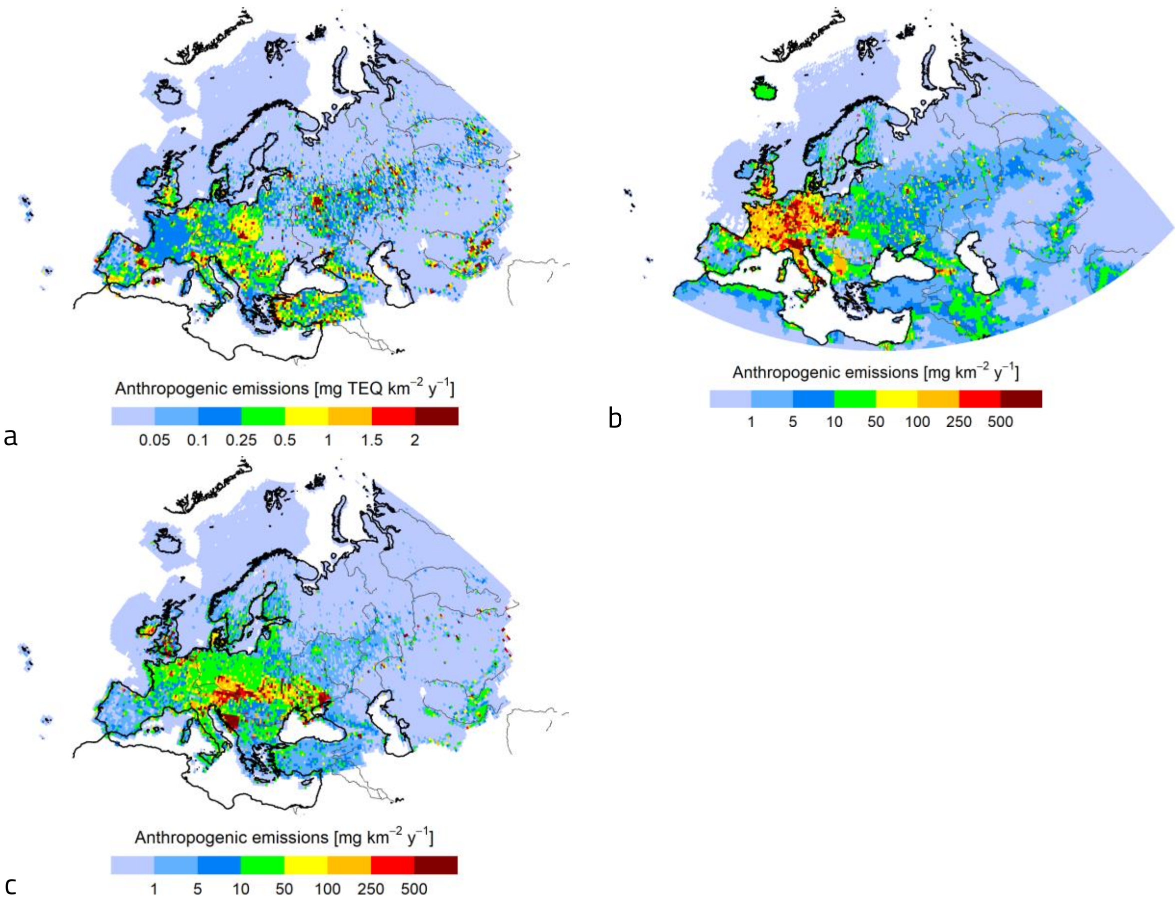


Fig. 1.13. *Annual anthropogenic emissions of PCDD/Fs (a), PCB-153 (e), and HCB (c) in 2023*

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 (UNECE, 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) (Aas et al., 2024).

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., 2025).

Figure 2.1 shows an overview of which sites have reported data to EMEP in 2023. In 2023, there were 40 sites measuring heavy metals in both aerosols and precipitation, and altogether there were 71 measurement sites. 27 sites were measuring mercury in either air and precipitation, 17 of these with co-current measurements in air and precipitation. In total, respectively 23 and 13 Parties to the Convention report heavy metals and mercury data. For POPs it was in 17 Parties reporting 2023 data, in total 38 sites. Of these, 31 sites measured in both aerosol and in precipitation or deposition. One should further note that several of the Parties only measure PAHs (i.e. 5 Parties and 20 sites).

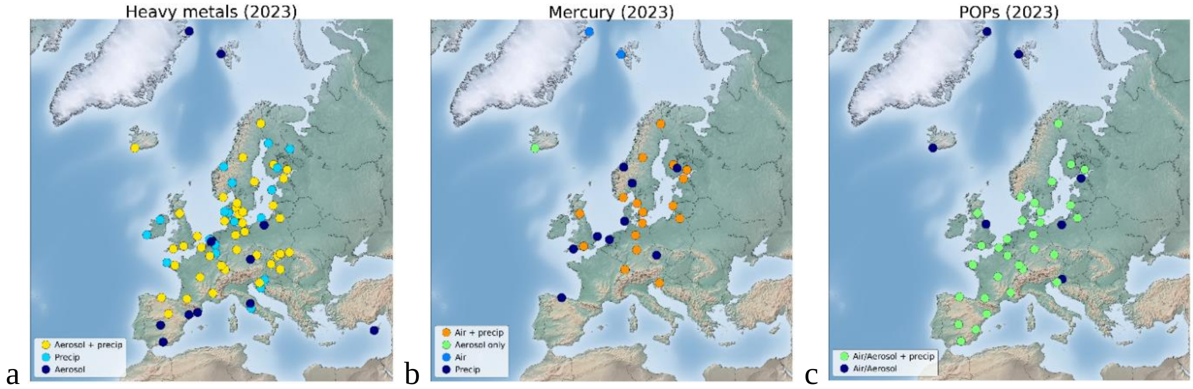


Fig. 2.1. *Overview of sites measuring heavy metals (a), mercury (b) and POPs (c) in 2023*

2.1. Monitoring of heavy metals

There were more than 30 different trace elements that have been reported to EMEP in 2023. The most common elements are Pb, Cd, As, Ni, Zn, Cu and Cr measured at more than 50 sites while V, Mn, Co, Hg and Fe at 20 or more sites. Annual averages of As, Cd, and Pb concentrations in aerosols in 2023 are presented in Fig. 2.2 and in precipitation in Figure 2.3. The highest concentrations for these elements in aerosols are generally observed around the British Channel, Cyprus and in Eastern Europe. For precipitation, the highest levels are seen in Eastern Europe, but elevated levels are also observed at other sites, such as in Spain depending on the component.

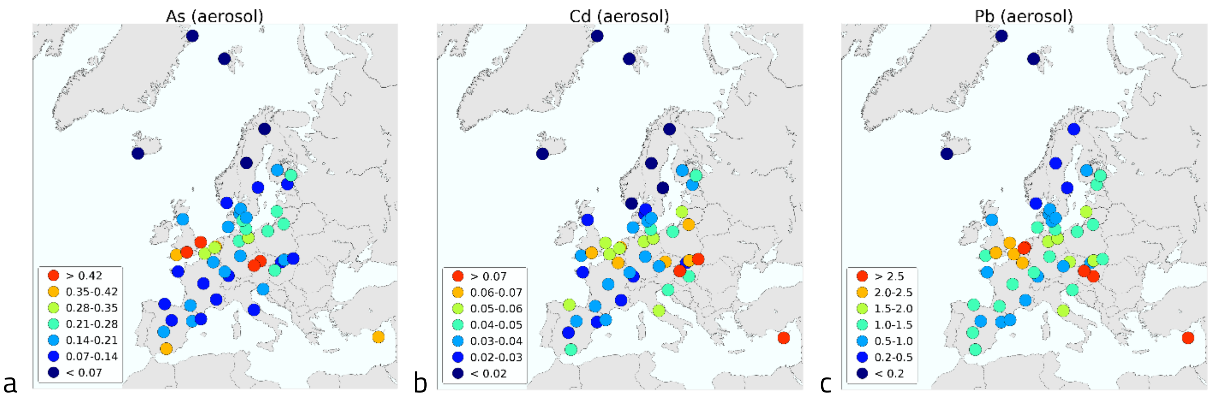


Fig. 2.2. *Annual mean concentrations of As (a), Cd (b), and Pb (c) in aerosols (ng/m^3) in 2023.*

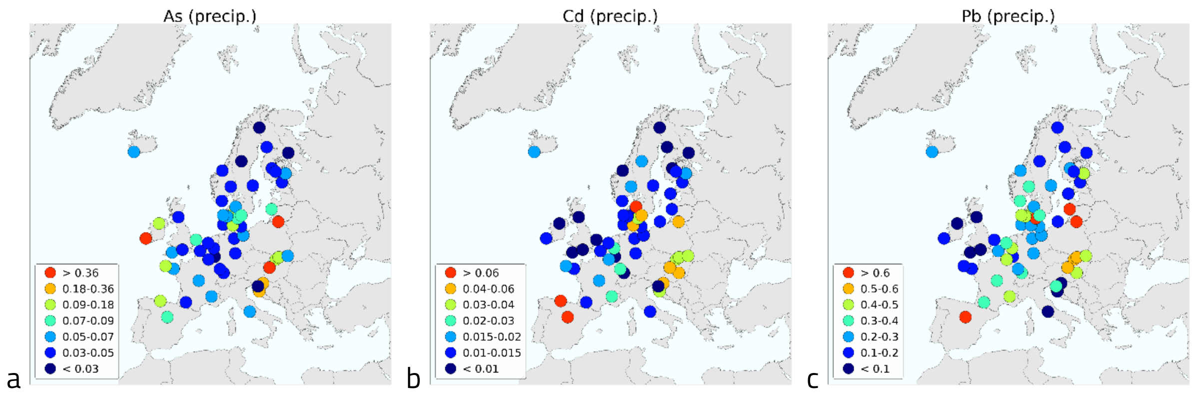


Fig. 2.3. *Volume weighted annual mean concentrations of As (a), Cd (b), and Pb (c) in precipitation (mg/L) in 2023.*

For total gaseous and elemental mercury, the highest concentration in 2023 is seen at the Waldhof site in Germany followed by the arctic Norwegian site, and a tendency for highest concentration in central Europe (Fig. 2.4). Similar for precipitation, the highest concentrations are observed in central Europe. In addition, very high levels are seen at ES0008 in Spain, the reason is unclear.

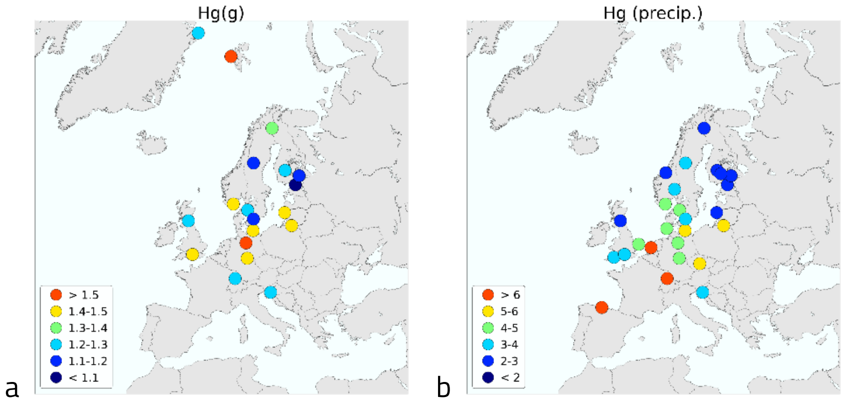


Fig. 2.4. *Annual mean concentrations of total- or gaseous elemental mercury in air (a, ng/m3) and volume weighted average concentrations of mercury in precipitation (b, ng/L) in 2023*

2.2. 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 36 sites in air and aerosols. In comparison, the legacy POPs; PCBs, HCHs and DDTs, are measured at 18 sites depending on compound, 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 5. In general, the concentrations of most POPs decrease from the south/south-east to the north of Europe.

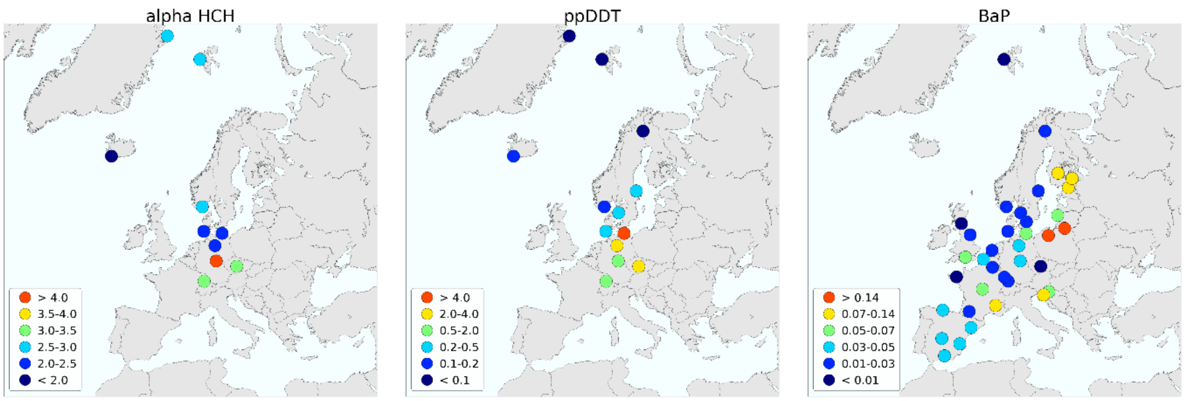


Fig. 2.5. *Annual mean concentrations of a-HCH, p,p-DDT (pg/m3) and benzo[a]pyrene (ng/m3) in air and aerosols at EMEP sites in 2023.*

2.3. Trends in HCB

Hexachlorobenzene (HCB) has been measured under EMEP since 1993 and continues to draw attention due to stagnant or increasing levels at several sites despite declining emissions (Hung et al., 2016; Wong et al., 2021). This report updates the long-term trends in HCB concentrations, expanding on an earlier EMEP status report (*Ilyin et al.*, 2022). The spatial and temporal variability in average annual mean concentrations of HCB over the past 20 years is shown in Fig. 6.

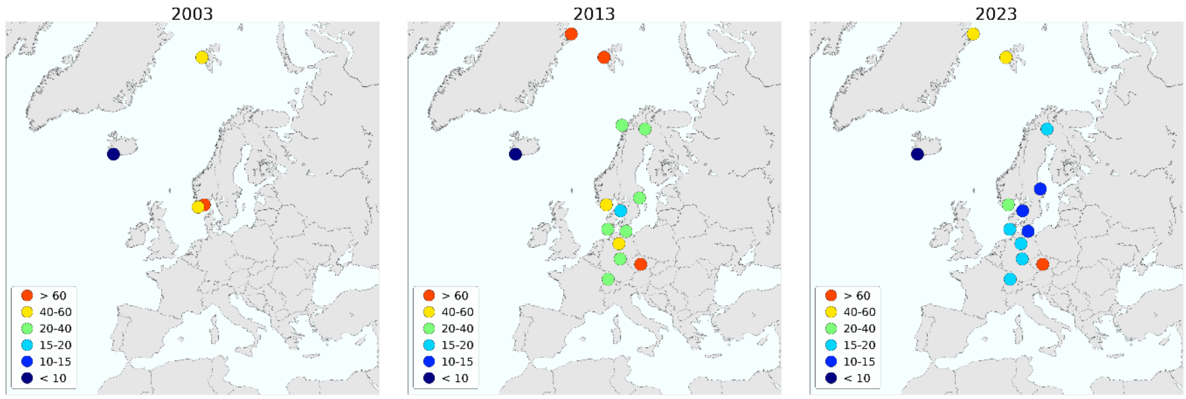


Fig. 2.6. *Annual mean concentrations of HCB (pg/m3) in 2003, 2013 and 2023 in air and aerosols.*

HCB originates from various sources, including historical pesticide use, industrial processes, combustion, and biomass burning. While primary emissions have declined, re-volatilization from contaminated surfaces, particularly soils, remains important, especially under rising temperatures and reduced Arctic sea ice. Due to its high volatility and long atmospheric lifetime (ca 2.5 years), HCB is expected to show low spatial variability as observed in passive sampling campaigns across Europe (Halvorsen et al., 2023; Jaward et al., 2004). However, elevated levels may indicate ongoing local emissions (Halvorsen et al., 2023; Hung et al., 2016). Indeed, in Figure 6, Kosetice shows the highest concentrations, which is consistent with its proximity to historical source regions.

Arctic sites such as Station Nord and Zeppelin also show elevated levels, despite their remoteness, and these levels are higher than those at most continental sites, with the exception of Kosetice. This latitudinal gradient, along with decreasing temperatures, is commonly explained by the "grasshopping" effect (Wania and MacKay, 1996). Re-volatilization from Arctic seawater may also contribute (Ma et al., 2011). However, Platt et al. (2023) showed that elevated HCB concentrations at Zeppelin during Arctic haze periods were linked to air mass transport from Asia, while lower concentrations coincided with transport from ice-free ocean regions. These findings suggest that oceanic secondary emissions currently play a limited role in the atmospheric HCB levels observed at Zeppelin.

A complicating factor when comparing HCB levels across monitoring sites is the issue of breakthrough during active air sampling. HCB is known to pass through polyurethane foam (PUF) under certain conditions, which can lead to underestimation of concentrations (Bidleman et al., 2025; Melymuk et al., 2014; Wong et al., 2021). Station Nord uses a PUF-XAD-PUF setup that avoids this artifact. In contrast, the very low levels observed at the Icelandic site may be due to breakthrough caused by long sampling times.

The decadal maps in Fig. 2.6 indicate a general decline in HCB levels over the past 20 years. Figure 2.7 shows the long-term temporal trends at selected EMEP sites using the Digital Filtration Technique (Hung et al., 2005), which highlights both seasonal cycles and inter-annual trends. Concentrations are shown as the natural log (ln C), with trends and first-order half-lives (t½, years) indicated.

Seasonal variability is observed at most sites, with concentrations typically peaking in winter. While the overall trend across sites indicates a slow decline, some locations show significant fluctuations. Zeppelin, the site with the longest continuous monitoring record, displays a particularly notable pattern: concentrations were lowest around 2002, increased until approximately 2016, and have since declined and stabilized in the most recent years. This behaviour cannot be fully explained by a simple combination of declining primary emissions and increasing secondary emissions driven by climate warming. Further research is needed to better understand the interplay between secondary sources, climate impacts, and transport dynamics including hemispheric transport on shaping HCB trends.

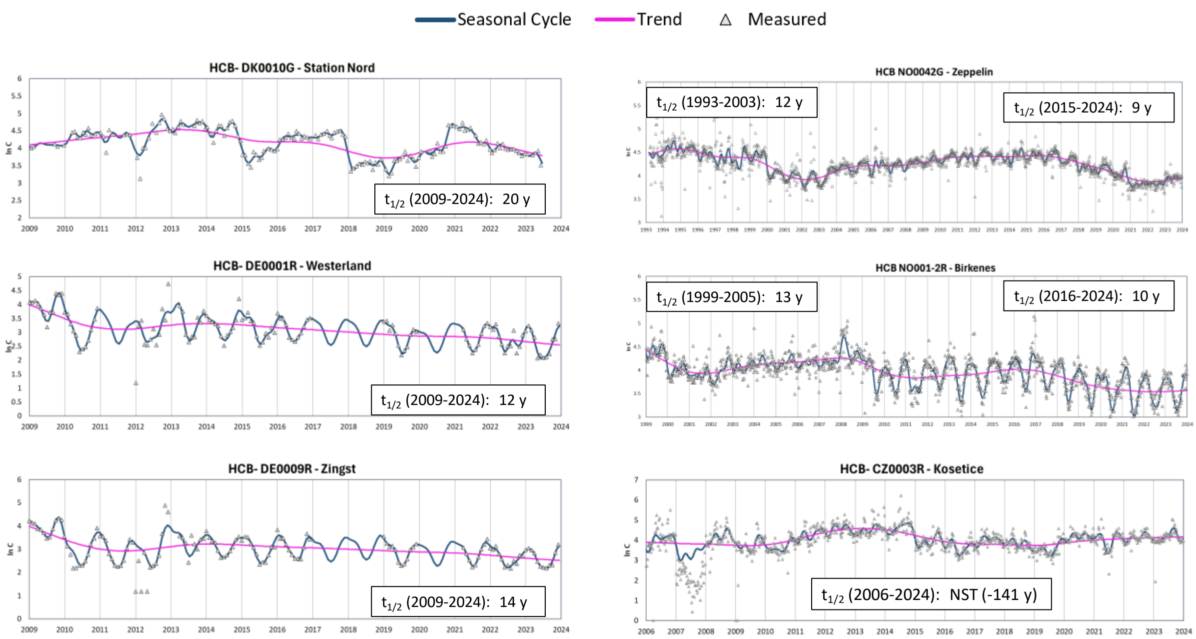


Fig. 2.7 *Temporal trends of HCB in air at six EMEP sites. The concentrations are presented in natural log of concentrations (ln C) on the y-axis.*

2.4. Trends in PCB-153

Polychlorinated biphenyls (PCBs) have been measured under EMEP since the mid-1990s. With more than 20 years of data now available, we include here an assessment of long-term trends in PCB concentrations at EMEP sites with extended measurement series. PCB-153 is used for this analysis, as it is the most consistently monitored and reported congener. The spatial and temporal variability in annual mean concentrations of PCB-153 over the past two decades is shown in Fig. 2.8.

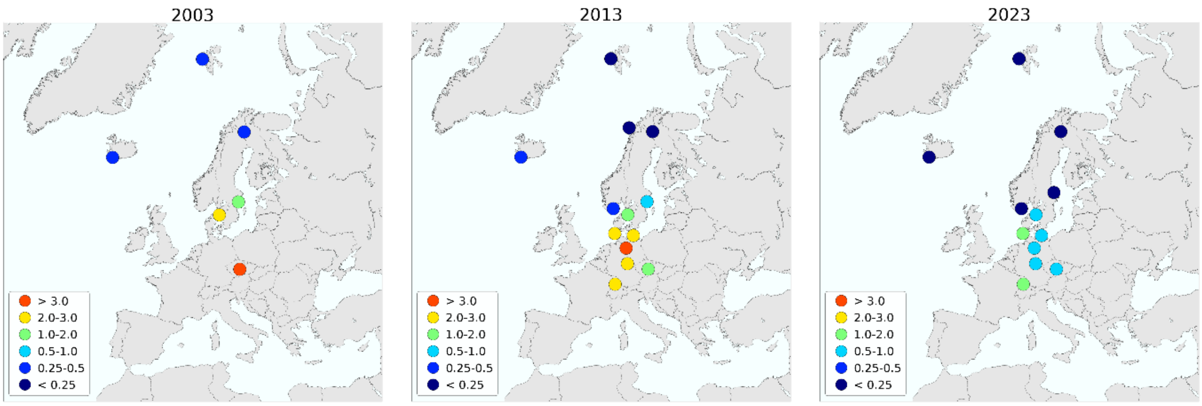


Fig. 2.8. *Annual mean concentrations of PCB-153 (pg/m3) in 2003, 2013 and 2023 in air and aerosols.*

The spatial distribution of PCB-153 reflects its historical use, particularly in central Europe, where production and application were most intensive (Breivik et al., 2002). Production peaked around 1970 and has since been phased out through national bans and global agreements, including the Aarhus Protocol on POPs and the Stockholm Convention.

Despite these control measures, PCBs continue to be released into the environment due to their use in long-lived materials. Over half of global PCB production went into electrical transformers and capacitors, while other significant uses included paints, sealants, and construction materials. These applications may still emit PCBs during regular use or when buildings and equipment are demolished or improperly disposed of. As such, while emissions have declined markedly, low-level ongoing primary emissions remain possible in certain regions.

To assess long-term trends, we use the same EMEP sites as discussed above for HCB. As illustrated in Fig 2.8 and the long-term temporal trends in Fig. 2.9, PCB-153 concentrations have shown a consistent and significant decline at all selected sites, demonstrating the success of regulatory measures. However, the trend appears to flatten in recent years, indicating that remaining sources are likely more diffuse or secondary.

PCBs are known to undergo reversible atmospheric deposition, meaning they can volatilize from previously contaminated surfaces such as soil, water, or snowpacks. This secondary emission process is temperature-dependent, and for PCB-153, concentrations tend to be higher during summer, likely reflecting enhanced re-volatilization under warmer conditions (Wania and MacKay, 1996). This effect may be further amplified in the Arctic due to climate warming (Ma et al., 2011) contributing to the observed seasonal variability and slower declines in some regions.

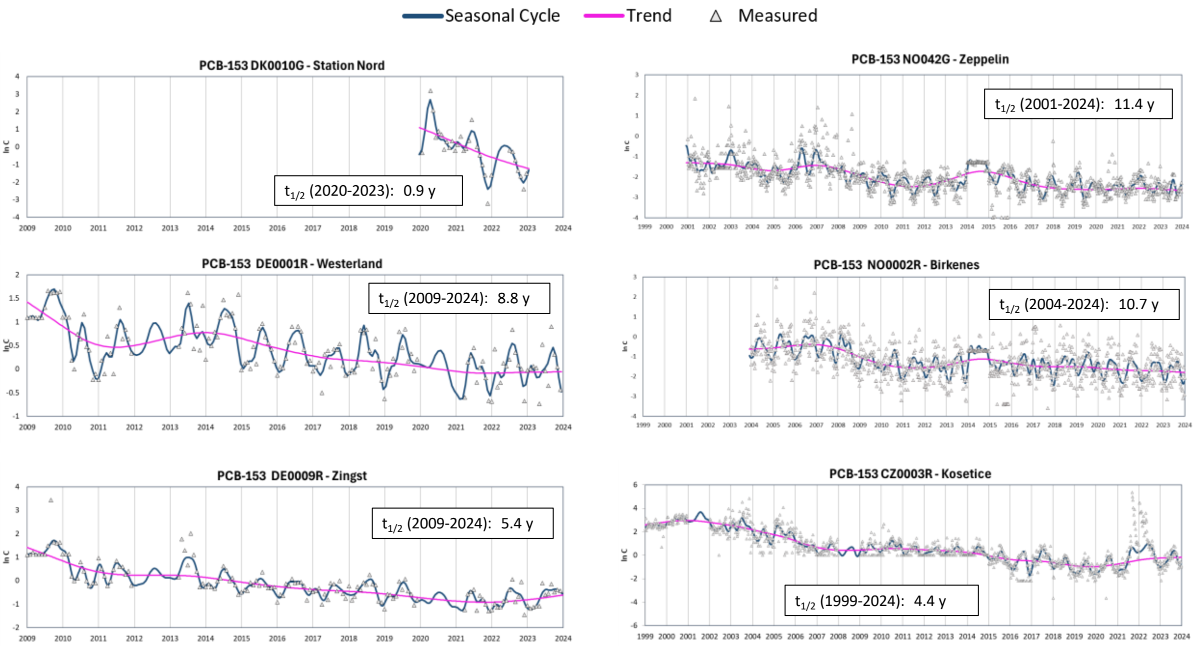


Fig. 2.9. *Temporal trends of PCB-153 in air at six EMEP sites. The concentrations are presented in natural log of concentrations (ln C) on the y-axis.*

3. Status of HM and POP air pollution in 2023

This chapter presents model assessment results for transboundary pollution by heavy metals and POPs in EMEP countries for 2023. 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 overall pollution levels. Source-receptor matrices characterising transboundary fluxes are provided in Annex B, while detailed statistics from the model evaluation against measurements are presented in Annex C.

3.1. Model setup

The assessment of heavy metal and POP pollution in the EMEP region was conducted using the latest stable open-source version of the GLEMOS model (v2.3.0, https://github.com/glemos-model). The simulations employed a multi-scale nested approach, combining global- and regional-scale modelling to account for the influence of both regional and global emission sources. Global-scale simulations with a spatial resolution of 3°×3° were performed to provide boundary conditions for the regional domain. Recent research and development activities related to further model improvements are described in Chapter 4.

Meteorological parameters for the model simulations were generated using operational analysis data from the European Centre for Medium-Range Weather Forecasts (*ECMWF*, 2024) and pre-processed with the Weather Research and Forecasting modelling system (*WRF*, v3.7.1) (*WRF*, 2025). The community-based global chemistry transport model GEOS-Chem (v14.5.1) (*GEOS-Chem*, 2025) was applied to produce three-dimensional atmospheric concentrations of chemical reactants and particulate matter required for simulating Hg and POP chemistry in the atmosphere. Detailed land cover data were incorporated from the Moderate Resolution Imaging Spectroradiometer (MODIS) product – the combined Terra and Aqua MODIS Land Cover Type dataset (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 were generated using the updated dust pre-processor (*Ilyin et al.*, 2007; see Section 4.1).

The most recent gridded emissions data for 2023 for the EMEP domain — covering Pb, Cd, Hg, four PAHs (B(a)P, B(b)F, B(k)F, and IP), HCB, PCBs, and PCDD/Fs — were prepared by CEIP based on official reporting data submitted in 2025, as described in Chapter 1. Additional emission parameters, including the vertical distribution and seasonal variation of heavy metal and POP emissions, as well as the chemical speciation of Hg emissions, were produced using approaches previously developed at MSC-E (*Ilyin et al.*, 2018; see Section 1.5). For global-scale simulations, we used the UNEP Global Mercury Assessment 2018 inventory (*AMAP/UN Environment*, 2019), the global PAH emissions inventory from Peking University (*Shen et al.*, 2013), the congener-specific global PCB emissions inventory from Breivik et al. (2007), expert estimates of historical HCB emissions from Shatalov et al. (2010), and the latest global PCDD/F emissions inventory from Song et al. (2023).

3.2 Lead

Lead (Pb) is a hazardous pollutant that is toxic even at very low exposure levels, causing both acute and chronic effects on human health. As a multi-organ toxicant, it can affect neurological, cardiovascular, renal, gastrointestinal, haematological, and reproductive systems. Lead also bioaccumulates in the environment, posing risks to both terrestrial and aquatic ecosystems. Owing to its low vapour pressure, atmospheric lead is predominantly bound to particulate matter. Its transport and deposition behaviour are therefore governed by the properties of these particles. Since lead is primarily associated with fine particulate matter (PM2.5), it can undergo long-range atmospheric transport, travelling hundreds to thousands of kilometres from its emission sources.

In 2023, surface air concentrations of Pb across EMEP countries showed a wide range, from around 0.3 ng/m^3 in Scandinavia and Northern Russia to over 6 ng/m^3 in parts of Central Europe and Central Asia (Fig. 3.1a). Average concentrations across much of Europe exceeded 1 ng/m^3. The highest levels – above 10 ng/m^3 in some areas of Central and Western Europe – are attributed to substantial anthropogenic emissions. In Central Asia, elevated Pb levels (above 6 ng/m^3) are mainly associated with wind resuspension from bare soils, a process that also contributes to relatively high concentrations in Northern Africa and the Middle East. Overall, a clear geographic gradient is evident, with Pb concentrations decreasing from south to north and northeast across the region. Seasonal variations indicate higher Pb concentrations during the cold season and spring, largely driven by increased anthropogenic emissions in winter and enhanced wind resuspension from barren and arable lands during spring (Fig. 3.1b).

Simulated Pb air concentrations show a good agreement with observations, showing a relatively high spatial correlation (0.6) and low relative bias (27%) (Fig. 3.1a; Table C1). Almost 80 % of the 38 valid measured annual mean concentrations fall within a factor of two of the modelled values.

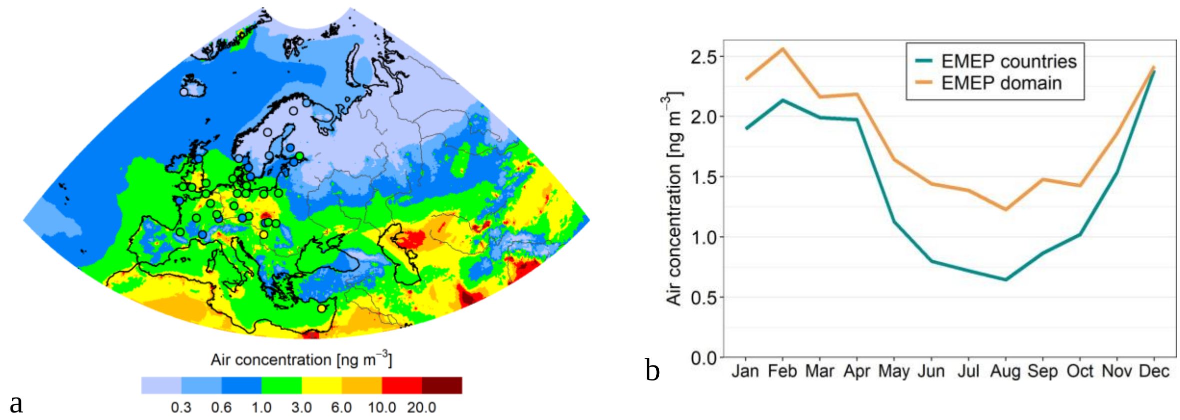


Fig. 3.1. *Annual mean air concentrations of Pb (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Pb air concentrations in EMEP countries and for the entire EMEP domain (b) in 2023.*

Precipitation scavenging, or wet deposition, is a key atmospheric removal process that transfers pollutants from the atmosphere to terrestrial and aquatic ecosystems. The spatial pattern of annual wet deposition of Pb in 2023 reflects both the distribution of atmospheric concentrations and regional precipitation patterns. Higher deposition levels were observed in Central Europe and Central Asia, consistent with elevated air concentrations. Deposition fluxes generally ranged from 0.05 to 0.5 kg km^{-2} yr^{-2} (Fig. 3.2a), with the highest values exceeding 0.8 kg km^{-2} yr^{-1}. The highest wet deposition of Pb across both EMEP countries and the entire domain in 2023 was observed during the spring season (Fig. 3.2b).

The precipitation (wet deposition) measurements follow the same spatial pattern as the modelled values (Fig. 3.2a). In the case of 36 valid sites the spatial correlation between modelled and observed values is 0.65 (Table C1). Approximately 70% of the measurement sites agree with the modelled values within a factor of two.

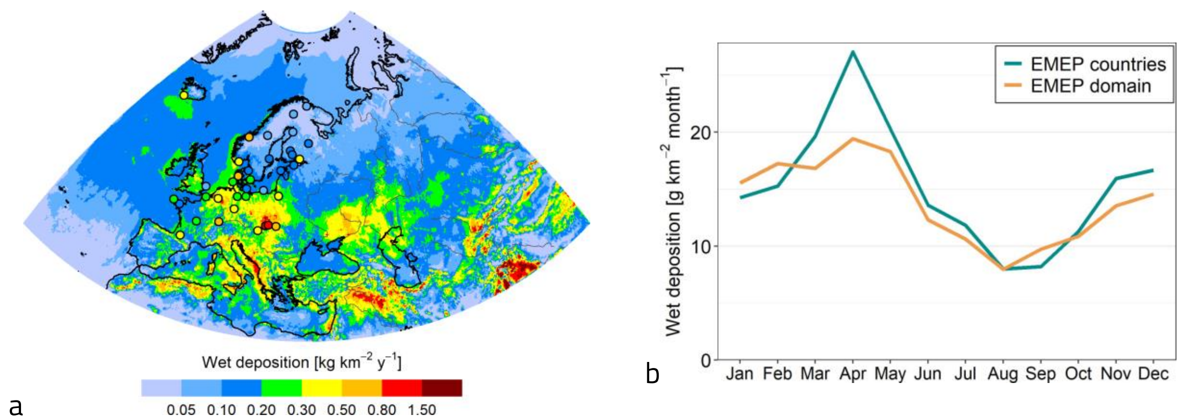
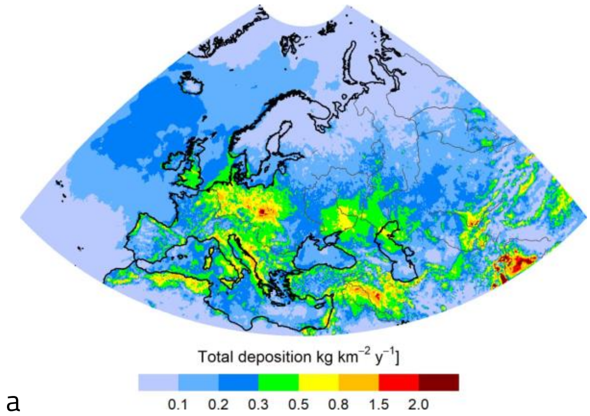


Fig. 3.2. *Annual wet deposition flux of Pb (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Pb wet deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

Total atmospheric deposition comprises both wet deposition and dry deposition, the contribution of dry deposition can be particularly significant in forested regions and areas characterized by low precipitation. In 2023, total Pb deposition across EMEP countries ranged from 0.1 to 1.5 kg km^{-2} yr^{-1} (Fig. 3.3a), the spatial distribution of total deposition closely mirrors that of wet deposition. Regionally, the total deposition is the highest in Central Europe, and Central Asia from the modelled domain. In Central Asia, the higher deposition is caused by elevated levels of dust resuspension. The peak total deposition for the EMEP countries, as well as for the entire domain, occurred in April 2023.



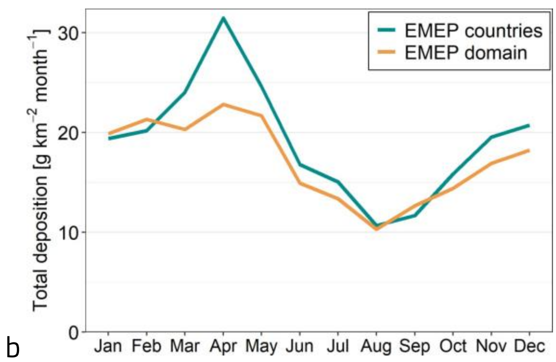


Fig. 3.3. *Annual total deposition flux of Pb (a) and seasonal variation of mean Pb deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

The relative contributions of different pollution source categories vary significantly across countries (Fig. 3.4). Deposition fluxes are highest in Central European and Balkan countries such as Poland, Bosnia and Herzegovina, Montenegro, Slovakia, Czechia, and Germany, while the lowest values are observed in Scandinavia and the northern parts of the modelled domain, including Finland, Sweden, Norway, Iceland, and Russia. Countries located near the boundaries of the modelled domain exhibit notable contributions from non-EMEP sources.

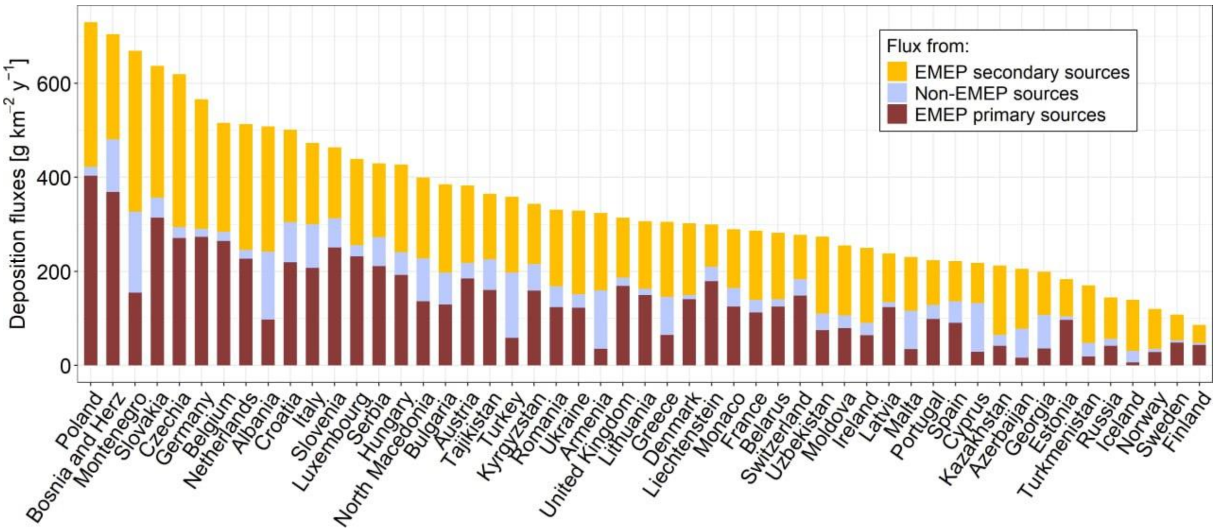


Fig. 3.4. *Country-average deposition of Pb to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2023.*

Deposition from primary anthropogenic sources can be classified based on contributions from domestic emissions and transboundary transport originating in other EMEP countries. Among the countries with the highest anthropogenic Pb deposition, the relative share of these contributions varies considerably (Fig. 3.5a). The contribution of domestic sources is greatest in countries geographically isolated by seas or located along the coast, such as the United Kingdom, Portugal, Italy, and Spain (Fig. 3.5b). In contrast, domestic contributions are minimal in small European states (e.g. Monaco, Liechtenstein) and in certain Central Asian and Caucasus countries (e.g. Kyrgyzstan, Azerbaijan), where deposition is largely driven by transboundary air pollution. In several larger Central European countries, such as Germany and Poland, where national emissions are substantial, domestic sources account for the majority of Pb deposition.

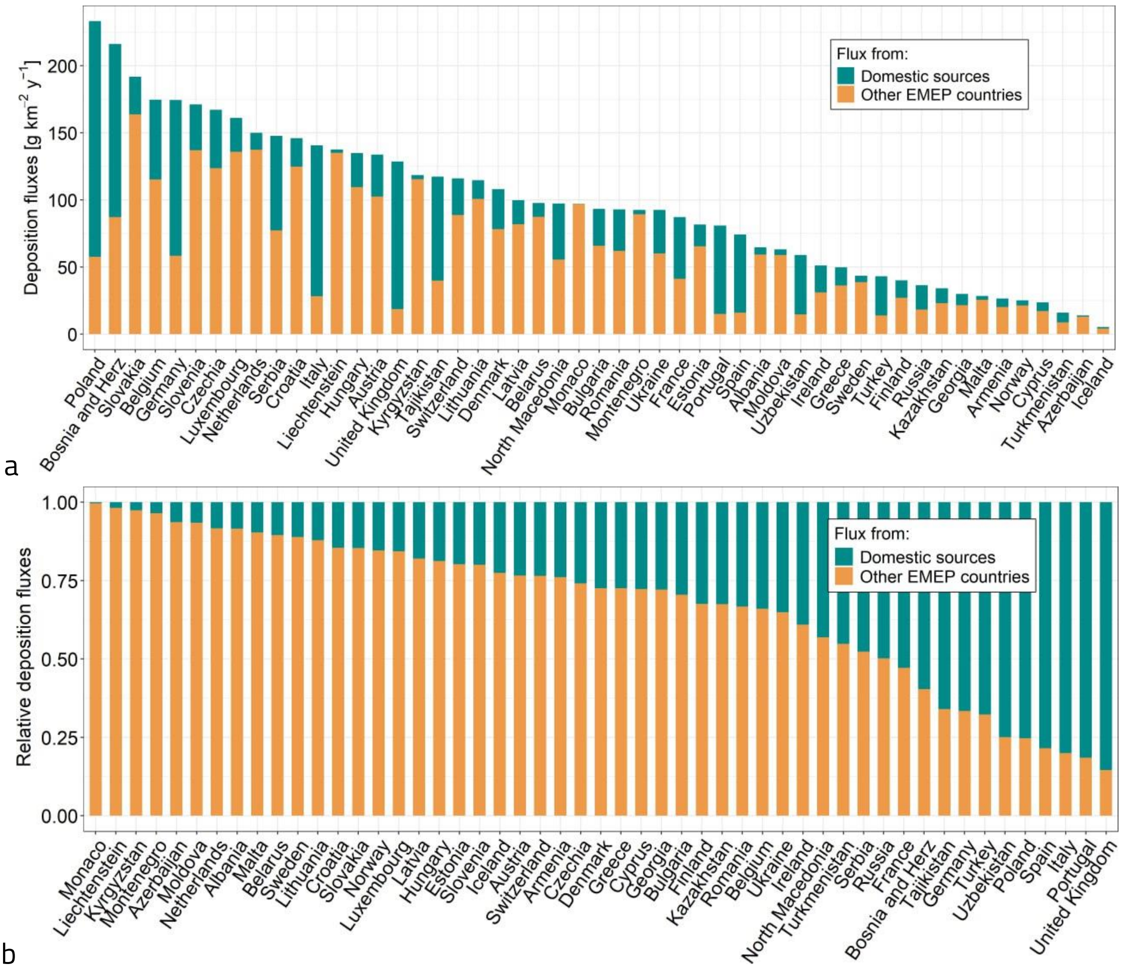


Fig. 3.5. *Country-average Pb anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to Pb anthropogenic deposition in EMEP countries (b) in 2023.*

3.3. Cadmium

Cadmium (Cd) is a non-essential and highly toxic element that primarily affects the kidneys and skeletal system in humans and is classified as a human carcinogen via inhalation. Health impacts associated with Cd exposure include kidney damage, bone deterioration, and an increased risk of cancer. Similar to Pb, cadmium is predominantly found in the atmosphere at trace concentrations, bound to fine aerosol particles, and its atmospheric behaviour is largely determined by the properties of these particles. With an atmospheric residence time ranging from several days to weeks, Cd can undergo long-range transport from emission or re-emission sources before being deposited onto terrestrial or aquatic surfaces.

In 2023, air concentrations of Cd ranged from 0.01 to 0.5 ng/m3 (Fig 3.6a). The highest Cd air concentration was observed in Central Asian deserts, where dust resuspension is significant. The lowest air concentration was assessed in the northern part of the modelled domain, which is far of every kind of emission sources. In Central Europe, elevated level of Cd concentration was found (above 0.1 ng/m3) in the following countries: Germany, Poland, Belgium, Netherlands, and some Balkan countries. The seasonal variation of Cd shows a regular pattern with a maximum in the cold season due to elevated anthropogenic emission (Fig. 3.6b).

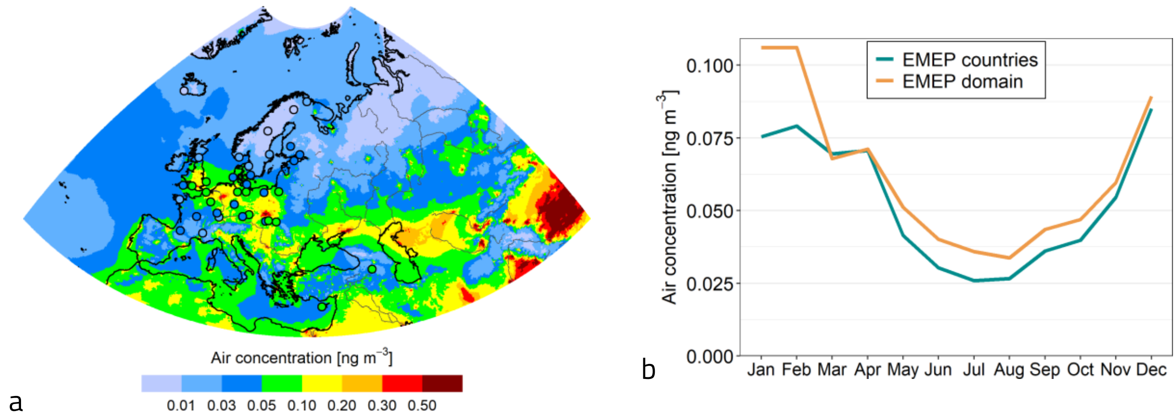


Fig. 3.6. *Annual mean air concentrations of Cd (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Cd air concentrations in EMEP countries and for the entire EMEP domain (b) in 2023.*

The model reasonably reproduces observed Cd air concentrations, with approximately 80% of the 37 measurement sites matching the modelled values within a factor of two (Table C1). However, the spatial correlation is relatively low (0.54). A moderate overestimation of about 23%, particularly in Central Europe, is likely attributable to uncertainties in modelling wind re-suspension of Cd from urban and industrial areas.

In 2023, wet deposition of Cd ranged from about 1 g km^{-2} y^{-1} in the northern part of the modelled domain (Scandinavian countries) to around 30 g km^{-2} y^{-1} in Central Europe and the Balkans (Poland, Germany, Serbia, and Montenegro) (Fig. 3.7a). Elevated Cd wet deposition was also observed in Eastern Europe and Central Asia. Seasonal variations show a peak in spring, while the lowest levels were recorded in late summer and early autumn (Fig. 3.7b).

Although the model significantly underestimates Cd wet deposition at several sites, resulting in an average underprediction of 54%, it reasonably captures the overall spatial pattern, with a moderate correlation coefficient (0.4) and agreement within a factor of two at 44% of the sites (Fig. 3.7a; Table C1). The underestimation is likely related to uncertainties in model parameterisations and measurements at certain monitoring locations, which will be investigated further.

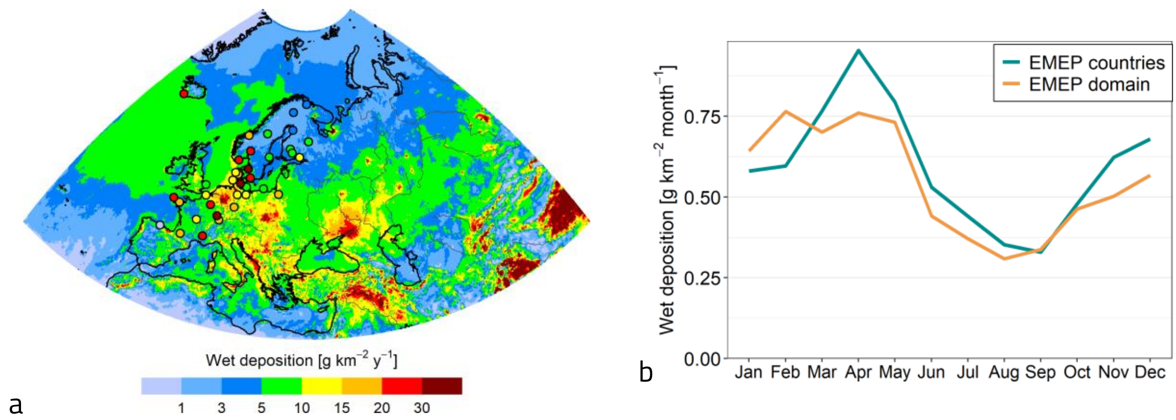


Fig. 3.7. *Annual wet deposition flux of Cd (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Cd wet deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

Annual total deposition of Cd ranges In Europe from 2 to 70 g km^{-2} y^{-1}, with higher fluxes estimated in Asia (Fig. 3.8a). Within Europe, the highest deposition values are found in Central Europe, including Poland, Germany, and the Balkan states, while the lowest values occur in the northern part of the modelled domain (Scandinavian countries), consistent with wet deposition patterns. Seasonal variations in total deposition mirror those of wet deposition, with minimum fluxes in summer and peaks in spring.

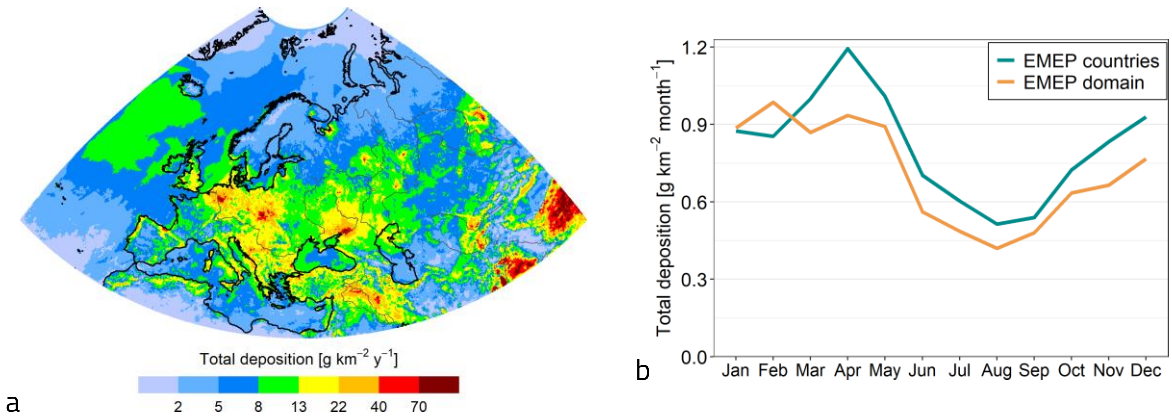


Fig. 3.8. *Annual deposition flux of Cd (a) and seasonal variation of mean Cd deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

Cadmium deposition in EMEP countries originates from both domestic sources, anthropogenic and secondary, and emissions from outside the region. The relative contributions of these sources vary significantly across countries (Fig. 3.9). Among primary anthropogenic sources within the EMEP region, the highest Cd deposition occurs in Central European and Balkan countries, including Poland, Bosnia and Herzegovina, Slovakia, Serbia, Germany, Czechia, and Slovenia. In contrast, non-EMEP sources contribute most to Cd deposition in several Southern European (Albania, Montenegro, Türkiye) and Central Asian (Armenia, Georgia, Tajikistan, Kyrgyzstan) countries. Additionally, secondary emissions from wind resuspension of desert dust strongly influence Cd deposition in parts of Central Asia.

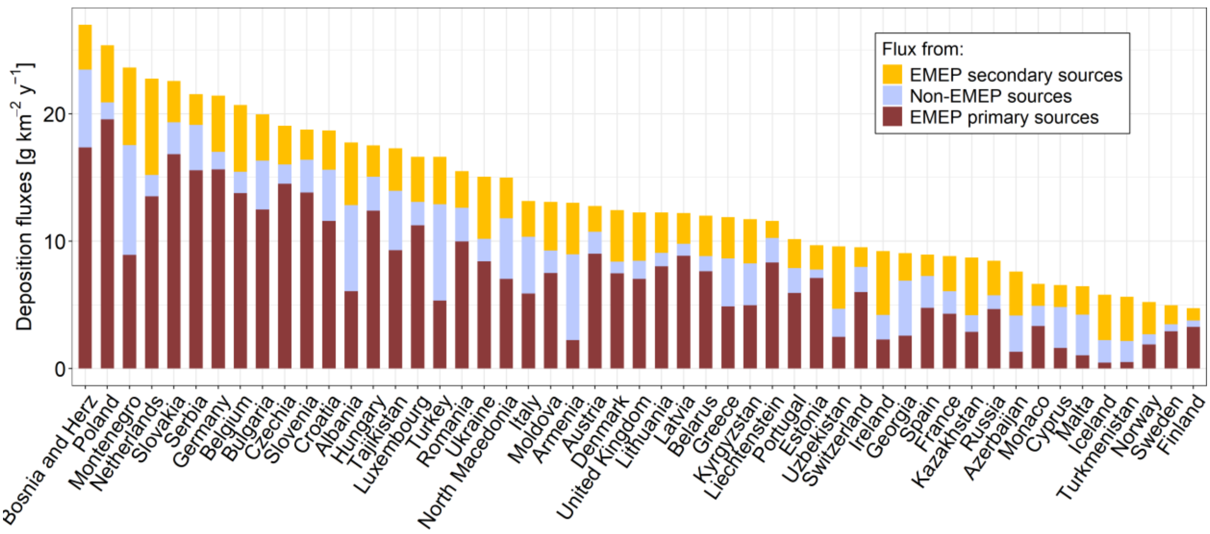


Fig. 3.9. *Country-average deposition of Cd to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2023.*

Across the EMEP region, anthropogenic emissions contribute substantially to Cd deposition. The proportion of domestic sources varies considerably, from just a few percent in countries with low national emissions to more than 80% in larger countries such as Spain, the United Kingdom, and Portugal, which are partly isolated by the sea (Fig. 3.10a). In some countries with the highest Cd deposition, domestic emissions dominate (e.g. Poland, Bosnia and Herzegovina, Germany), whereas in others, transboundary inflow from neighbouring states is the primary source (e.g. Czechia, Slovakia). Model results show that in roughly three-quarters of EMEP countries (39 out of 51), Cd deposition is driven mainly by transboundary transport rather than local emissions, highlighting the international nature of the problem (Fig. 3.10b).

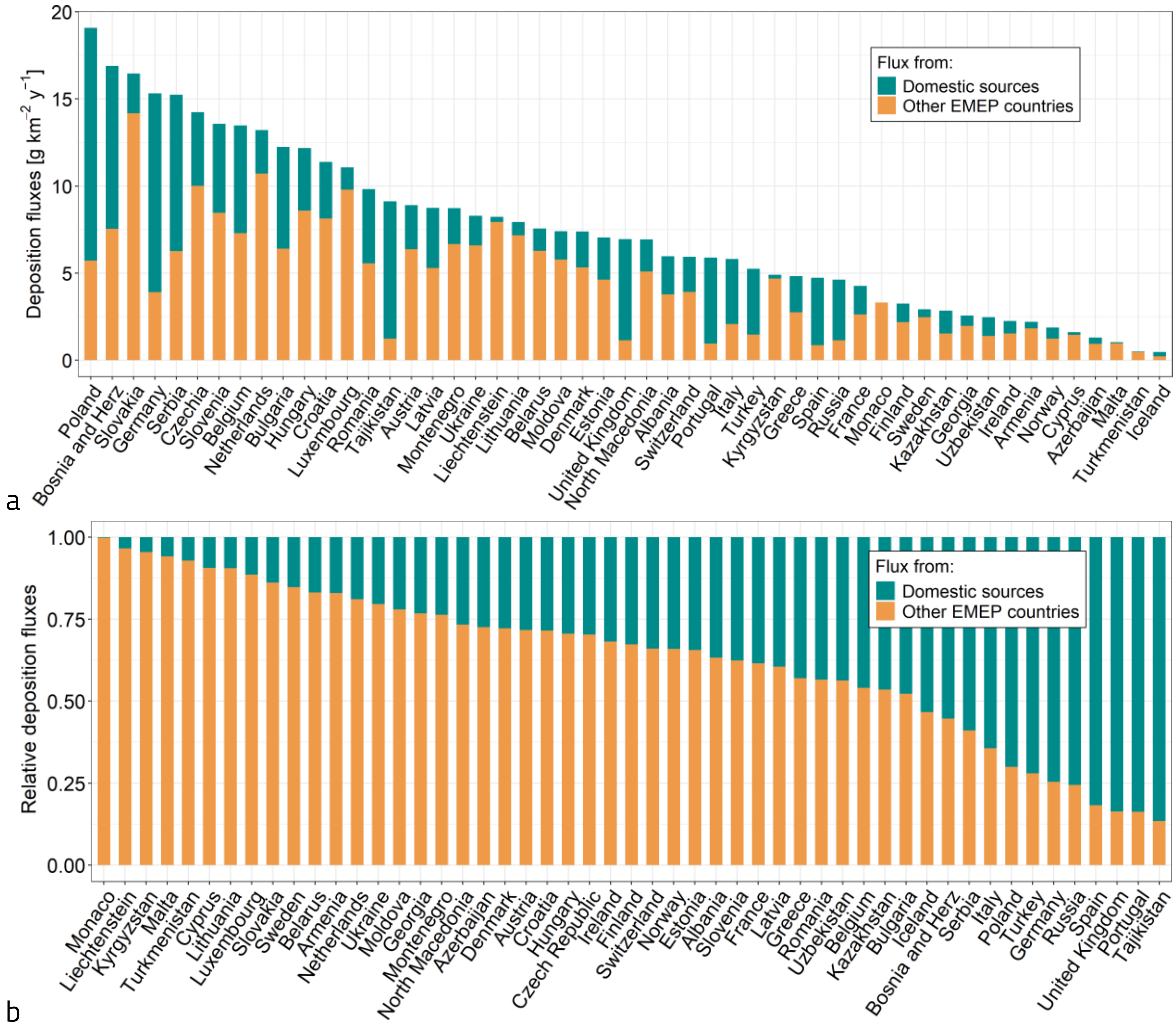


Fig. 3.10. *Country-average Cd anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to Cd anthropogenic deposition in EMEP countries (b) in 2023.*

3.4. Mercury

Mercury (Hg) is predominantly present in the atmosphere in its relatively inert elemental form (Hg^0), which gives it a longer atmospheric lifetime compared to other heavy metals such as Pb and Cd. This contributes to the long-range transport of Hg, allowing it to reach regions far from emission sources. Furthermore, Hg^0 can undergo various physicochemical transformations into oxidised and particulate forms, which can interconvert and be reduced back to Hg^0. Consequently, the dispersion of atmospheric Hg, its deposition to terrestrial and aquatic environments, and its overall environmental fate are largely governed by the chemical cycling of Hg compounds.

In 2023, atmospheric Hg^0 concentrations in the surface layer across the entire EMEP region ranged from 0.8 to 10 ng m^{-3}, with an average of 1.3 ng m^{-3} (Fig. 3.11). The variation in Hg^0 concentrations is relatively small due to the even distribution of background levels resulting from the long atmospheric lifetime of Hg. Nevertheless, noticeable differences exist between countries within the EMEP region. Above-average Hg^0 concentrations are observed near the Mediterranean coast and, in particular, over the Black and Caspian Seas. Concentrations below 1.3 ng m^{-3} occur in Switzerland, central France, Finland, Scandinavia, the Baltic states, and remote regions such as the Arctic. Modelling results are consistent with Hg^0 concentrations measured at EMEP stations (circles in Fig. 11a), showing a mean bias of –8%. The maximum difference between modelled and observed values was 0.4 ng m^{-3}. Seasonality is minimal (Fig. 11b), with average Hg^0 concentrations ranging from 1.1 to 1.4 ng m^{-3} throughout the year.

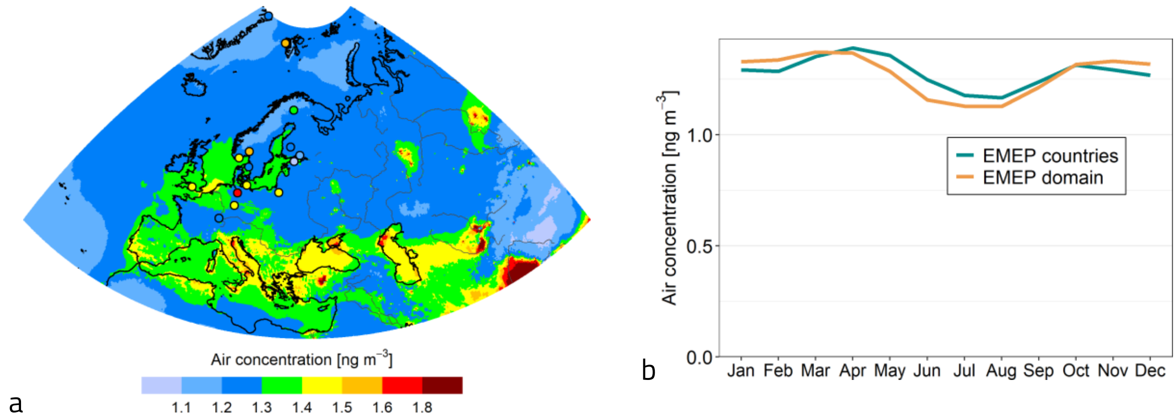


Fig. 3.11. *Annual mean air concentrations of Hg^0 (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Hg^0 air concentrations in EMEP countries and for the entire EMEP domain (b) in 2023.*

Mercury deposition is primarily driven by oxidised forms of Hg, which are either directly emitted or formed through atmospheric transformations. Consequently, the spatial pattern of Hg deposition is influenced by several factors, including the spatial distribution of emissions, meteorological variability, and regions of intensive atmospheric oxidation. The spatial distribution of Hg wet deposition (Fig. 3.12a) closely follows that of total Hg deposition, with the highest wet deposition fluxes observed in Central and Southern Europe, parts of the Caucasus, and Central Asia (further details are provided in the discussion on total Hg deposition). Modelled results are in reasonable agreement with Hg wet deposition measurements at EMEP stations (circles in Fig. 3.12a), with the largest difference between modelled and observed values reaching 13 g km^{-2} y^{-1}. The seasonal distribution of Hg wet deposition (Fig. 3.12b) indicates the highest values (above 0.6 g km^{-2} month^{-1}) during spring and summer (March to August), while lower deposition levels are modelled for autumn and winter (September to February).

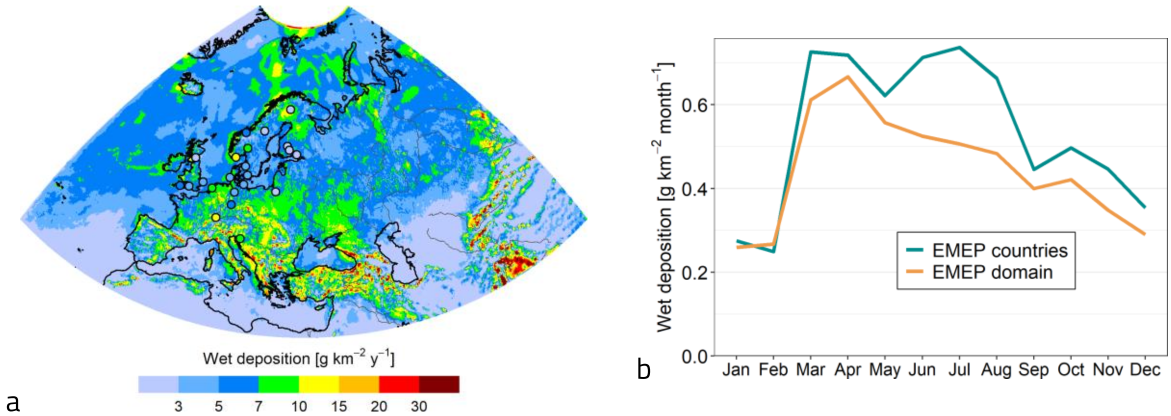


Fig. 3.12. *Annual wet deposition flux of Hg (circles on the map show observed values in the same colour scale) (a) and seasonal variation of mean Hg wet deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

The most intensive total Hg deposition (Fig. 3.13a, exceeding 40 g km^{-2} y^{-1}) is modelled for specific areas in the Caucasus, particularly Armenia and Georgia, as well as for several Central Asian countries and parts of Türkiye. Elevated mercury deposition fluxes (above 25 g km^{-2} y^{-1}) are also modelled for Central and Southern Europe, including Germany, Poland, Czechia, Romania, Italy, Spain, Croatia, Bosnia and Herzegovina, and Bulgaria. High total mercury deposition in these regions is largely driven by elevated anthropogenic Hg emissions. Increased total Hg deposition is also observed in the high Arctic, especially in spring, due to enhanced Hg^0 oxidation and subsequent deposition during Atmospheric Mercury Depletion Events (AMDEs). However, much of the mercury deposited on snow is later re-emitted back into the atmosphere. The seasonal distribution of total Hg deposition (Fig. 3.13b) shows the highest average values (above 1 g km^{-2} month^{-1}) during spring and summer (March to August), while lower deposition levels are modelled for autumn and winter (September to February). Overall, the seasonality of wet and total Hg deposition follows very similar patterns.

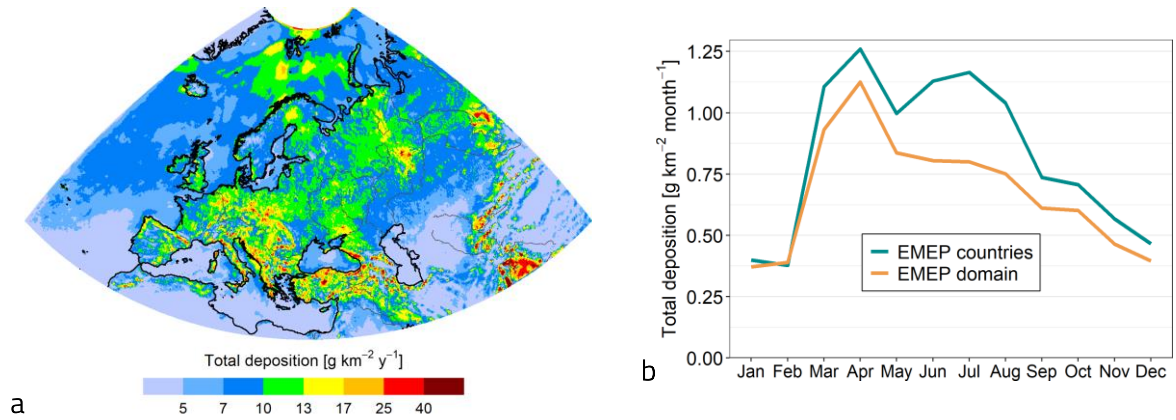


Fig. 3.13. *Annual deposition flux of Hg(a) and seasonal variation of mean Hg deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

The model assessment of long-range transport of Hg demonstrates the significant effect of transboundary pollution in the EMEP countries, further emphasizing the nature of Hg as a global pollutant. Each country contributes to Hg pollution not only within its own territorial borders but also to the territories of other countries. The extent of contribution of a specific EMEP country to transboundary pollution is influenced by its national emissions, as well as the size and geographical location of the country.

For 2023, Montenegro is the largest recipient of transboundary Hg deposition per km^2 (Fig. 3.14); Bosnia and Herzegovina and Slovakia are the only other recipients of transboundary Hg deposition fluxes above 15 g km^{-2} year^{-1}. Non-EMEP countries are the largest contributors to the transboundary Hg deposition (>50 % of contribution for all EMEP countries). The only countries that have >40 % of contribution from EMEP source are Czechia and Poland. For 30 EMEP countries, transboundary transport from non-EMEP sources contributed to >75% of the deposition flux. The impact of regional secondary/natural sources is insignificant, contributing <3% to the deposition flux for all EMEP countries.

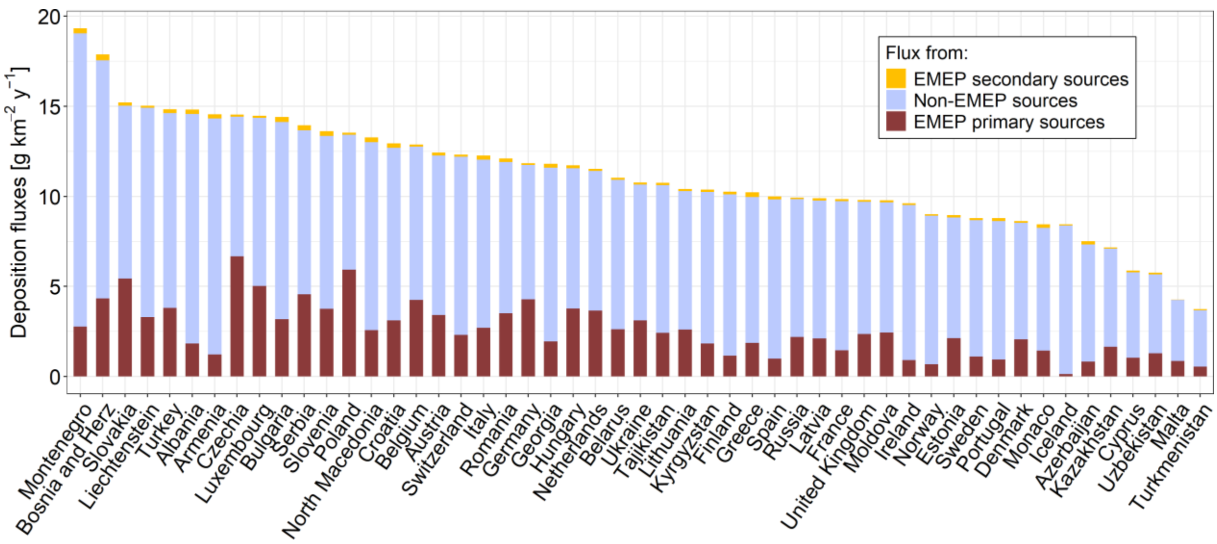


Fig. 3.14. *Country-average deposition of Hg to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2023.*

When examining Hg anthropogenic deposition originating solely from within the EMEP domain (Fig. 3.15), it becomes evident that, for 40 EMEP countries, the majority of deposition (>50%) comes from transboundary sources within other EMEP countries. Nations where domestic sources contribute more to deposition than external EMEP sources are generally those with large national Hg emissions, such as Czechia, Serbia, Poland, Germany, Italy, Spain, Portugal, Russia, Tajikistan, the United Kingdom, and Türkiye. In contrast, countries with low national emissions exhibit an almost 100% relative contribution of Hg deposition from other EMEP countries, including Monaco, Liechtenstein, Malta, Cyprus, Albania, and Moldova (Fig. 3.15b).

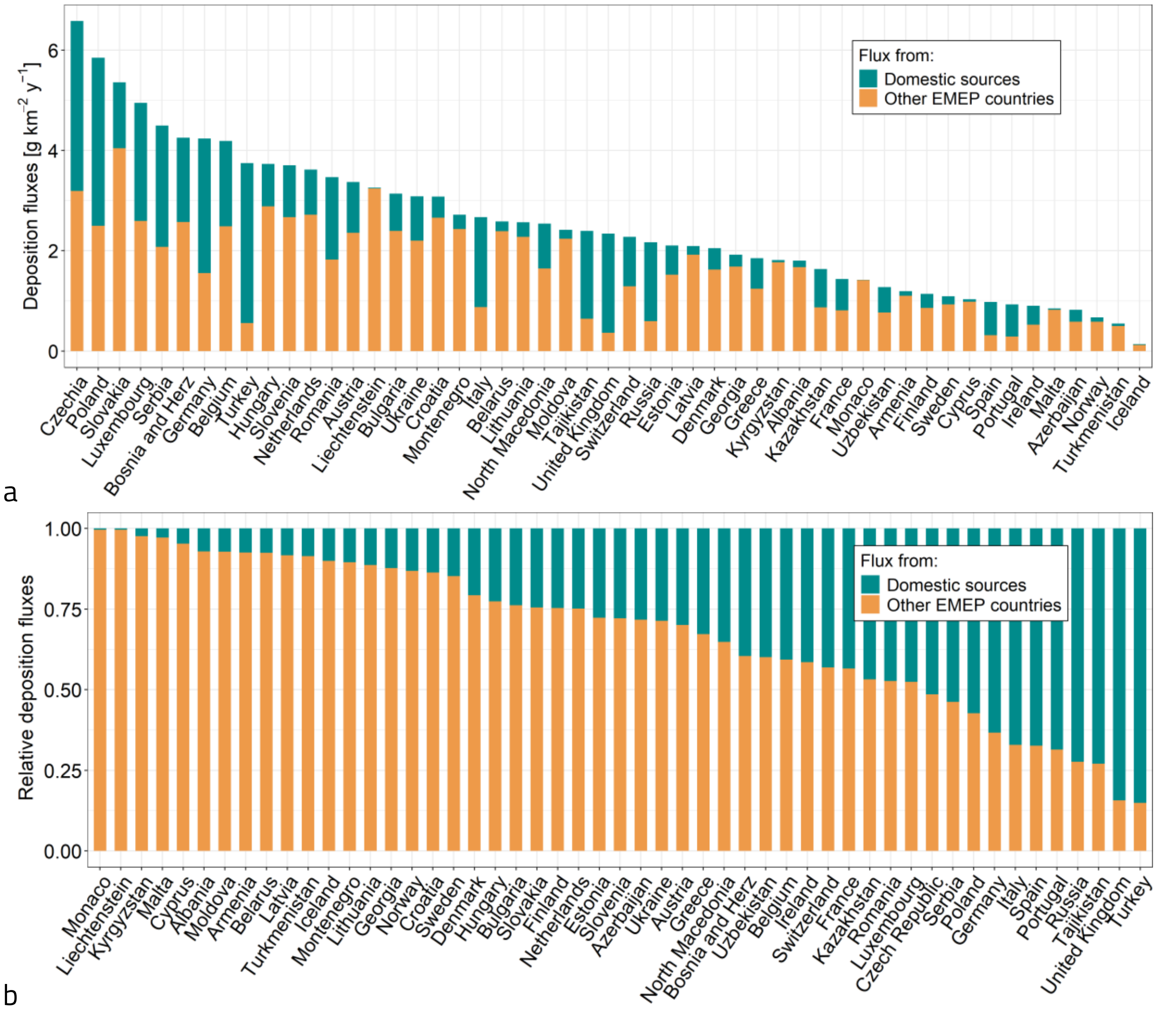
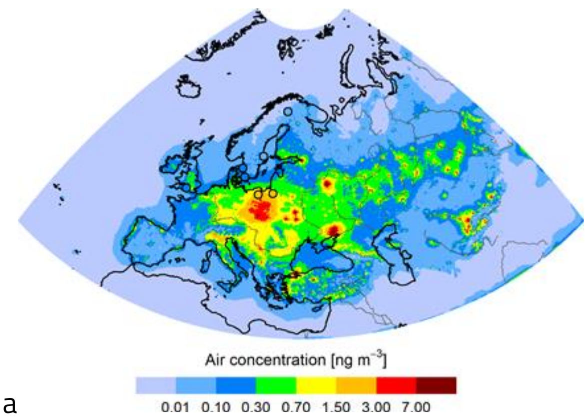


Fig. 3.15. *Country-average Hg anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to Hg anthropogenic deposition in EMEP countries (b) in 2023.*

3.5. Polycyclic Aromatic Hydrocarbons (PAHs)

Polycyclic Aromatic Hydrocarbons (PAHs) are organic compounds composed of two or more fused aromatic rings formed mainly through the incomplete combustion of fossil fuels, biomass, and other carbon-based materials. Although natural processes such as wildfires and volcanic activity contribute to their formation, anthropogenic sources, including industrial emissions, vehicular exhaust, and residential heating, dominate their presence in the environment. Owing to their chemical stability and hydrophobicity, PAHs persist in soils and sediments, bioaccumulate in aquatic organisms, and pose significant health risks, as several are mutagenic, teratogenic, or carcinogenic, with benzo(a)pyrene being the most notable example. Given their persistence and toxicity, four PAHs – 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) – are regulated under the Protocol on Persistent Organic Pollutants (POPs). This section presents the model assessment of pollution from these along with comparisons against measurements.

The spatial distribution of average annual modelled atmospheric concentrations of the sum of four PAHs across the EMEP domain is shown in Figure 3.16a. Elevated concentrations above 1.5 ng/m^3 are observed in Central and Eastern Europe, particularly in Poland, Czechia, Serbia, northern Italy, and in certain areas of Türkiye and Kazakhstan. The highest levels, exceeding 7 ng/m^3, occur in southern Poland and near the Dardanelles and Bosphorus straits. Moderate concentrations dominate much of Central and Eastern Europe, while lower levels prevail in Northern and Western Europe, especially in Norway, Sweden, France, the United Kingdom, and Spain. Seasonal variation is pronounced, with modelled concentrations peaking in winter due to increased residential combustion emissions and reaching their lowest values in summer owing to enhanced atmospheric degradation (Fig. 3.16b).



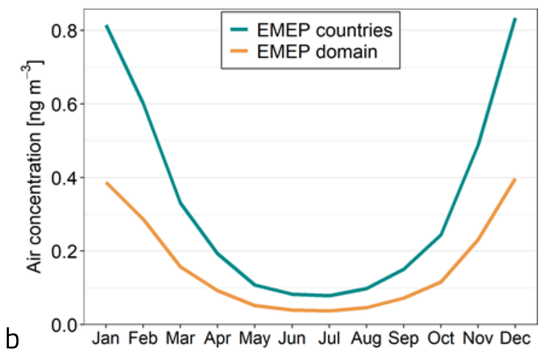


Fig. 3.16. *Annual mean air concentrations the sum of 4 PAHs (circles on the map show observed values in the same colour scale) (a) and seasonal variation of the sum of 4 PAHs air concentrations in EMEP countries and for the entire EMEP domain (b) in 2023.*

The 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.

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/m^3 in several regions, including southern Poland, eastern Czechia, and over the Dardanelles and Bosporus straits.

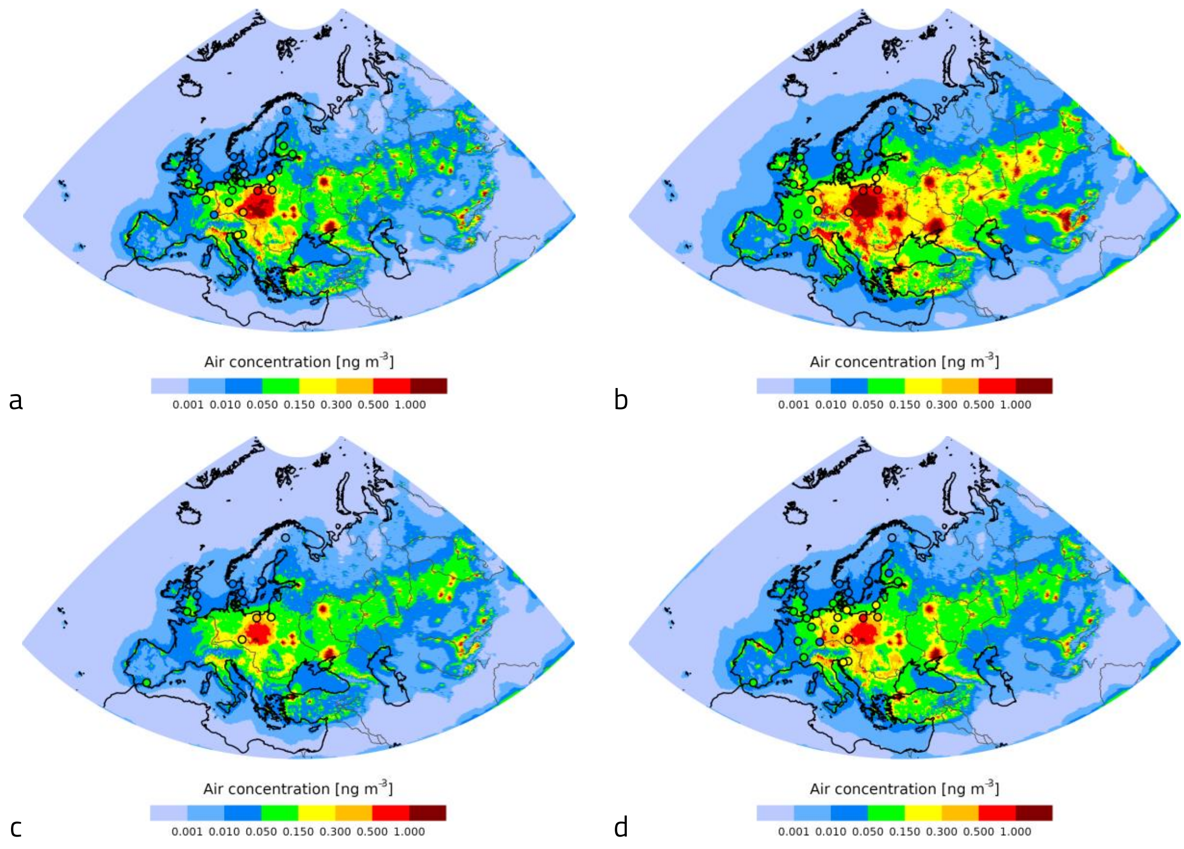


Fig. 3.17. *Annual mean air concentrations of B(a)P (a), B(b)F (b), B(k)F (c), and IP (d) in 2023 (circles on the maps show observed values in the same colour scale).*

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.

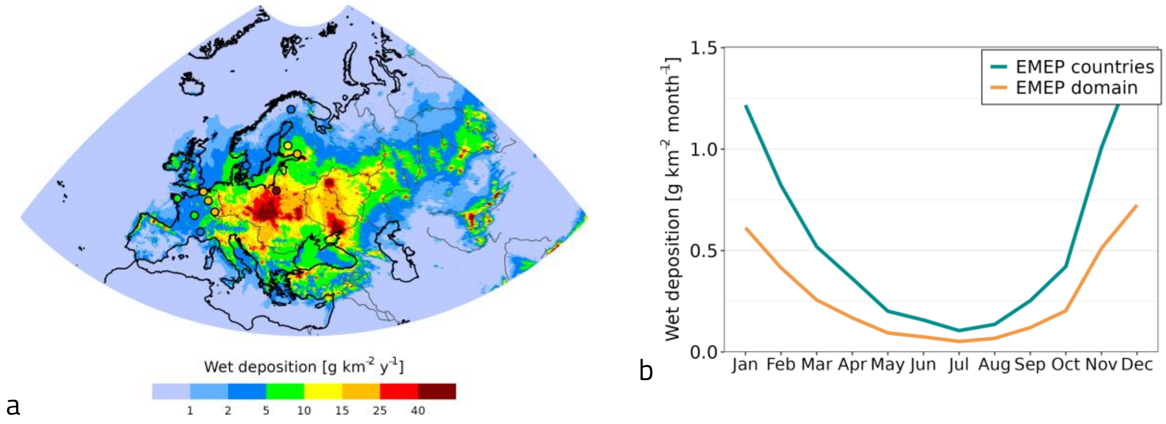


Fig. 3.18 *Annual wet deposition flux of the sum of 4 PAHs (circles on the map show observed values in the same colour scale) (a) and seasonal variation of the sum of 4 PAHs wet deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

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.

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.

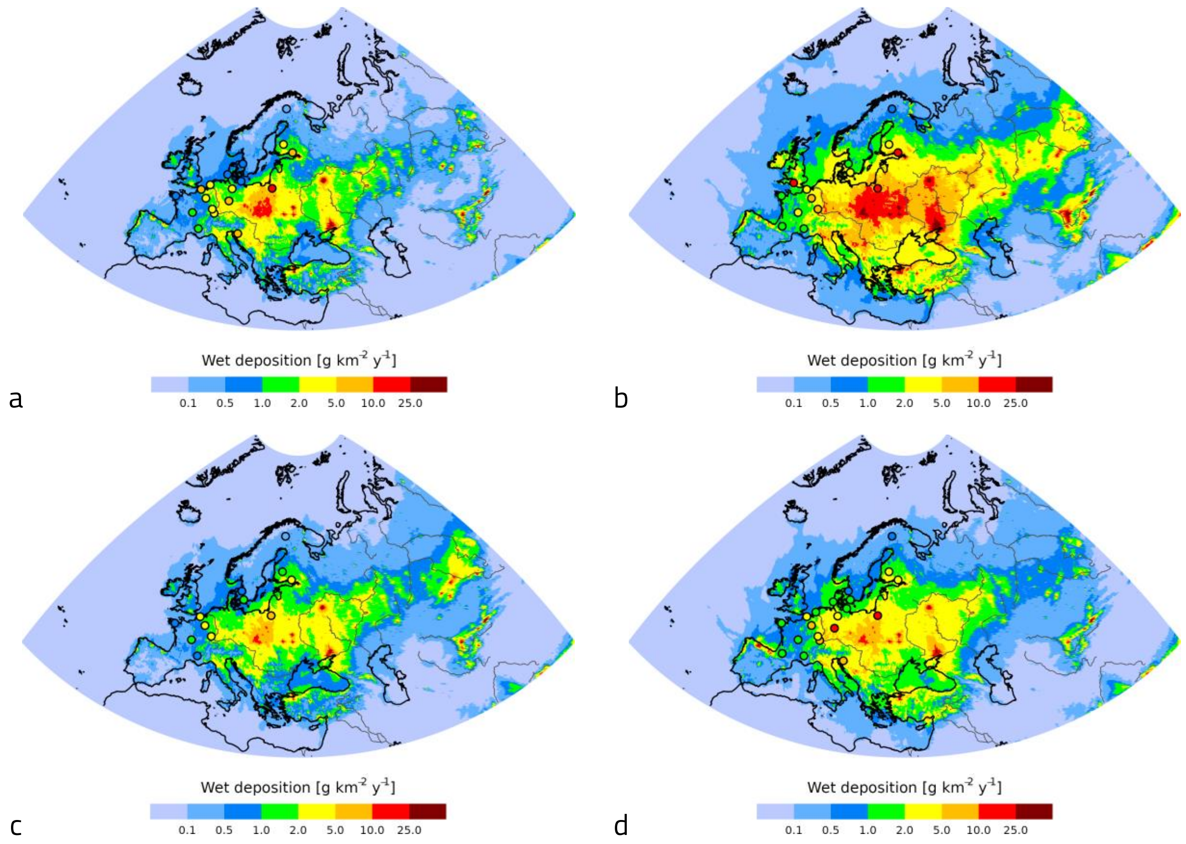


Fig. 3.19. *Annual wet deposition flux of B(a)P (a), B(b)F (b), B(k)F (c), and IP (d) in 2023 (circles on the maps show observed values in the same colour scale).*

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.

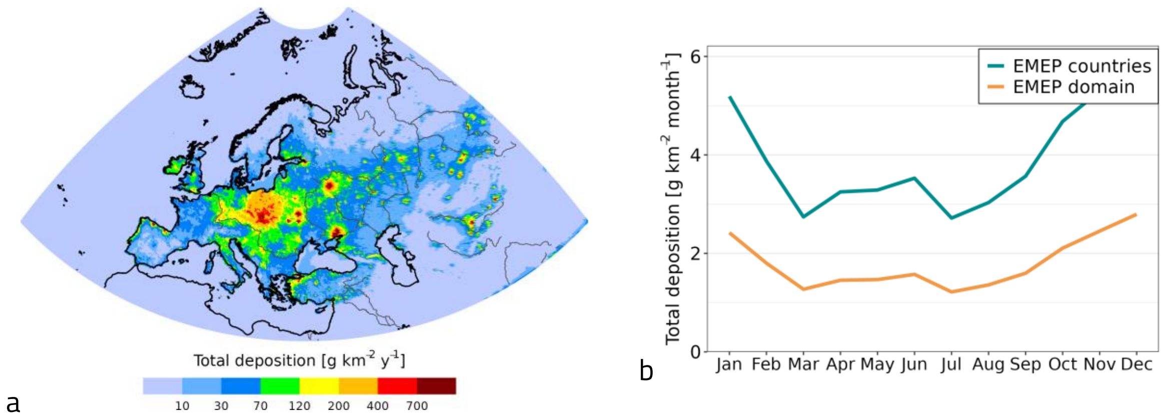


Fig. 3.20. *Annual total deposition flux of the sum of 4 PAHs (a) and seasonal variation of the sum of 4 PAHs total deposition in EMEP countries and for the entire EMEP domain (b) in 2023.*

PAH deposition in the EMEP region arises from both primary anthropogenic emissions within EMEP countries and contributions from secondary and non-EMEP sources (Fig. 3.21). In most countries, the influence of non-EMEP and secondary sources is limited due to the short atmospheric residence time of PAHs and weak re-emission fluxes from surfaces. Overall, these sources account for 10% to 43% of total deposition across EMEP countries, with the highest shares observed in remote areas and near the domain borders, including Iceland, Portugal, Cyprus, Ireland, Spain, and the United Kingdom.

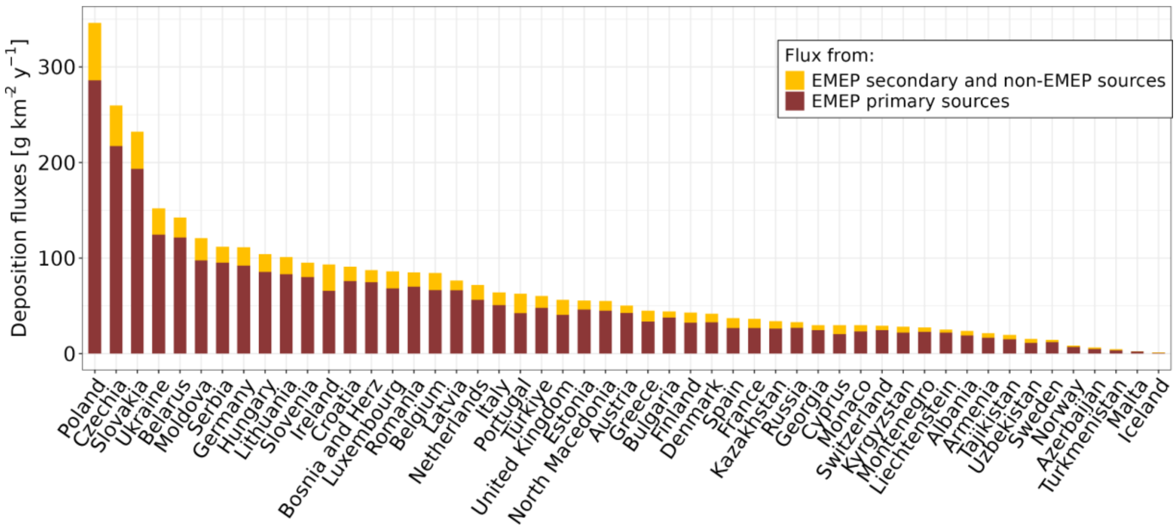


Fig. 3.21. *Country-average deposition of the sum of 4 PAHs to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2022.*

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.

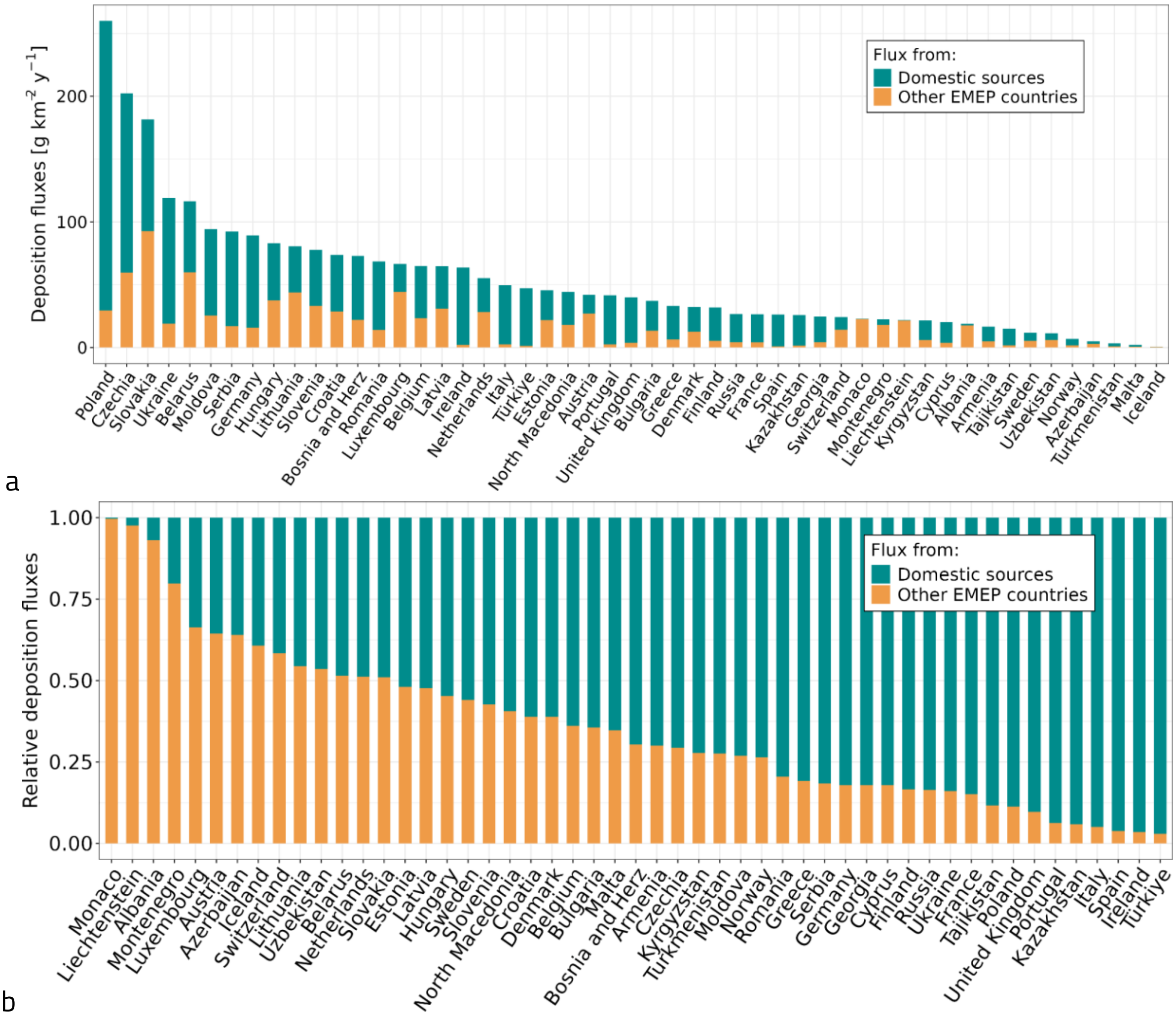


Fig. 3.22 *Country-average anthropogenic deposition of the sum of 4 PAHs to EMEP countries (a) and relative contribution of domestic and foreign sources to the sum of 4 PAHs anthropogenic deposition in EMEP countries (b) in 2022.*

3.6 HCB, PCBs, PCDD/Fs

This section summarizes the modelled and observed pollution levels of HCB, PCBs and PCDD/Fs in the EMEP domain in 2023. These pollutants are toxic, semi-volatile and widespread in the environment. They are known for their adverse effects on human health and biota, underlining the persistent risks they pose long after their initial release (Hoyeck et al., 2022; Mishra et al. 2022; WHO 2000; 2003). Their resistance to degradation, ability to bioaccumulate through the food chain and considerable potential for long-range atmospheric and marine transport over hundreds to thousands of kilometres contribute to their environmental persistence. HCB, PCBs and PCDD/Fs are primarily formed as unintentional by-products of various anthropogenic activities such as fossil fuel combustion, chemical production and waste incineration. Their gas-particle partitioning is highly temperature-dependent, allowing them to exist in the atmosphere in both the gas and particle forms. Long-term accumulation in terrestrial and aquatic compartments facilitates secondary emissions (re-volatilization) back into the atmosphere, significantly maintaining pollution levels even in remote regions.

In 2023, the lowest atmospheric PCDD/Fs concentrations were observed over the North Atlantic region and the northern parts of Scandinavia (Fig. 3.23a). In contrast, elevated concentrations were observed in Central, Southern and Eastern Europe, with pronounced hotspots in Northern Italy, Southern Türkiye and certain areas of the Caucasus and Central Asia. In general, Western European countries, including France, Portugal, the Netherlands and Belgium, exhibited intermediate concentration levels, between 1 and 4 fg TEQ m^{-3}. Central European countries and several Balkan countries such as Czechia, Hungary, Austria, Poland, Croatia, Serbia and Romania showed relatively higher concentrations in the range of 4 to 8 fg TEQ m^{-3}. Overall, the spatial distribution reveals a clear gradient, with PCDD/Fs concentrations decreasing from Central Europe and parts of Southern Europe towards the western, eastern and northern parts of the EMEP domain. Seasonally (Fig. 3.23b), the highest PCDD/Fs concentrations in the air occurred during the cold season (December-February). From late winter to spring (March to May), concentrations decreased sharply, reached their lowest level in late spring and then gradually increased during the summer and autumn months. Throughout the year, the mean concentration averaged over the boundaries of EMEP countries remained slightly higher than in the broader EMEP domain, reflecting the influence of national anthropogenic emission sources and secondary emission processes in these countries.

Measurements of PCDD/Fs air concentrations in 2023 were carried out at the two EMEP stations in Sweden (Råö and Norunda Stenen). For both stations, the model predictions were within a factor of two compared to the observed concentrations. At station Råö, the model showed good agreement and slightly overestimated the measured values by about 3%. In contrast, the model underestimated the observed concentrations with a bias of about -15% at station Norunda Stenen.

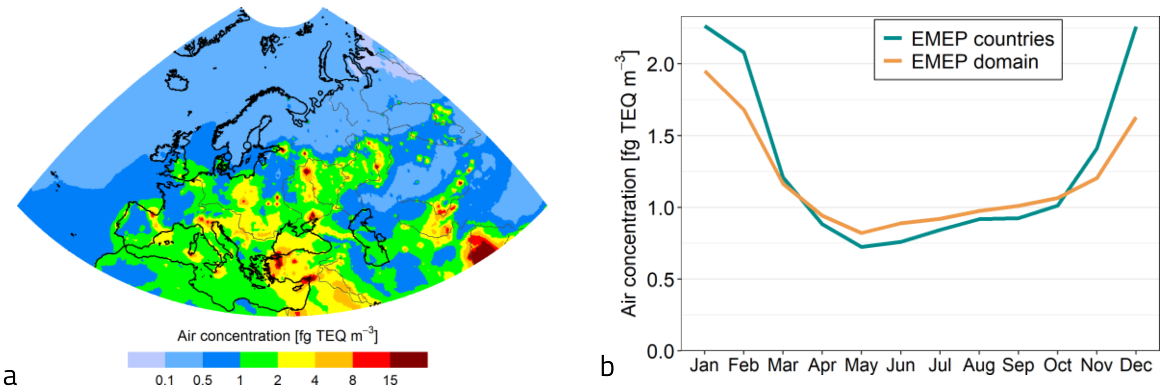


Fig. 3.23. *Annual mean air concentrations of PCDD/Fs (a) (circles on the map show observed values in the same colour scale) and seasonal variation of mean PCDD/Fs (b) air concentrations in EMEP countries and EMEP domain in 2023*

In 2023, annual mean concentrations of PCB-153 in surface air in the EMEP domain showed considerable spatial variability, ranging from below 0.1 pg/m^3 in parts of Northern and Eastern Europe to above 7.0 pg/m^3 in certain areas of Southern and Central Europe (Fig. 3.24a). The highest concentrations were observed in the Mediterranean region – including Spain, northern Italy and parts of the Balkans – where levels were generally above 3 pg/m^3, with local hotspots exceeding 7 pg/m^3. These high levels are attributed to significant anthropogenic emissions. In contrast, the lower concentrations observed in Northern and Eastern Europe are likely due to colder temperatures, which have reduced the volatilization that limits atmospheric concentrations. Overall, the spatial distribution exhibits a clear gradient, with concentrations decreasing from the southwest towards the north and northeast of the EMEP domain. The seasonal variation of PCB-153 concentrations shows a distinct pattern with the highest values in the summer months (June–August) and the lowest values in winter (December–February) (Fig. 3.24b). In August 2023, the highest monthly mean concentration over the EMEP region reached about 0.65 pg/m^3, while the domain-wide average was about 0.45 pg/m^3. These results highlight the continuing influence of secondary emissions and climate-related variability on atmospheric PCB-153 pollution in Europe.

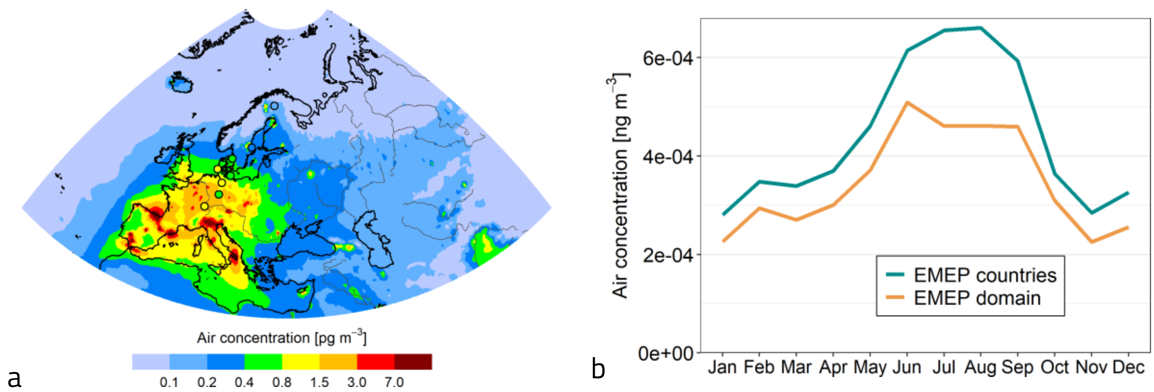
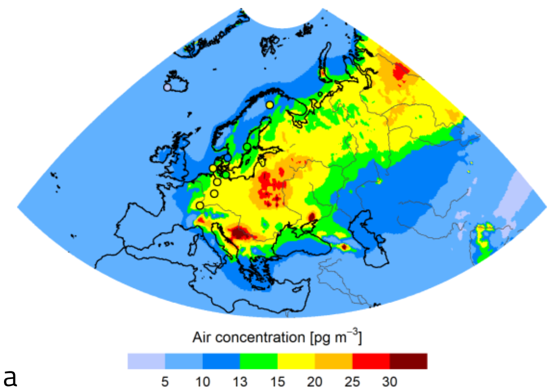


Fig. 3.24. *Annual mean air concentrations of PCB -153 (a) (circles on the map show observed values in the same colour scale) and seasonal variation of mean PCB-153 (b) air concentrations in EMEP countries and EMEP domain in 2023*

In 2023, annual mean air concentrations of HCB showed considerable spatial homogeneity across the EMEP domain — between 15 and 20 pg/m^3 – with local hotspots in some Balkan countries and in the Eastern part of Central Europe (Fig. 3.25a). This pattern indicates a high atmospheric persistence of HCB, which leads to a relatively uniform regional distribution. Nevertheless, the highest concentrations were found in the Eastern parts of the domain – especially over Eastern Europe and Western Russia – where the modelled values were higher than in Central and Western Europe. Central European countries such as Germany and Poland had medium concentrations, while the lowest values were found over Northern Scandinavia and the Southern Mediterranean. The measured station data (circles) closely follow the modelled spatial pattern and confirm increased HCB pollution in Central Europe and comparatively clean conditions in Northern Europe. Seasonally, HCB concentrations follow a consistent cycle both in the EMEP countries and in the wider EMEP domain (Fig. 3.25b): The lowest concentrations occur in winter (December–February), followed by a rapid increase in spring, a peak in late summer (August) and a subsequent decline in autumn until early winter.



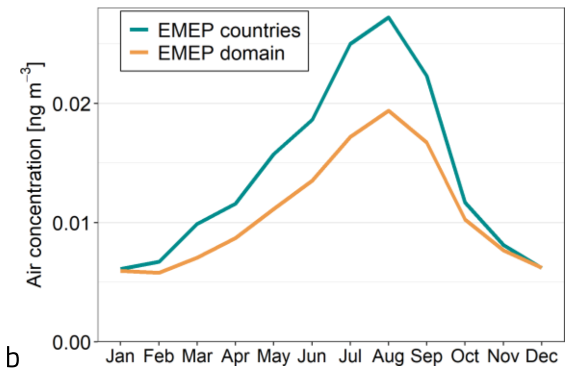


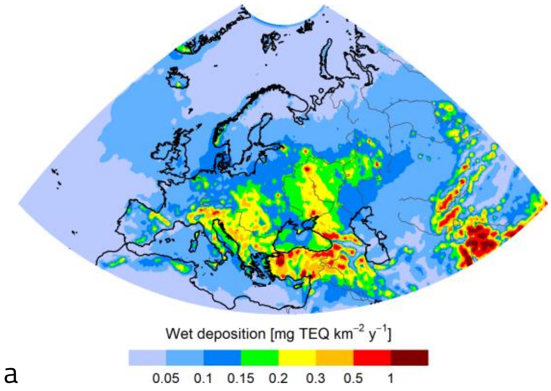
Fig. 3.25. *Annual mean air concentrations of HCB (a) (circles on the map show observed values in the same colour scale) and seasonal variation of mean HCB (b) air concentrations in EMEP countries and EMEP domain in 2023*

A comparison between modelled and observed PCB-153 and HCB concentrations within the EMEP monitoring network for 2023 shows a remarkable agreement. The modelling results show high spatial correlations with the measurements - 0.7 for PCB-153 and 0.87 for HCB – as well as relative biases of about 24% for PCB-153 and -1% for HCB between modelled and observed concentrations (Figs. 3.24-3.25; Table C1). Notably, the model predictions for both PCB-153 and HCB concentrations are within a factor of two of the observed values at all monitoring stations. However, the model slightly underestimates the measured concentrations at two stations (Westerland (Germany) and Råö (Sweden)) for PCB-153 and at five stations (Westerland, Schauinsland, Schmücke (Germany), Pallas (Finland) and Norunda Stenen (Sweden)) for HCB.

Precipitation scavenging, or wet deposition, plays a crucial role in the removal of pollutants from the atmosphere and their deposition in terrestrial and aquatic compartments. The modelled annual wet deposition fluxes of PCDD/Fs, PCB-153 and HCB for 2023 in the EMEP domain are shown in

Figs. 3.26-3.28. The spatial distribution of the wet deposition fluxes generally aligns with the distribution of the corresponding air concentrations. In 2023, the wet deposition patterns of these three POPs partly reflected the spatial distribution of their atmospheric concentrations, with elevated fluxes mainly observed in Southern European countries such as Italy and Türkiye. In addition, higher wet deposition fluxes were observed for HCB in Central Asian countries such as Turkmenistan and Tajikistan and for PCDD/Fs in countries of the Caucasus region such as Azerbaijan and Armenia.

In 2023, the highest wet deposition fluxes of PCDD/Fs across the EMEP domain were observed over Central, Southern and Eastern Europe, while significantly lower fluxes were estimated in Northern and North-Eastern Europe (Fig. 3.26a). Notable hotspots were identified in Türkiye, Italy, the Western Balkans and the Caucasus region, reflecting a combination of elevated atmospheric concentrations and moderate to high precipitation rates that enhance atmospheric scavenging. The spatial distribution of PCDD/Fs wet deposition fluxes closely follows the patterns of atmospheric concentrations and anthropogenic emission sources across the EMEP domain. Seasonally (Fig. 3.26b), wet deposition of PCDD/Fs was highest in the winter months (December-February), decreased in spring and reached a minimum in April. There was a slight increase in April and May, followed by a further decrease in summer, with the lowest levels being reached in September. A second increase occurred in late autumn (October-November), probably due to cooler temperatures and higher PCDD/Fs levels in the atmosphere, which made wet deposition more effective. Throughout the year, mean wet deposition levels in the EMEP countries were consistently higher than the EMEP domain average, showing that regional emissions and secondary re-volatilization of these PCDD/Fs pollutants influence wet deposition patterns across Europe.



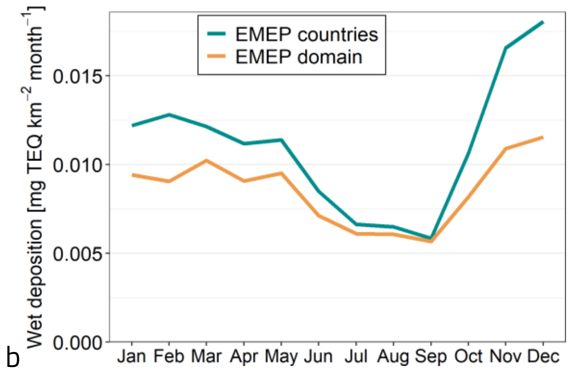


Fig. 3.26. *Annual wet deposition flux of PCDD/Fs (a) (circles on the map show observed values in the same colour scale) and seasonal variation of mean PCDD/Fs (b) wet deposition in EMEP countries and EMEP domain in 2023*

For PCB-153, wet deposition fluxes were lowest in Northern and Eastern Europe and highest in certain areas of Southern Europe (e.g. Italy and North-Eastern Spain) and Central Europe (e.g. Czechia, Hungary, Slovakia and Austria) as well as in the Western Balkans (Fig. 3.27a). These regions exhibited both higher PCB-153 concentrations in the atmosphere and relatively high precipitation, which led to more efficient scavenging. In contrast, the lower deposition fluxes in the Northern and

North-Eastern parts of the EMEP domain coincided with lower atmospheric concentrations. Seasonal variations in PCB-153 wet deposition showed a distinct peak in late spring and early summer (May-June), followed by a decline in the autumn months (November-December), as shown in Fig. 3.27b. The highest wet depositions occurred in some Central and Southern European countries in May, with continued high levels in June and July, primarily due to resuspension of PCB-153 from croplands.

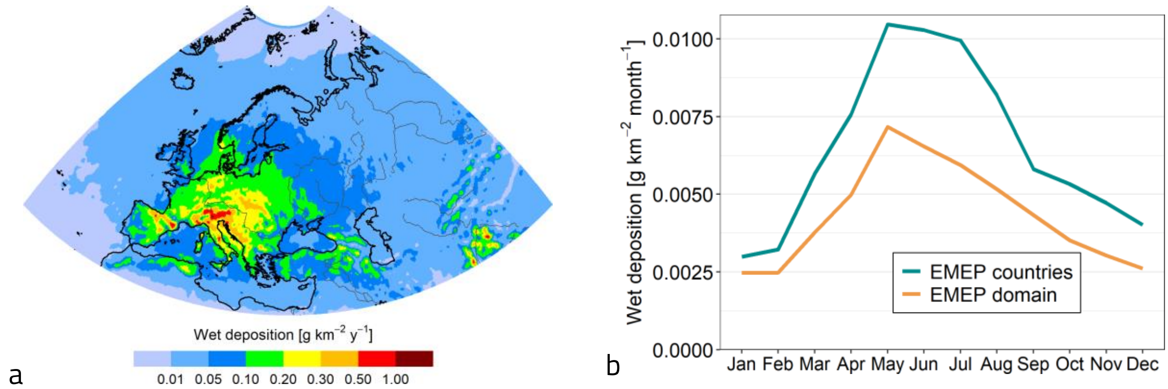


Fig. 3.27. *Annual wet deposition flux of PCB-153 (a) (circles on the map show observed values in the same colour scale) and seasonal variation of mean PCB-153 (b) wet deposition in EMEP countries and EMEP domain in 2023*

For HCB, annual wet deposition fluxes ranged from very low levels in Northern Scandinavia and Western Europe to significantly higher levels in parts of the Mediterranean and Central and Eastern Europe (Fig. 3.28a). The highest wet deposition fluxes were observed in Central European countries such as the Czechia, Hungary, Slovakia and Austria as well as in Southern European and Balkan countries such as Italy, Albania, Bulgaria, Serbia, Romania and Türkiye and in parts of the Caucasus region. HCB wet deposition also shows a strong seasonal pattern, with a pronounced peak in late spring and early summer (April-May), as shown in Fig. 3.28b. After the peak in May, the deposition levels decreased significantly in the summer months (June to August), which can be attributed to the lower precipitation during this period. A second increase was observed in the autumn months (September to November), probably due to changing meteorological conditions and resuspension processes, followed by a slight decrease in December.

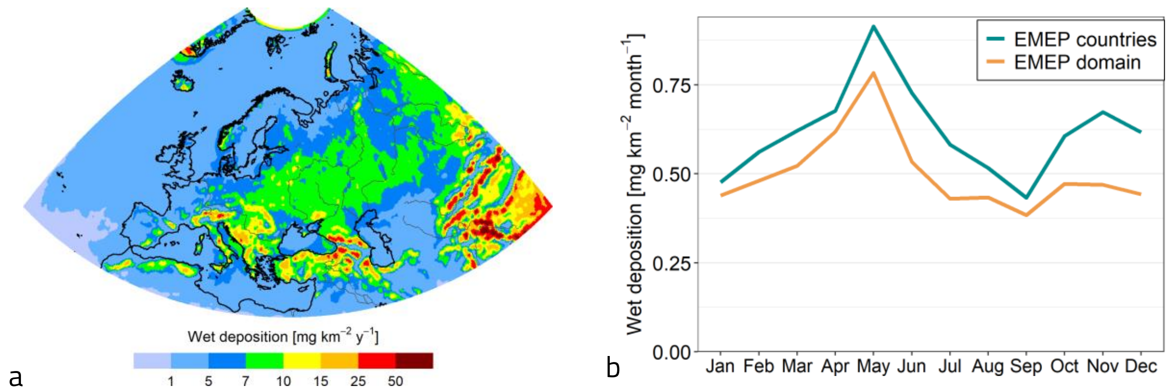


Fig. 3.28. *Annual wet deposition flux of HCB (a) (circles on the map show observed values in the same colour scale) and seasonal variation of mean HCB (b) wet deposition in EMEP countries and EMEP domain in 2023*

The modelled annual total deposition fluxes of PCDD/Fs, PCB 153 and HCB over the EMEP domain for 2023 are shown in Figs. 3.29-3.31. These total deposition fluxes are influenced by various factors, including the spatial distribution of primary emission sources, precipitation patterns, surface characteristics and the contribution of secondary emissions. In general, the spatial distribution of total deposition follows the distribution of atmospheric concentrations. Total atmospheric deposition reflects the combined effect of wet deposition, which occurs through precipitation scavenging, and dry deposition, which occurs through direct uptake by terrestrial and aquatic surfaces. The role of dry deposition is particularly important in forested regions and in areas with low annual precipitation.

Fig. 3.29a shows the spatial distribution of total deposition fluxes of PCDD/Fs over the EMEP domain in 2023. The map shows a distinct spatial variability with total deposition values ranging from below 0.5 to above 20 mg TEQ km^{-2} y^{-1}. The highest total deposition levels of over 20 mg TEQ km^{-2} y^{-1}, are mainly observed in South-Eastern Europe, particularly in regions of Türkiye, the Eastern Mediterranean and parts of the Balkans. Moderate total deposition fluxes, between 3 and 10 mg TEQ km^{-2} y^{-1}, are found in parts of Central Europe, including Germany, Poland and the Czechia, as well as in areas in Spain, Portugal, France, Italy, Western Russia and Ukraine. In contrast, the lowest total deposition levels, between 0.5 and 2 mg TEQ km^{-2} y^{-1} are estimated in Northern Europe. This includes Scandinavia, UK, Ireland, Northern Russia and the Arctic regions as well as the surrounding marine areas such as the North and Baltic Seas and the Northern Atlantic Ocean. This spatial distribution reflects a clear gradient, with higher total deposits in the Central and South-Eastern regions and lower values in the North. The seasonal variations of total PCDD/Fs deposition in 2023 in the EMEP countries and the domain are shown in Fig. 3.29b. The monthly mean total deposition fluxes are lowest in the winter months (December-February), followed by a steady increase in spring (March-May) with a peak in summer (July). The peak in summer is much more pronounced in the EMEP countries and is about 1.5 times higher than the average for the EMEP domain. After this peak, total deposition fluxes gradually decrease in the autumn (September-November) and reach their winter minimum again in December.

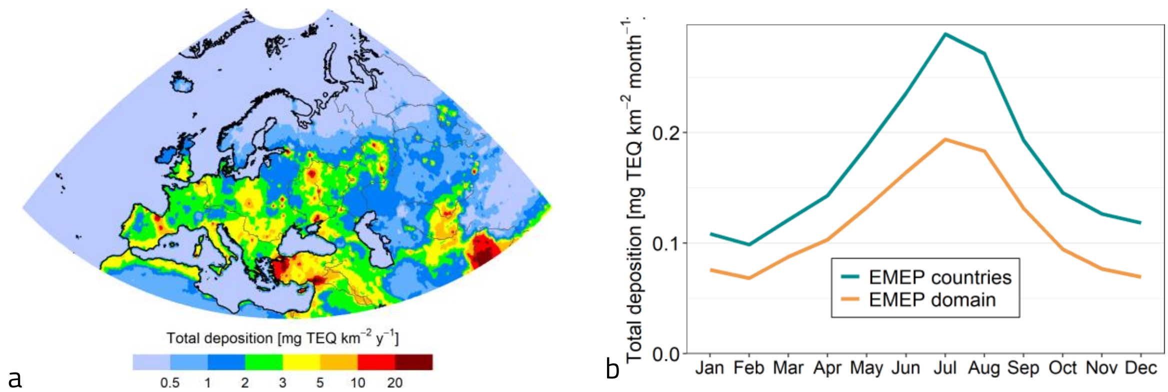


Fig. 3.29. *Annual deposition flux of PCDD/Fs (a) and seasonal variation of mean PCDD/Fs (b) deposition in EMEP countries and EMEP domain in 2023*

In 2023, PCB-153 annual total deposition fluxes across the EMEP domain showed considerable spatial variability, ranging from less than 0.01 g km-2 y-1 in relatively unpolluted areas in northern Scandinavia, Iceland and northern Russia — where local emissions are minimal and cold climatic conditions limit deposition processes — to about 3 g km-2 y-1 in certain regions of Southern and Western Europe (Fig. 3.30a). In Eastern Europe and Southern Scandinavia, deposition fluxes generally ranged between 0.1 and 0.5 g km^{-2} y^{-1}. Particularly high values of over 1 g km^{-2} y^{-1}, were observed in parts of Central and Southern Europe, especially in Austria, Switzerland and several Balkan countries such as Serbia and Bulgaria. The highest deposition values of almost 3 g km^{-2} y^{-1}, were found in areas of Central, Western and Southern Europe, including Spain, France, Germany, Poland, the Czechia and Austria. The seasonal pattern of PCB-153 total deposition showed a clear maximum in summer, with monthly mean deposition fluxes increasing sharply from winter onwards and peaking in July (Fig. 3.30b). In January and February, the mean fluxes over the EMEP countries amounted to around 0.017 g km^{-2} month^{-1}, while the domain-wide mean values were slightly lower at around 0.012 g km^{-2} month^{-1}. With the temperature rise in spring, the deposition levels increased accordingly and reached peak values of around 0.075 g km^{-2} month^{-1} for the EMEP countries and around 0.04 g km^{-2} month^{-1} for the EMEP domain in July. After the summer maximum, deposition gradually decreased in late summer and autumn, reaching a winter minimum of about 0.02 g km^{-2} month^{-1} in the EMEP countries and 0.01 g km^{-2} month^{-1} in the EMEP domain in December.

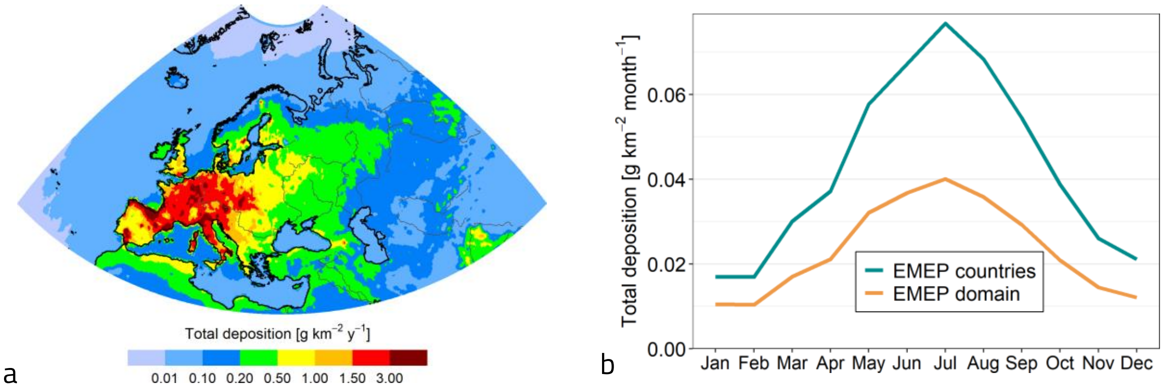


Fig. 3.30. *Annual deposition flux of PCB-153 (c) and seasonal variation of mean PCB-153 (d) deposition in EMEP countries and EMEP domain in 2023*

In contrast, HCB showed a more spatially uniform distribution of annual total deposition fluxes across the EMEP domain in 2023, with generally higher deposition levels compared to PCB-153, except in Western Europe (Fig. 3.31a). Total deposition fluxes ranged from around 1 g km^{-2} y^{-1} in the cleanest regions of Northern Scandinavia to over 25 g km^{-2} y^{-1} in areas with high deposition potential. Moderate total deposition fluxes between 2 and 5 g km^{-2} y^{-1}, were observed in parts of Western Europe influenced by long-range atmospheric transport. In Central Europe – including Germany, Poland and Austria – elevated total deposition fluxes between 5 and 15 g km^{-2} y^{-1} were observed, with additional local hotspots identified in parts of the Eastern Mediterranean. The highest total deposition fluxes of more than 25 g km^{-2} y^{-1}, were estimated in the Northeast of Russia and in parts of the Ural region, where cold climatic conditions promote the removal of semi-volatile HCB from the atmosphere. The seasonal variations of HCB total deposition in 2023 (Fig. 3.31b) followed a pronounced annual cycle. Total deposition fluxes were lowest in the winter months (December–February), increased in spring and reached a maximum in midsummer. The maximum was reached in August for both EMEP countries and the EMEP domain. After the summer maximum, the fluxes declined in the autumn and reached a minimum again in the winter. During the summer maximum, the mean HCB total deposition over the EMEP countries was about twice as high as the mean value for the EMEP domain.

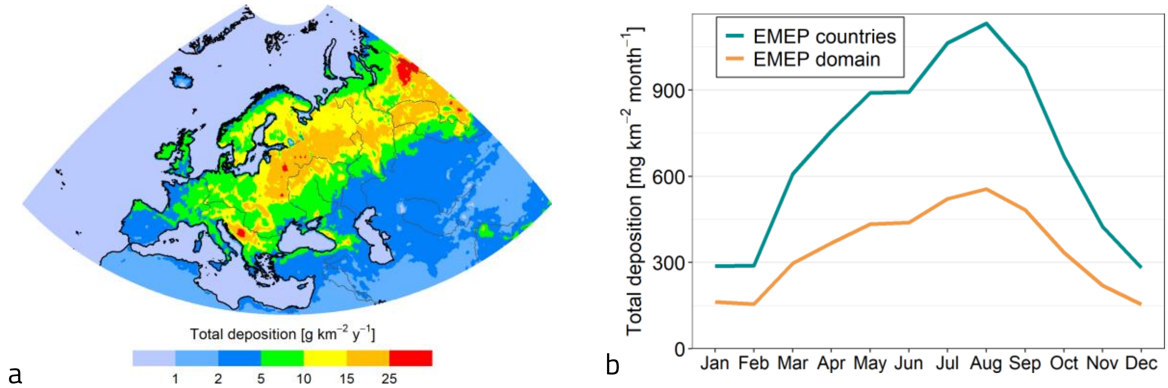


Fig. 3.31. *Annual deposition flux of HCB (a) and seasonal variation of mean HCB (b) deposition in EMEP countries and EMEP domain in 2023*

The relative contributions of the different types of sources vary greatly from region to region. By distinguishing between primary anthropogenic emissions within EMEP countries, secondary sources resulting from re-emissions within countries, and long-range transport from non-EMEP regions, the spatial distribution of pollution can be better understood.

In 2023, the country-average deposition fluxes of PCDD/Fs in the EMEP domain show a clear west-east and south-north gradient (Fig. 3.32). The highest total deposition is observed in Western, Central and parts of Southern Europe, and in the Balkan countries. In these regions, both EMEP primary anthropogenic emissions (red bars) and secondary emission sources (yellow bars) contribute almost equally to the total deposition, with the exception of several countries. The source apportionment analysis shows that EMEP secondary emission sources contribute significantly to total deposition in many countries, especially in countries with higher total deposition fluxes such as Cyprus, Turkey, Belgium, the Netherlands, Luxembourg and Spain. This highlights the important role of atmospheric cycling and re-volatilization processes of previously deposited PCDD/Fs. Contributions from non-EMEP sources (blue bars) are relatively low throughout the domain. In East-Central Europe and further north, across the Baltic and Arctic regions, total deposition shows a gradual decline. In these regions, primary and secondary emission sources still at approximately equal levels, with the exception of certain countries – such as Iceland and Finland – where secondary sources predominate; however, both contributions are generally low. EMEP secondary emission sources also predominate in countries of the Caucasus and Central Asia. The lowest deposition fluxes are observed in the Northernmost and Easternmost EMEP countries, where lower regional emissions, limited precipitation scavenging and lower re-volatilization potential combine to minimize atmospheric deposition.

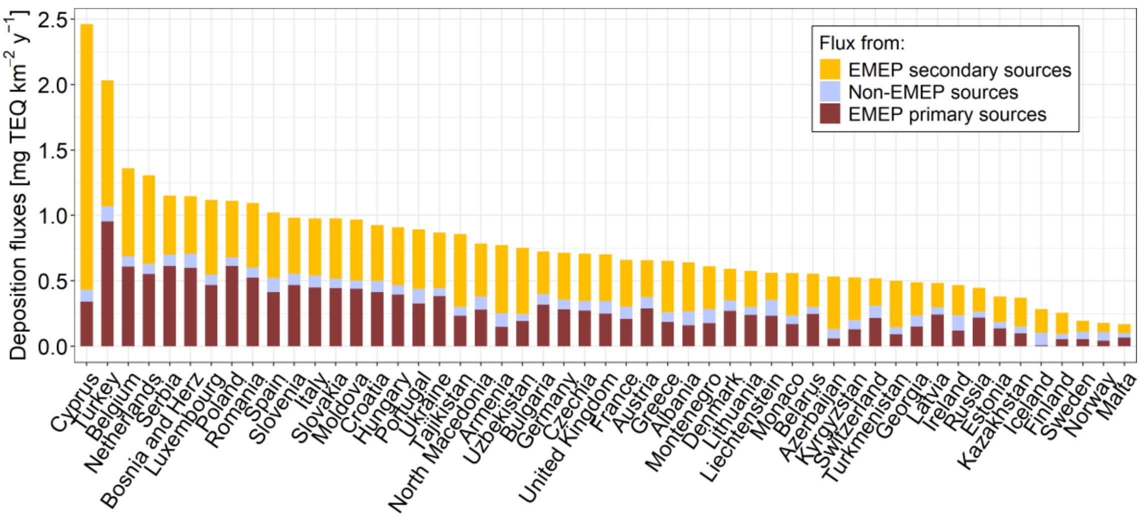


Fig. 3.32. *Country-average deposition of PCDD/Fs to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2023*

Figure 3.33 shows the country-average deposition fluxes of PCB-153 in the EMEP domain in 2023. The highest PCB-153 deposition levels from EMEP primary sources are mainly observed in Central (e.g., Austria, Czechia, Slovakia), Southern (e.g., Spain, Italy) and Western (e.g., Luxembourg, Belgium, France) European countries. In almost all countries – from Northern to Southern and Western to Eastern Europe, the Caucasus and Central Asia – secondary EMEP sources (in yellow) represent the dominant contribution to the total deposition of PCB-153. In comparison, primary EMEP sources (in red) and especially non-EMEP sources (in blue) play a relatively minor role, although their combined influence is more pronounced in countries with higher total deposition fluxes.

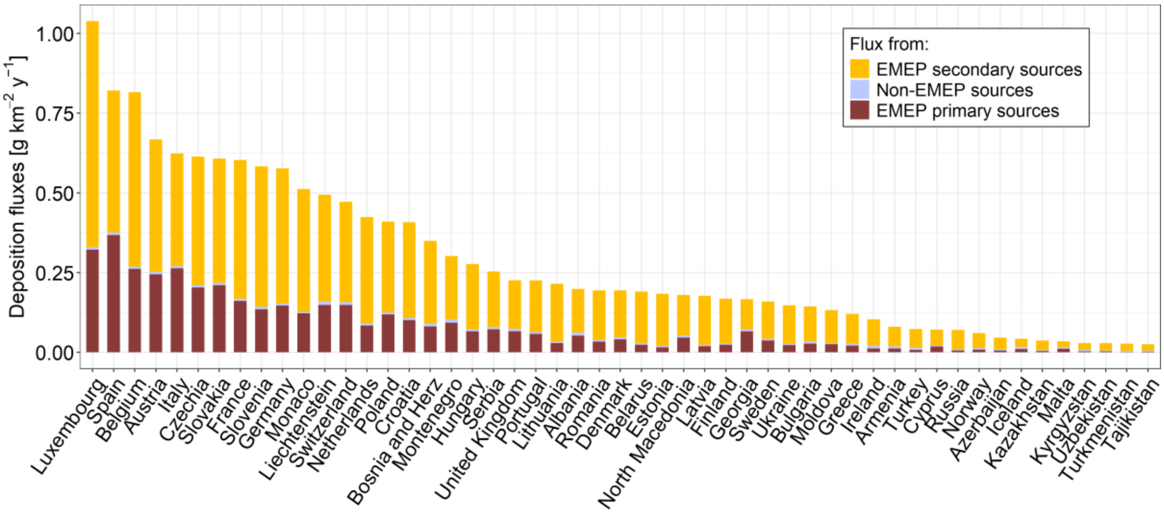


Fig. 3.33. *Country-average deposition of PCB-153 to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2023.*

Fig. 3.34 displays the country-average deposition fluxes of HCB across the EMEP domain in 2023, along with the relative contribution of the different source categories. While the deposition pattern of HCB exhibits some similarities with that of PCB-153, it also shows distinct regional characteristics. In almost all EMEP countries, the contributions of both EMEP primary sources and non-EMEP sources remain relatively low, which is consistent with the trends observed for PCB-153. The contribution from non-EMEP sources appears to be relatively uniform across the EMEP domain, with slightly higher contributions in the UK and Ireland. Similarly, the contribution of EMEP primary sources is generally low, with the exception of some Balkan countries (e.g., Bosnia and Herzegovina, Croatia and Slovakia) and Ukraine and Georgia, where the primary contribution is more pronounced. The EMEP secondary sources represent the predominant contributor to the total HCB deposition in most EMEP countries. However, in several Central Asian countries (e.g., Tajikistan, Turkmenistan, Kyrgyzstan) as well as in Malta and Cyprus, the relative contributions of EMEP secondary and non-EMEP sources are approximately equal. The findings of this study for both PCB-153 and HCB underline the crucial importance of secondary sources in determining deposition patterns and highlight the significant role of atmospheric transport and transformation processes in influencing the spatial distribution of POPs in the EMEP domain.

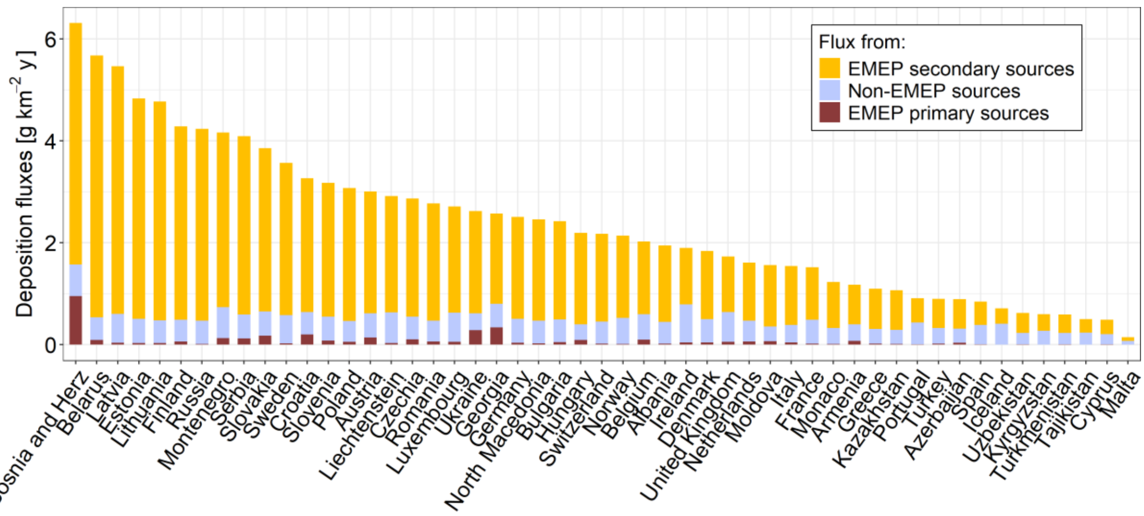


Fig. 3.34. *Country-average deposition of HCB to EMEP countries from EMEP primary anthropogenic, secondary and non-EMEP emission sources in 2023.*

The anthropogenic component of deposition in the EMEP countries can be divided into two categories: deposition resulting from national emission sources (domestic sources) and deposition originating from transboundary atmospheric transport from foreign sources (other EMEP countries). Modelling results for assessment of relative contributions of domestic and foreign sources to deposition of PCDD/Fs, PCB-153 and HCB are presented in Figs. 3.35-3.37.

Figure 3.35a shows the country-average deposition fluxes of PCDD/Fs from anthropogenic sources in the countries of the EMEP domain in 2023. The highest total deposition fluxes are observed in countries such as Türkiye, Poland, Serbia, Belgium, Bosnia and Herzegovina, the Netherlands, Romania and Italy, where deposition from domestic sources dominates the total load. In these countries, contributions from other EMEP countries are present but account for a smaller share. In contrast, several Southern and Central European countries, such as Switzerland, Luxembourg, Greece, and Hungary, show a more balanced contribution between domestic and transboundary sources, highlighting the significant role of regional atmospheric transport processes. In Northern and Eastern Europe, including the Scandinavian countries (Sweden, Finland, Norway, and Iceland), Estonia, and Belarus, total deposition fluxes are among the lowest in the EMEP domain. In these countries, the relative share of transboundary inputs often exceeds that of domestic sources, reflecting their limited local emissions. The results show that while domestic sources remain the dominant contributor to deposition in most high-flux countries, transboundary transport plays a remarkable role in a large part of the domain and contributes significantly to total deposition, particularly in countries with relatively low domestic emissions. Fig. 3.35b shows the relative contributions of domestic and foreign sources in the total anthropogenic PCDD/Fs deposition in each EMEP country. According to the modelling results, the contribution of transboundary transport of PCDD/Fs is above 50% in 26 of the 51 EMEP countries, accounting for almost half of them.

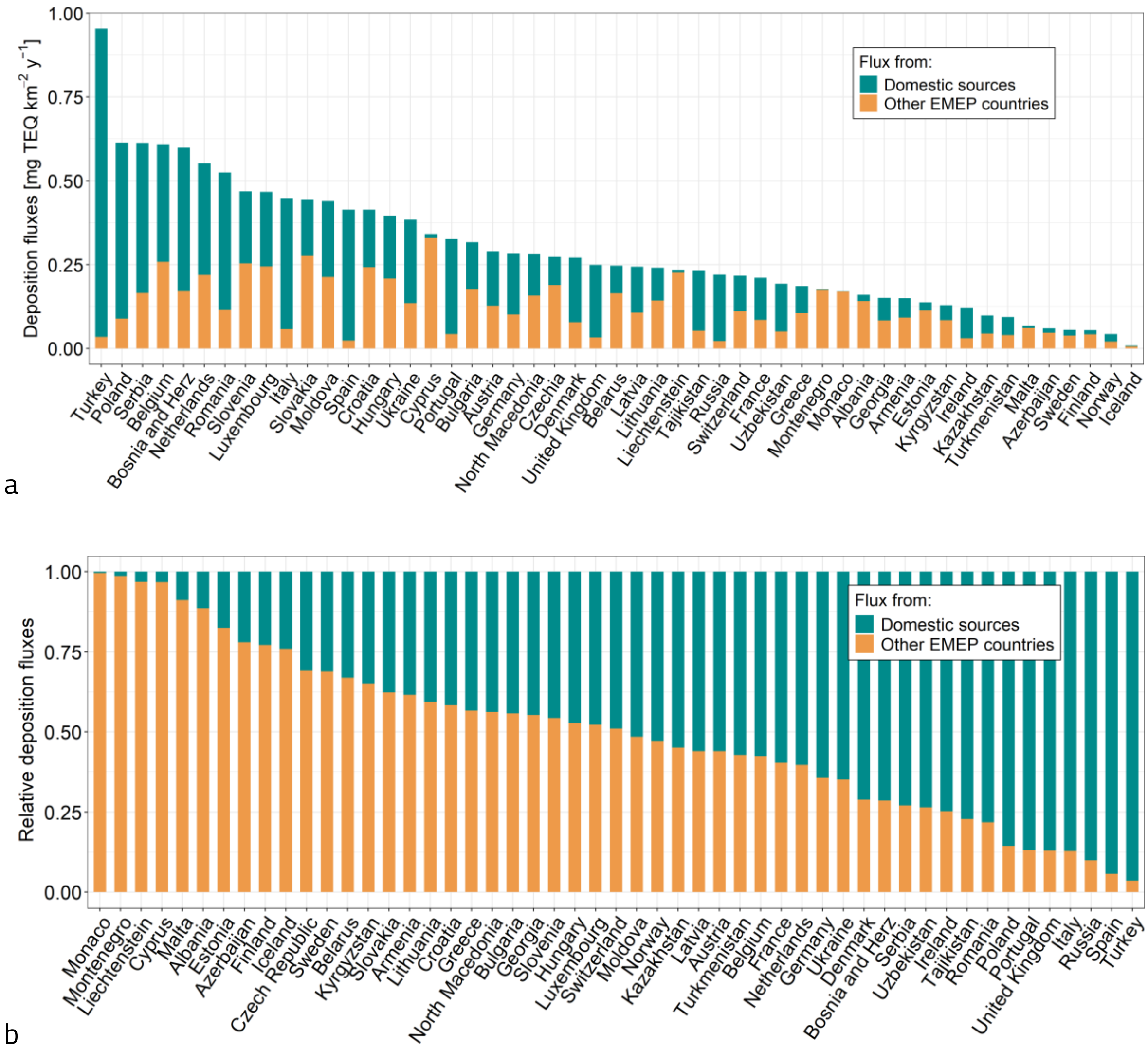


Fig. 3.35. *Country-average PCDD/Fs anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to PCDD/Fs anthropogenic deposition in EMEP countries (b) in 2023.*

Figure 3.36a shows the country-average anthropogenic deposition fluxes of PCB-153 in the countries of the EMEP domain in 2023. The highest deposition fluxes were estimated for Spain, Luxembourg, Italy, Belgium, Austria, Slovakia, Czechia and France, while the lowest fluxes were observed in the Central Asian countries (Kyrgyzstan, Tajikistan and Turkmenistan, Uzbekistan), Russia, Türkiye, Norway and Iceland. The largest contributions of transboundary atmospheric transport were identified in countries with small territories and/or low national emissions such as Slovenia, Liechtenstein, Monaco, the Netherlands and Montenegro. Conversely, the smallest contributions of transboundary transport were estimated for countries with significant national emissions and relatively large territories such as Spain, UK and Italy. In addition, a significant influence of national sources was found for countries in the western part of the EMEP region, due to the predominant atmospheric westerly transport and the relative distance to major external emission sources. Fig. 3.36b shows the relative contribution of domestic and foreign sources to the total anthropogenic PCB-153 deposition in each EMEP country. According to the modelling results, the contribution of transboundary transport of PCB-153 is more than 50% in 35 out of 51 EMEP countries.

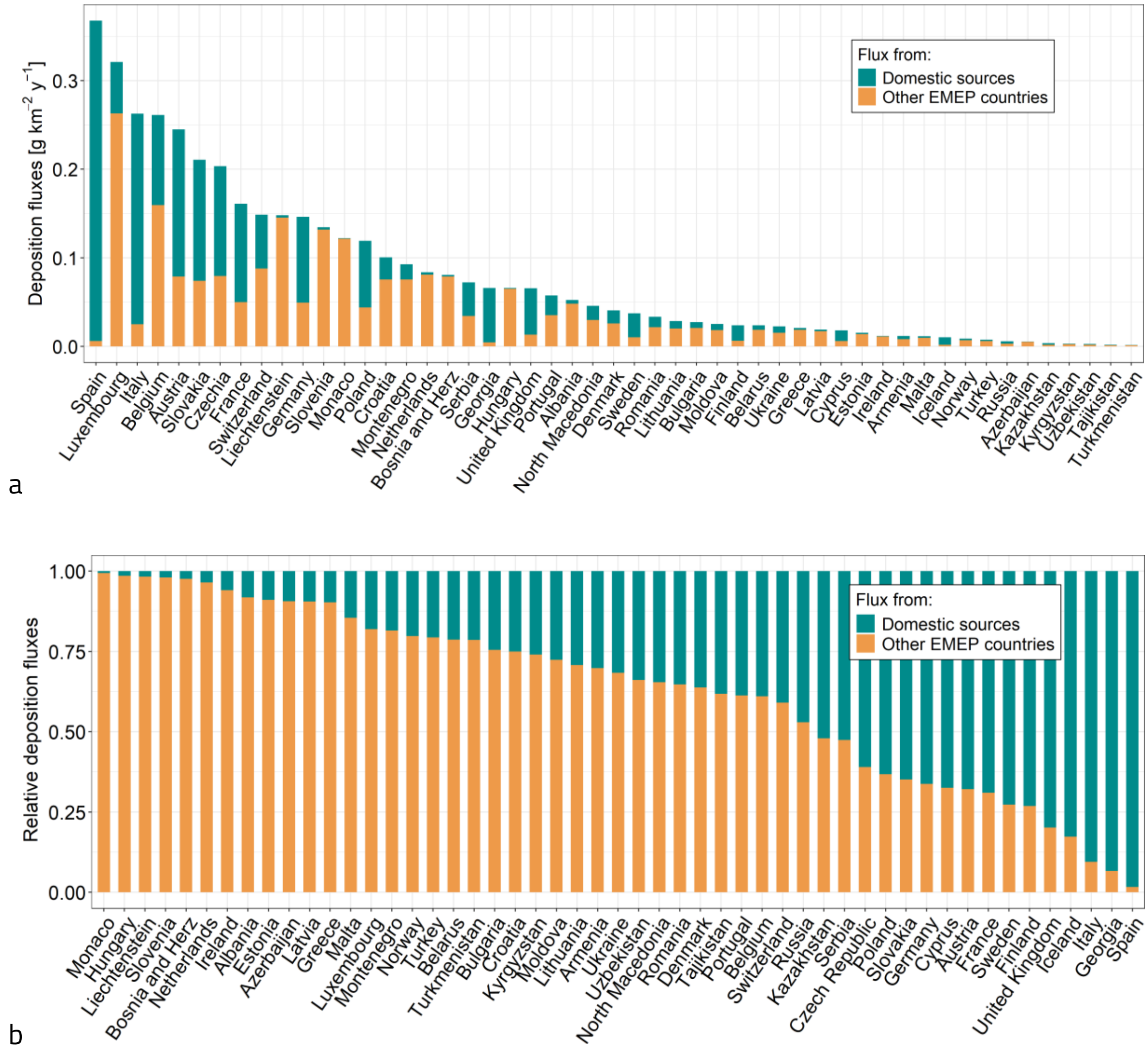


Fig. 3.36. *Country-average PCB-153 anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to PCB-153 anthropogenic deposition in EMEP countries (b) in 2023.*

Figure 3.37a displays the country-average anthropogenic deposition fluxes of HCB in the countries of the EMEP domain in 2023. The highest deposition fluxes were observed in Bosnia and Herzegovina, Georgia, Ukraine, Slovakia and Croatia, indicating significant local or regional emissions in these countries. In contrast, deposition levels were significantly lower in Iceland, Spain, Norway, Portugal, Malta and Central Asian countries such as Kyrgyzstan, Tajikistan and Turkmenistan. The figure further breaks down the contribution of domestic sources and transboundary transport from other EMEP countries. While countries with higher deposition generally had significant contributions from domestic sources, the influence of transboundary pollution was more pronounced in countries with lower total deposition levels. Fig. 3.37b displays the relative contributions of domestic and foreign sources to total anthropogenic HCB deposition in each EMEP country. According to the modelling results, the contribution of transboundary HCB transport is above 50% in 37 of the 51 EMEP countries. In countries such as Liechtenstein, Cyprus, Azerbaijan, Monaco and Armenia, almost all HCB deposition comes from external sources, suggesting limited domestic emissions. On the other hand, countries such as Bosnia and Herzegovina, Georgia, Finland, Ukraine and the United Kingdom showed a dominant influence of domestic sources, suggesting significant national contributions to total deposition. These results emphasize the essential role of both national emissions and long-range atmospheric transport in determining the deposition patterns of POPs in the region.

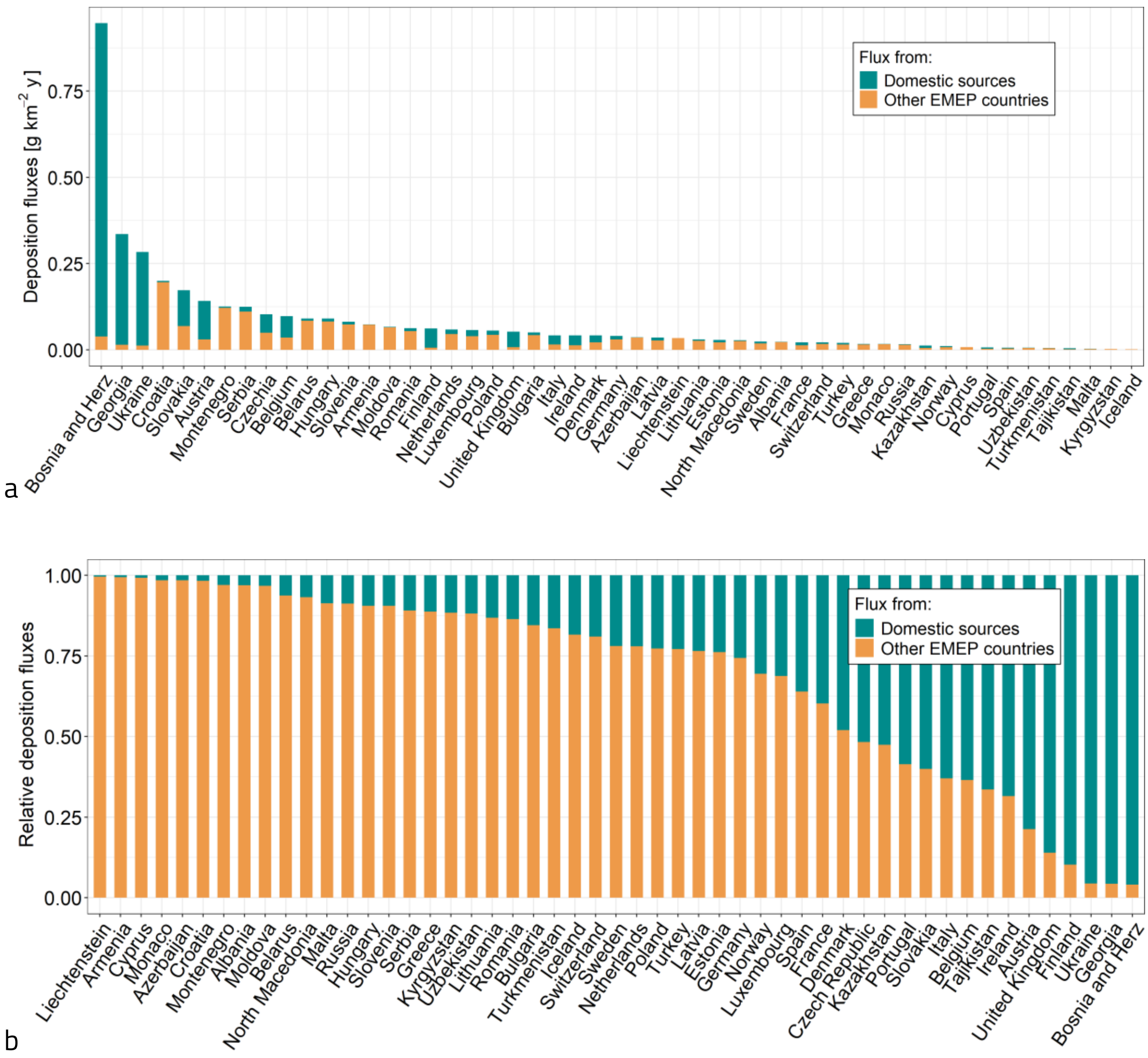


Fig. 3.37. *Country-average HCB anthropogenic deposition to EMEP countries (a) and relative contribution of domestic and foreign sources to HCB anthropogenic deposition in EMEP countries (b) in 2023.*

4. Research and developments

MSC-E has continued its research activities aimed at improving model parameterisations and enhancing the performance of the GLEMOS model for simulating heavy metal and POP pollution. Current research focuses on re-evaluating the role of dust suspension in particulate heavy metal contamination, developing an integrated approach to PAH source apportionment in Europe, and advancing preparatory work for detailed country-scale analyses of PAH pollution, including a pilot study for Slovenia and the Western Balkan countries. In addition, an innovative method for bias correction of reactive mercury measurements has been developed and applied to evaluate multi-model trend simulations. Finally, multi-media modelling of legacy POPs (HCB, PCBs, PCDD/Fs) has been re-established for operational assessment, including preparation of modelling tools and input data, evaluation of long-term environmental accumulation, and refinement of model parameterisations for further development.

4.1. Re-evaluation of dust suspension effect on heavy metal pollution

Wind resuspension is an important source of atmospheric dust and associated contaminants. It plays a significant role in the current deposition of particulate heavy metals such as Pb and Cd. Recent estimates suggest that secondary emissions from dust resuspension – originating from both natural and human-disturbed surfaces – may contribute more than 50% of the total annual deposition of these pollutants in EMEP countries (*Travnikov et al.*, 2024). However, these estimates remain highly uncertain due to a range of poorly defined parameters within the resuspension process. These include the wind erosion characteristics of bare soil, agricultural land, and urban surfaces, as well as the concentrations of heavy metals in topsoil, urban dust, and roadside dust.

To re-evaluate the impact of dust suspension on heavy metal pollution and to test the performance of the current parameterisation implemented in GLEMOS, a series of sensitivity tests and modelling experiments were conducted and evaluated against detailed observational data. The GLEMOS wind resuspension scheme (*GL07*; *Ilyin et al.*, 2007), which is largely based on the approach originally developed by Marticorena and Bergametti (1995), was compared with alternative schemes available in the literature. These included the scheme developed by Shao (*SH04*; *Shao*, 2004), which was validated using observational data from Australian deserts (Shao et al., 2011), and the parameterisation proposed by Kok et al. (*KK12*; *Kok et al.,* 2012), which has demonstrated improved performance in dust simulations over the Gobi Desert (*Li et al.*, 2024).

The dust suspension schemes were evaluated by simulating well-documented episodes of Saharan dust intrusion into Europe in March-April 2022 (*Cuevas-Agulló et al.*, 2024; *Liger et al.*, 2024; *Rodríguez et al.*, 2024). Both dust suspension and anthropogenic emissions were taken into account in modelling atmospheric aerosols over the EMEP domain. The simulated PM10 concentrations were compared with EMEP measurements in Southern and Central Europe affected by the intrusion episodes (Fig. 4.1). Figure 4.1 presents examples of simulated daily PM10 concentrations before (Fig. 4.1a) and during (Fig. 4.1b) a dust episode on 15 March 2022. As shown, high atmospheric aerosol concentrations were simulated across Southern and parts of Central Europe following the Saharan dust intrusion, with the highest concentrations over Spain.

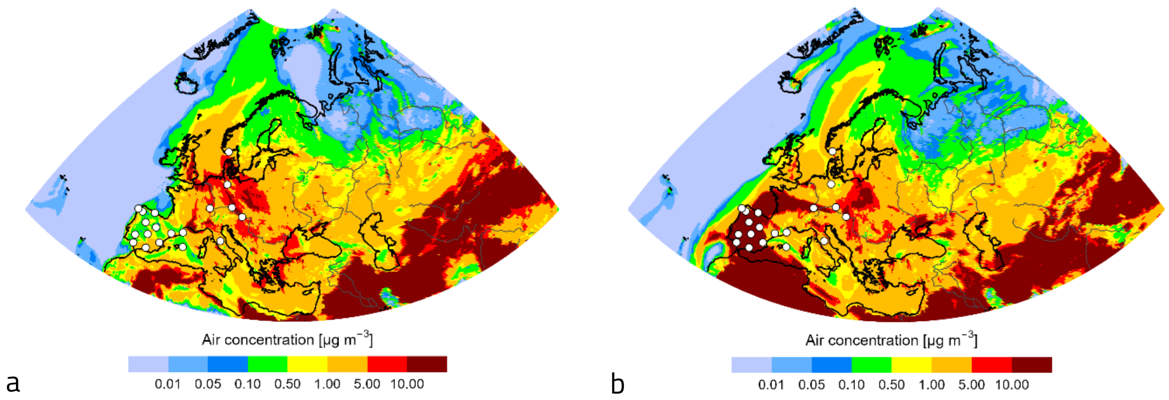


Fig. 4.1. *Atmospheric aerosol (PM10) concentration on March 13 (a) and March 15 (b) 2022, simulated with the base GLEMOS dust scheme. White circles indicate the locations of measurement sites.*

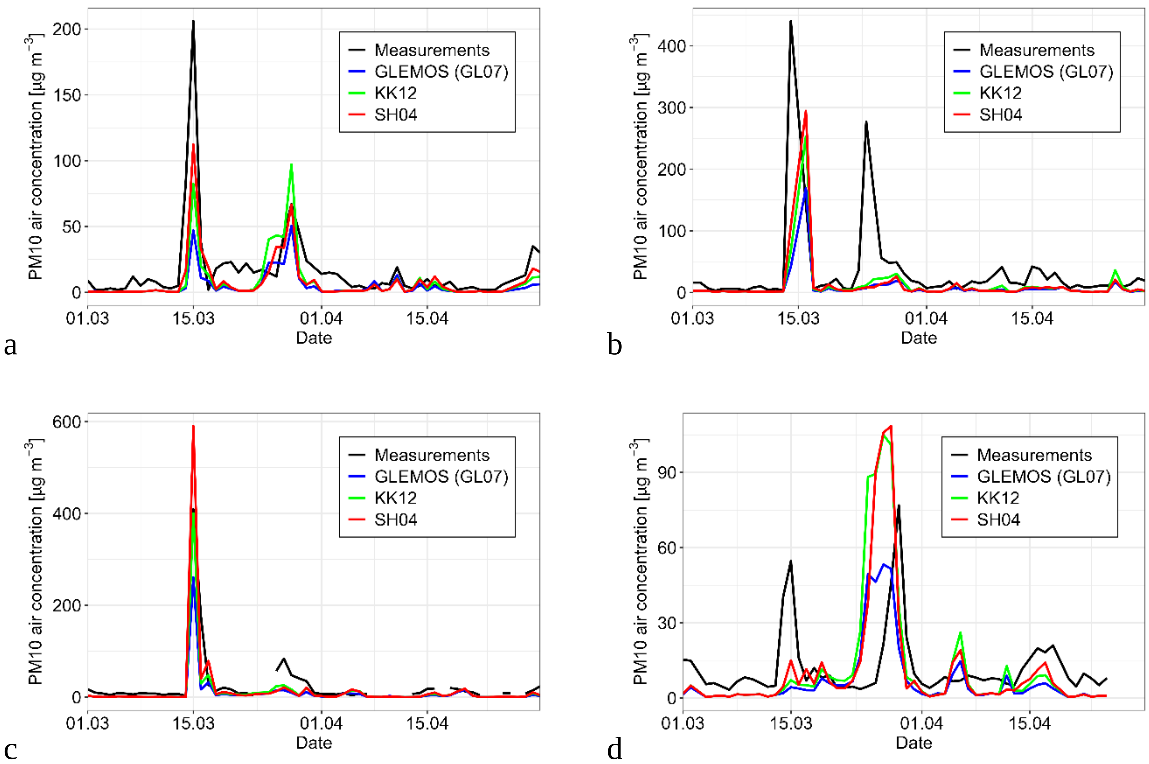


Fig. 4.2. *Measured and simulated PM10 air concentration at the EMEP stations in Spain: (a) Campisabalos (ES0009R), (b) Viznar (ES0007R), (c) Barcarrota (ES0011R), (d) Zarra (ES0012R).*

A comparison of observed and simulated PM10 concentration time series using three different dust schemes is presented in Fig. 4.2. All model simulations successfully capture the periods of high dust episodes, although they predict different PM10 levels. Overall, the GLEMOS standard dust suspension scheme tends to produce lower concentrations, leading to some underestimation of the highest observed peaks. Nevertheless, a more detailed statistical analysis of the simulated results, assessing quantitative similarity and temporal alignment between measured and modelled time series using the dynamic time warping technique (*Liu et al.*, 2024), indicates comparable performance across all schemes, with insignificant advantages for the GLEMOS standard scheme.

Different dust suspension modelling approaches were also evaluated for their ability to simulate secondary emissions of heavy metals (resuspension) and their contribution to pollutant concentrations and deposition levels in Europe. To this end, an annual simulation of Pb dispersion for 2022 was carried out on a regional scale using the standard operational model set-up, incorporating both anthropogenic emissions and wind resuspension. The results were compared with EMEP measurements across the entire European region. Figure 4.3 presents the annual mean Pb concentration patterns simulated with three different dust resuspension schemes, alongside observed values at monitoring sites. All three simulations produce similar spatial patterns, showing elevated concentrations in Central Europe, Northern Africa, Central Asia, and other parts of Asia. However, the predicted Pb levels differ due to variations in the estimated contribution from wind resuspension. The GLEMOS standard scheme yields lower concentrations, which align more closely with measurements in Central Europe (Fig. 4.3a).

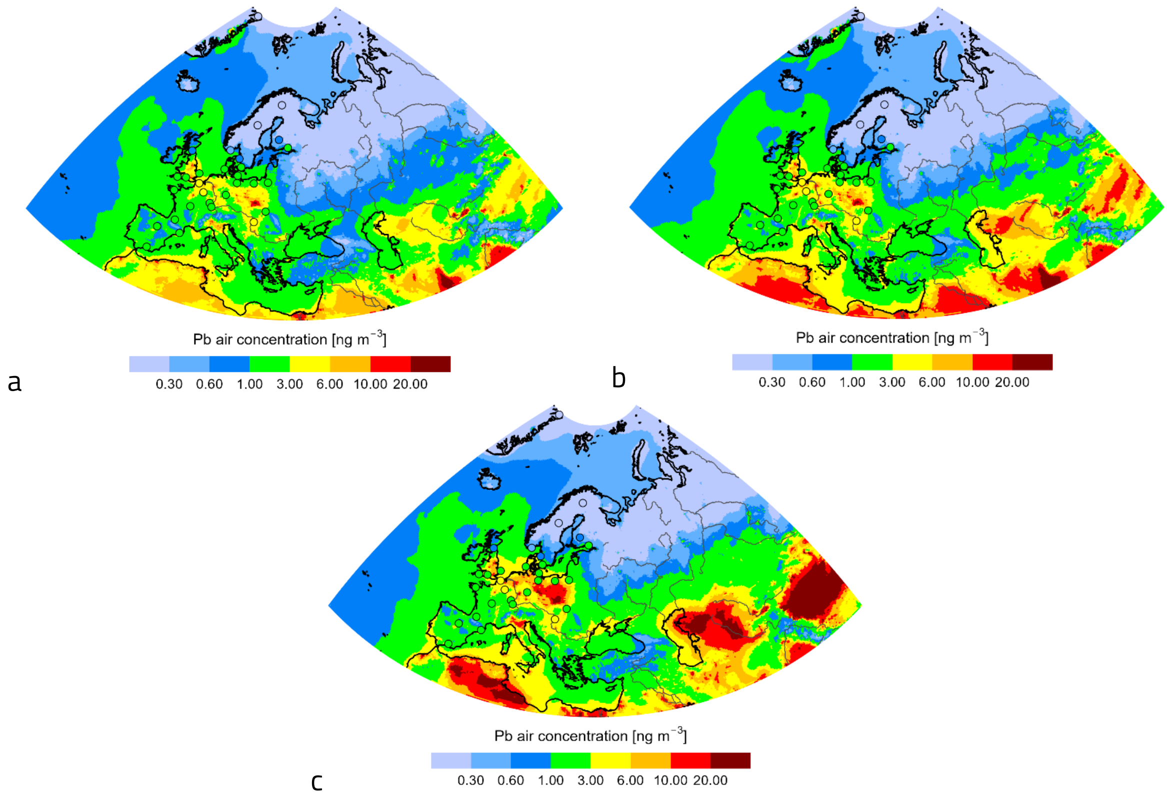


Fig. 4.3. *Annual mean Pb air concentrations in 2022 simulated with three different dust suspension schemes – the standard GLEMOS scheme GL07 (a), KK12 (b) and SH04 (c). Circles on the map show observed values in the same colour scale.*

A more detailed comparison of the modelling results with observations is presented in Fig. 4.4 and Table 4.1. All simulation setups overestimate the observed Pb air concentrations at measurement sites, albeit to varying degrees. The smallest bias (18%) is obtained with the standard GLEMOS scheme (GL07), while the largest bias (77%) is associated with the SH04 scheme. Both GL07 and KK12 show similar correlations between modelled and observed values (0.75 and 0.77, respectively), whereas SH04 demonstrates a lower correlation (0.58).

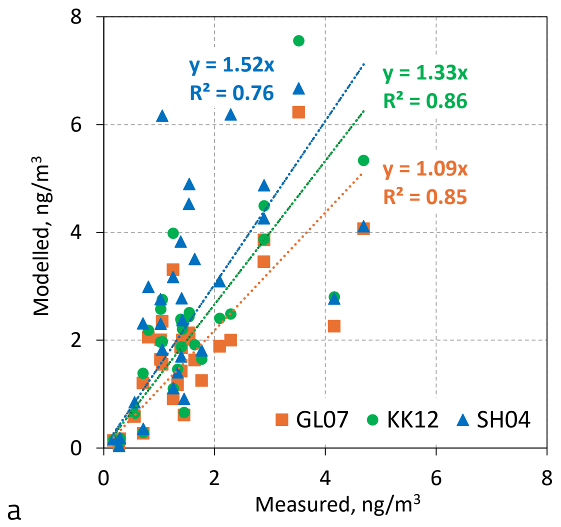


Fig. 4.4. *Comparison of simulated and measured annual mean Pb air concentrations at the EMEP measurement sites in 2022.*

Table 4.1. *Statistical parameters of the model-to-measurement comparison of annual mean Pb concentrations.*

Scheme	***Correlation***	***Bias (%)***
GL07 (GLEMOS)	0.75	17.5
KK12	0.77	42.1
SH04	0.58	76.2

Finally, we assessed the potential impact of wind resuspension on Pb atmospheric pollution in Europe during periods of intense Saharan dust intrusion. Figure 4.5a shows the regional pattern of Pb atmospheric deposition from secondary emissions caused by wind resuspension in March 2022, a month marked by a strong Saharan dust event. The results indicate that the entire Mediterranean region, as well as parts of Western and Central Europe, were affected by Pb from secondary sources. During these episodes, the contribution of secondary emissions to Pb pollution exceeded that of direct anthropogenic emissions. For example, in France, wind resuspension accounted for more than 60% of total Pb deposition in March 2022 (Fig. 4.5b).

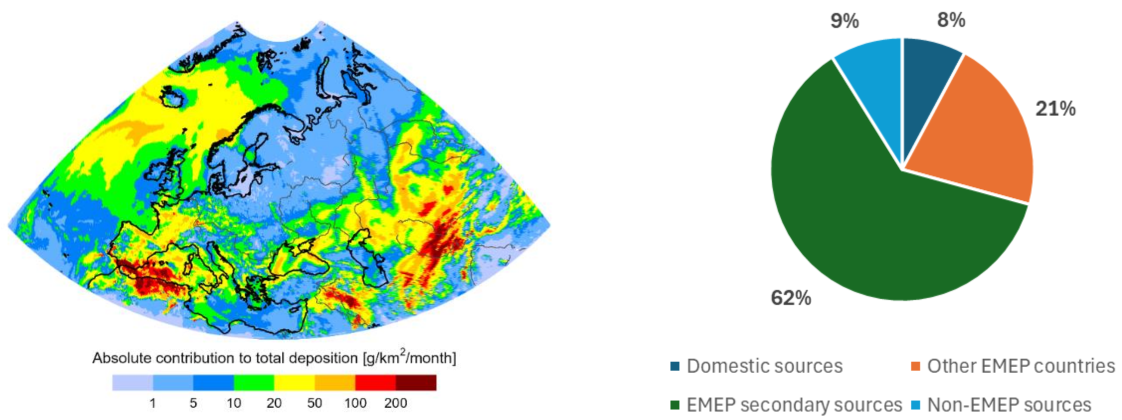


Fig. 4.5. *Monthly mean contribution of wind resuspension to Pb deposition over the EMEP region (a) and source apportionment of Pb deposition in (b) France in March 2022.*

In conclusion, all tested dust suspension schemes demonstrated similar performance in capturing major dust suspension events. The main differences between the schemes lay in the estimated amount of suspended dust rather than in the timing of the episodes. Under the testing conditions, the GLEMOS standard scheme showed slightly better overall performance. Further improvement of dust suspension approaches for modelling secondary emissions of particulate heavy metals and other toxic pollutants will require a more detailed analysis of the underlying processes and parameterisations. This work could be carried out as part of the coordinated activities under the Task Force on Measurement and Modelling (TFMM).

4.2. Integration of moss biomonitoring and modelling for PAH source attribution in Europe

Moss biomonitoring

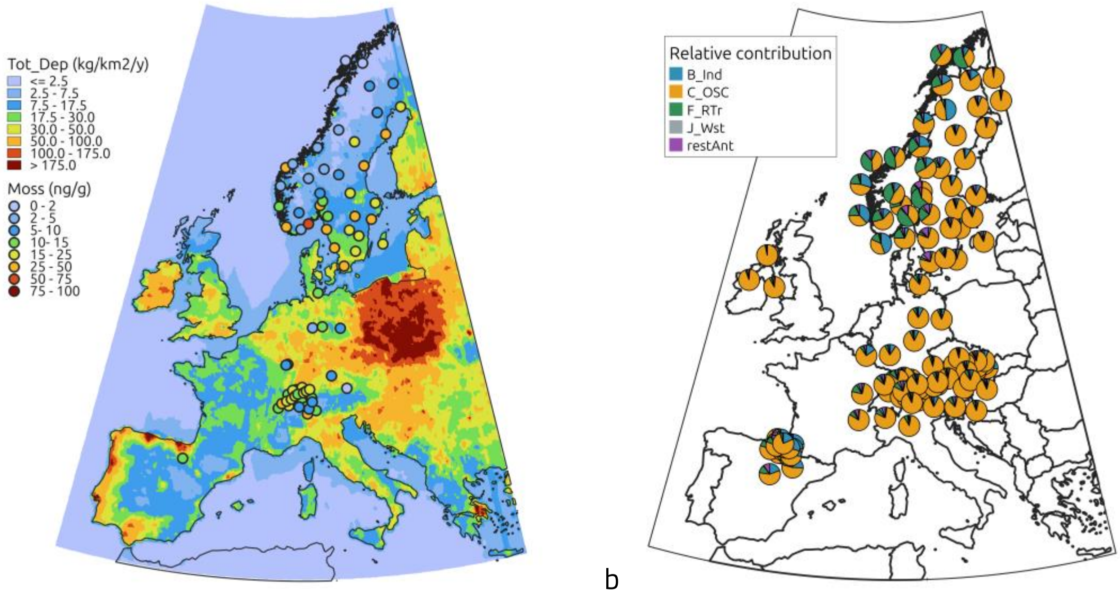
This study combines operational chemical transport modelling with moss biomonitoring to improve both the assessment of PAH spatial distribution and the accuracy of source attribution across Europe. While chemical dispersion models provide comprehensive temporal and spatial coverage of PAHs, they rely on validation from discrete air monitoring stations with limited geographical reach. Moss biomonitoring complements these models through its unique bioindicator properties: high sensitivity to atmospheric pollutants, enabling detection of low PAH concentrations; time-integrated accumulation, capturing long-term trends and episodic events; and cost-effective broad spatial coverage, including remote areas. Together, these features provide a more complete spatial representation. Integrating the two approaches delivers robust validation datasets for chemical transport model predictions, thereby enhancing confidence in source attribution assessments under the CLRTAP framework (Harmens et al., 2013; Wu et al., 2014).

The spatial distribution of PAH deposition in Northwestern Europe was analysed in cooperation with ICP-Vegetation, involving observed PAH concentrations in mosses (Harmens and Norris, 2008;

Harmens et al., 2013; Frontasyeva et al., 2020). The study particularly focuses on integrating moss biomonitoring into the validation of PAH source attribution in Europe. The data used for this analysis come from the 2015/2016 European moss survey, in which seven countries reported PAH concentrations in five moss species (*Hylocomium splendens*, *Hypnum cupressiforme*, *Pleurozium schreberi*, *Abietinella abietina*, and *Scleropodium purum*) at selected sites to monitor spatial patterns.

Source attribution modelling

Source attribution simulations of PAH deposition for 2015 were conducted over the European domain at a spatial resolution of 0.2°x0.2°. Sector-specific official EMEP emission data, supplemented with expert gap-filling by CEIP (Tista et al., 2017), were used in the analysis. The most recently reported gridded PAH emissions for 2022 were applied as a surrogate for the spatial distribution of sectoral emissions. The simulations distinguished four GNFR emission sectors: *Industry* (B_Ind), *Other Stationary Combustion* (C_OSC), *Road Transport* (F_RTr), *Waste* (J_Wst), along with a residual category representing all other anthropogenic sources (restAnt). The simulated spatial pattern and source attribution of atmospheric deposition for the sum of four PAHs (B(a)P, B(b)F, B(k)F, IP) are presented in Fig. 4.6.



a b

Fig. 4.6. *Spatial distribution (a) and source attribution (b) of annual deposition of the sum of four PAHs (B(a)P, B(b)F, B(k)F, IP) in 2015. Coloured circles in panel (a) represent moss concentrations, while pie charts in panel (b) illustrate the simulated source attribution of PAH deposition at moss monitoring sites.*

Considering the long-term accumulation effect of mosses, annual total deposition fluxes of individual PAHs were compared with moss measurements (Fig. 4.7). Among the PAHs, B(b)F exhibited the highest total deposition levels, followed by B(a)P, B(k)F, and IP, consistent with the emission profiles of industrial and vehicular combustion sources. Overall, the model showed good agreement with both air measurements and moss data, with moss concentrations correlating more strongly with particle-bound B(a)P and B(k)F due to their higher particle-associated fraction. Nevertheless, species-specific uptake dynamics can influence this comparison, which is further evaluated through moss-based and modelled source attribution analyses.

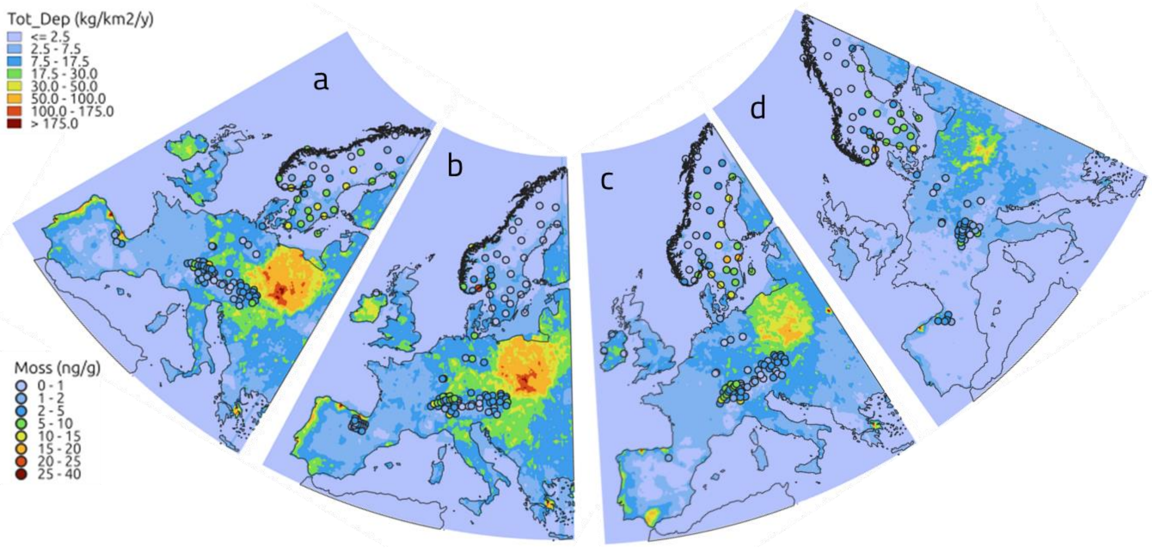


Fig. 4.7. *Annual deposition flux of B(a)P (a), B(b)F (b), B(k)F (c), and IP (d) in 2015. Coloured circles represent moss concentrations.*

Integrated source attribution analysis

Moss-derived source attribution of PAHs in this study employs two complementary measurement-based approaches to identify and quantify pollution sources across European monitoring sites - Molecular Diagnostic Ratios and Positive Matrix Factorization. Diagnostic ratios provide a fundamental screening tool for source identification by comparing the relative concentrations of specific PAH compounds, enabling discrimination between petrogenic (petroleum-based) and pyrogenic (combustion-derived) sources based on their characteristic molecular signatures. These ratios exploit the differential stability and formation pathways of individual PAH compounds, where petrogenic sources typically exhibit higher proportions of parent compounds relative to their alkylated homologs, while pyrogenic sources show elevated concentrations of high molecular weight PAHs formed during high-temperature combustion processes.

Molecular diagnostic ratio analysis across the seven countries included in the PAH moss survey reveals pyrogenic sources as the predominant PAH origin throughout the study region (Fig. 4.8). Source attribution classification indicates that over half of the sampling sites are characterized by non-traffic combustion sources, with biomass burning and coal combustion representing substantial contributors to PAH loadings across multiple locations. While fossil fuel-derived sources constitute a smaller proportion of the total sample sites, their presence remains consistently detectable, indicating the persistent influence of petrogenic inputs in the European PAH burden.

This source distribution pattern reflects the diverse energy and combustion practices across the surveyed countries, with residential heating, industrial processes, and regional biomass utilization contributing to the complex PAH emission landscape captured by moss biomonitoring.

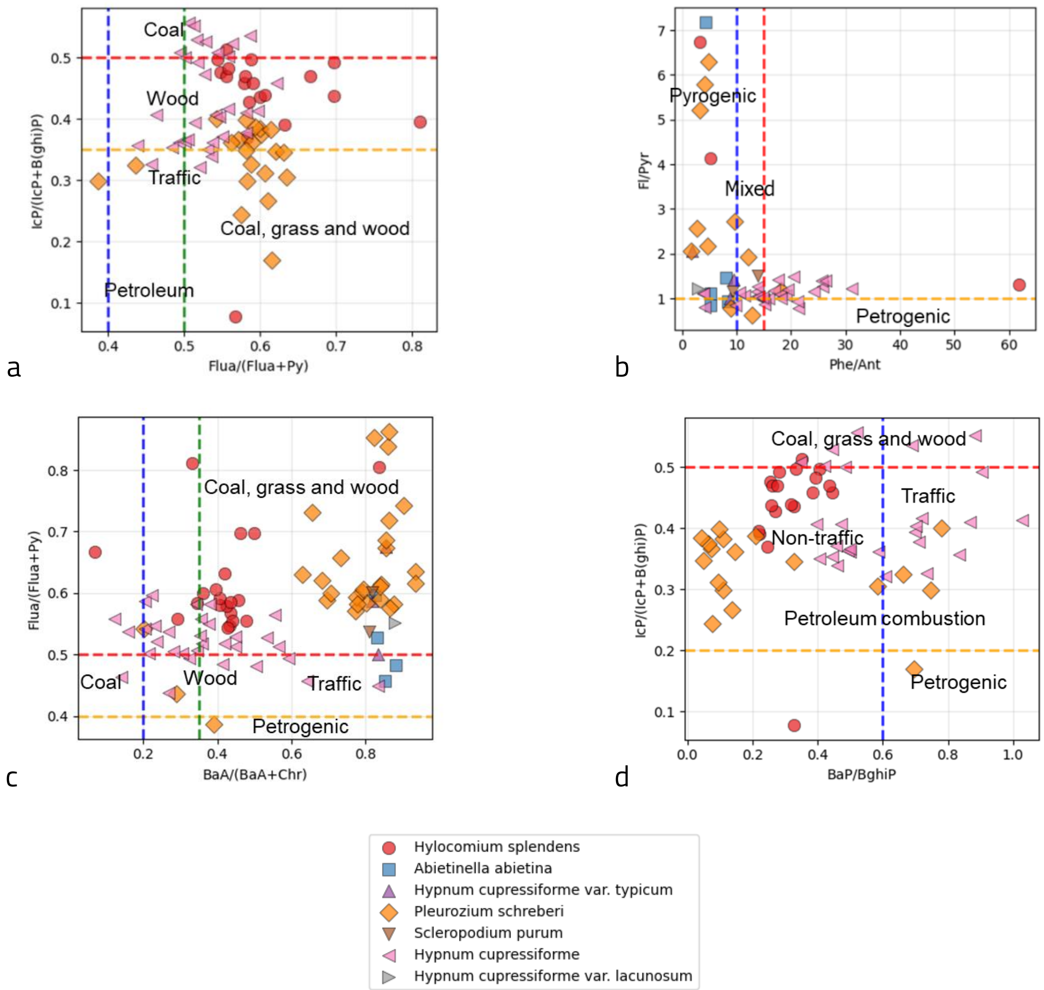


Fig. 4.8. *Scatter plot of different molecular diagnostic ratios with their respective literature-based thresholds for source categories (Tobiszewski, M., & Namieśnik, J., 2012; Katarzyna et al., 2017; Yunker et al., 2002; Ravindra, K., Sokhi, R., & Van Grieken, R. 2008). Each symbol corresponds to a moss species analysed.*

To achieve more sophisticated source apportionment, Positive Matrix Factorization (PMF) was employed as an advanced receptor modelling technique that performs multivariate factor analysis on the complete matrix of measured PAH concentrations. PMF decomposes this chemical dataset into two fundamental components: source profiles representing the characteristic chemical fingerprints of distinct pollution sources, and source contributions quantifying the relative contribution of each identified source to individual samples. This statistical approach leverages the patterns and co-occurrence relationships between light molecular weight (LMW) and heavy molecular weight (HMW) PAH compounds to group them into statistically robust source factors, thereby enabling both qualitative identification and quantitative apportionment of PAH sources (Fig. 4.9).

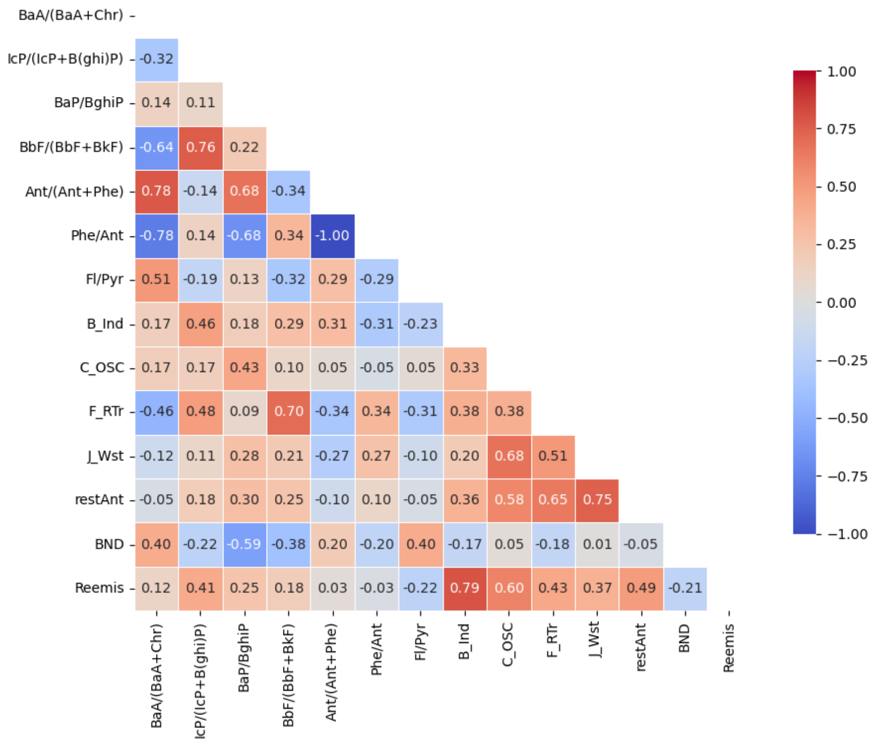


Fig. 4.9. *Spearman correlation heatmap for molecular diagnosis ratios and deposition from different emission sectors*

Deposition of the sum of four PAHs from each emission sector was compared with the molecular diagnostic ratios (Fig. 4.9), showing a good association (Spearman correlation R_{corr} > 0.43-0.70) with the heavy molecular weight compounds: IcP/(IcP+B(ghi)P) vs. Road Transport (F_RTr) and Industry (B_Ind), BaP/BghiP vs. Other Stationary Combustion (C_OSC), BbF/(BbF+BkF) vs. Road Transport (F_RTr), but not with the light molecular weight diagnostic ratios. This may be explained by the lower capture and retention efficiency of light molecular weight PAHs, which exist primarily in the gas phase.

Considering that morphological and ecological differences between moss species may significantly influence their PAH uptake dynamics, PMF analysis was also performed separately for the individual species *Hylocomium splendens*, *Hypnum cupressiforme*, and *Pleurozium schreberi* (Annex D). The analysis showed that *Hypnum cupressiforme* effectively discriminates between fresh combustion sources (LMW-dominated) and aged/industrial sources (HMW-dominated). *Hylocomium splendens* is better at capturing regional and long-range transport patterns. Pleurozium schreberi exhibits the most complex source interactions, reflecting influences from multiple source types simultaneously, strong sensitivity to local combustion sources (C_OSC, F_RTr, J_Wst), and detectable negative correlations with transboundary sources.

Species-specific metabolic processes may differentially affect PAH ratios, with sensitive species (*Pleurozium*) likely preserving source signatures better than tolerant species (*Hypnum*). Different species may show varying preferences for gas-phase vs. particle-bound PAHs, affecting the molecular weight distribution patterns used in source identification. Nevertheless, the combination of all three species provides a more comprehensive picture - from urban point sources (*Hypnum*) to regional background levels (*Pleurozium*) to forest-specific deposition patterns (*Hylocomium*).

This species-specific variability makes the comparative assessment approach valuable for validating chemical transport model predictions across different environmental conditions and pollution scenarios. The integration of diagnostic ratios and PMF provides a comprehensive framework for validating chemical transport model source attribution and enhancing confidence in transboundary pollution source identification under CLRTAP. Nevertheless, PAH source attribution depends on available data for moss measurements and quality of reported emissions data for source-receptor simulations. Results of the moss surveys are important for the evaluation of long-term trends of POPs in the EMEP region and further cooperation between EMEP/MSC-E and ICP-Vegetation is highly appreciated.

4.3. Country-scale pilot study of PAH pollution in Slovenia and Western Balkans

A detailed analysis of PAH pollution at the country scale, applying the source attribution methods discussed above, is being carried out as part of a pilot study recently initiated by MSC-E for Slovenia and the Western Balkan countries. The study aims to assess PAH pollution in the region by integrating various national datasets and involving the participation of national experts from the respective countries. At present, the activities focus on collecting measurement and emissions data, as well as preparing for high-resolution pollution modelling for Slovenia. In addition, a preliminary analysis of pollution levels in the country has been conducted to support the further development of the country-specific assessment.

Measurements

As previously formulated (Travnikov et al., 2024), part of the of pollution assessment for the region consists in the direct analysis of pollution levels, sources, and trends, as well as the evaluation of model estimates with observational data. These include regular measurements of PAH air concentrations from the EMEP monitoring network (EBAS, 2025), the European Environment Agency's Air Quality e-Reporting (AQ e-Reporting, 2025), measurement data of PAH levels from specialized measurement campaigns including their isotope composition, and datasets of PAH measurements in natural archives from mosses and lichens biomonitoring studies (Fig. 4.10).

Slovenia and Croatia represent some of the few countries in the Western Balkan region that maintain ongoing PAH measurements. Slovenia operates continuous measurements of B(a)P, B(b)F, B(k)F, and IP wet and dry deposition, as well as PM10 concentration, since 2008 at the rural background EMEP station Iskrba (SI0008R). Additionally, AQ e-reporting provides measurement records of PAHs from urban monitoring stations: Maribor (urban traffic), Nova Gorica (urban background), and Ljubljana Bežigrad (urban background) since 2018, with active B(a)P measurements in Celje since 2020. Historical data are available from inactive stations including Ljubljana Biotehniška fakulteta (urban background) and Ljubljana Bežigrad (urban background), both operational during 2008, and Celje (urban background) during 2020. Supplementary data from sampling campaigns and isotope composition analysis conducted during 2019-2021 are used to validate source attribution results at Nova Gorica, Ljubljana, Velenje, Celje, Maribor, and Ptuj. Slovenia has also participated in moss survey campaigns in 2010, 2015, and 2020, with PAH measurement data available for 2010.

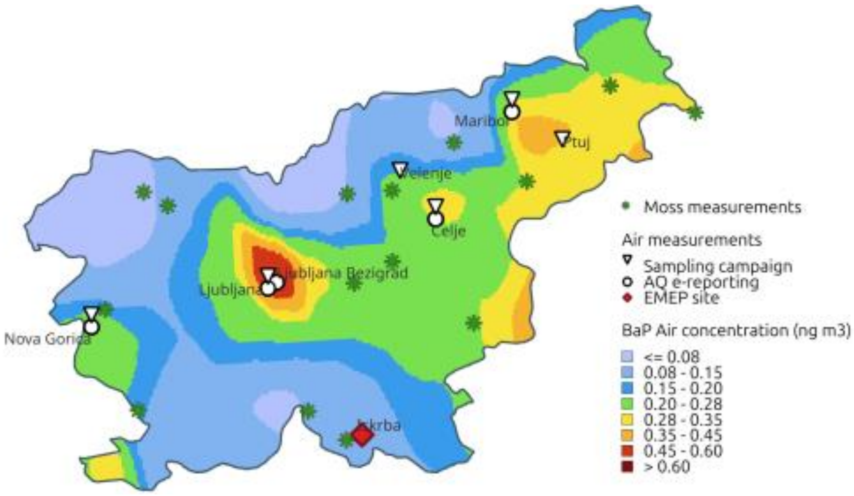


Fig. 4.10. *Locations of available PAH air concentration measurements in Slovenia, including the EMEP station, AQ e-reporting stations, sampling campaigns, and PAH measurements in mosses. The underlying map shows B(a)P air concentrations in 2023 based on EMEP operational modelling (Section 3.5).*

Similarly, Croatia maintains one EMEP measurement site in Puntijarka (HR0002R) for aerosol since 2018 and PM10 measurements since 2021. PAH measurement stations reported in AQ e-reporting include six stations: Rijeka (urban background since 2022), Sisak (suburban industrial since 2021), Zagreb (urban traffic during 2012-2022 with ongoing measurements since 2023, and urban background for the period June 2014 to February 2022), Plitvička jezera (rural background since 2021 with B(a)P data available from January 2021 to October 2022), Split (suburban background for 2023), and Slavonski Brod-1 (B(k)F measurements for 2018).

Emissions

Available data on PAH emissions in the Western Balkan region are limited to official reports submitted by the Balkan countries to the Air Convention. These data are collected, processed, and gap-filled by CEIP (Chapter 1). The available gridded emissions data for four PAHs (B(a)P, B(b)F, B(k)F, IP) have a spatial resolution of 0.1°×0.1° and cover the most recent years (https://www.ceip.at/the-emep-grid/gridded-emissions). To enable more detailed pollution assessment for Slovenia, MSC-E initiated negotiations with the Slovenian Environmental Agency (ARSO) to explore the possibility of developing a national PAH emissions inventory with a finer spatial resolution, down to a few kilometres.

Model setup and input data

The model assessment planned for the pilot study is organised as a set of nested simulations from regional to national scales, with progressively increasing spatial resolution, using the latest stable open-source GLEMOS model (v2.3, https://github.com/glemos-model). Standard operational EMEP simulations with a spatial resolution of 0.2°×0.2° (see Section 3.5) will serve as the basis for the analysis, providing boundary conditions for nested simulations over the Western Balkan region. This regional domain will in turn be further nested to a country-scale domain for Slovenia, with spatial resolution down to 0.02°×0.02° (Fig. 4.11). The nested approach will thus provide fine-resolution results for the country-specific analysis while accounting for the transboundary contributions from neighbouring and other countries to PAH pollution in Slovenia.

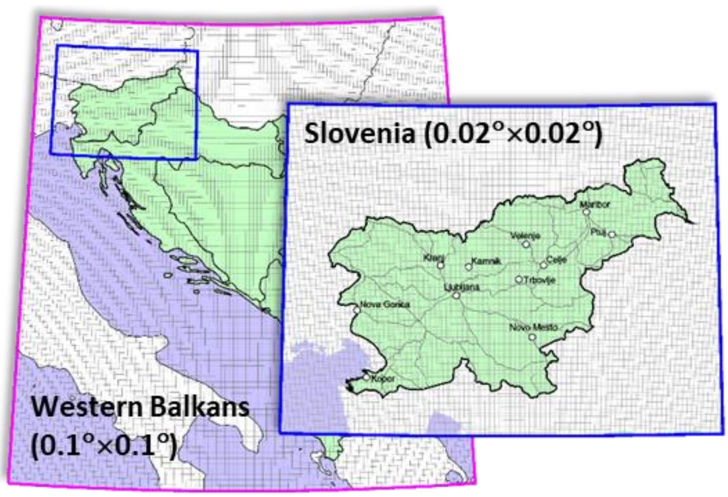


Fig. 4.11. *Nested simulation domains for fine-resolution model assessment of PAH pollution in Slovenia and the Western Balkan region.*

Each nesting step requires input data with corresponding resolution, including anthropogenic emissions, meteorological parameters, land cover data, as well as atmospheric concentrations of chemical reactants and particulate matter needed for PAH chemistry simulations. Global emissions will be taken from the Peking University PAH inventory (Shen et al., 2013), while European simulations will use EMEP emission data compiled by CEIP from national reporting. For Slovenia, the use of national emission datasets will be considered. Meteorological fields will be derived from operational ECMWF analyses (2025) and pre-processed with the WRF model (v3.7.1), whereas GEOS-Chem (v14.5.1) will provide atmospheric concentrations of chemical reactants and particulate matter. Land cover information with initial 500 m spatial resolution will be incorporated from the MODIS MCD12Q1 v061 product (Sulla-Menashe and Friedl, 2023) and interpolated to match modelling scale.

This multi-scale nested modelling approach is designed to capture the combined effects of global, regional, and local influences, providing a consistent framework for assessing PAH behaviour in the atmosphere and estimating deposition patterns across different spatial scales.

Preliminary pollution analysis

The preliminary analysis of PAH pollution in Slovenia and the Western Balkan region consists of two components: (1) a detailed assessment of B(a)P pollution levels and (2) emission source attribution for all four PAHs across the Western Balkan countries, with a focus on environmentally sensitive areas. The first part of the analysis is based on modelling results for the EMEP region for 2022. Modelling was performed using 0.1°×0.1° resolution emission data for 2022, prepared by CEIP based on official reporting in 2024. A general description of the modelling methodology and its comparison with measurements is provided in (Travnikov et al., 2024).

Modelled B(a)P air concentrations over the Western Balkan domain are shown in Fig. 4.12a. The highest concentrations, exceeding 1 ng/m^3, are limited to local areas in Serbia. In Slovenia, annual mean concentrations are mostly below 0.3 ng/m^3, with slightly elevated levels (0.3–0.5 ng/m^3) in the eastern regions and around Ljubljana, where they surpass 0.5 ng/m^3. Seasonal variability is pronounced with average winter concentrations in Slovenia exceed 0.5 ng/m^3, more than three times higher than in summer (Fig. 4.12b). This pattern is primarily driven by increased winter emissions, with stationary combustion expected to be the dominant source.

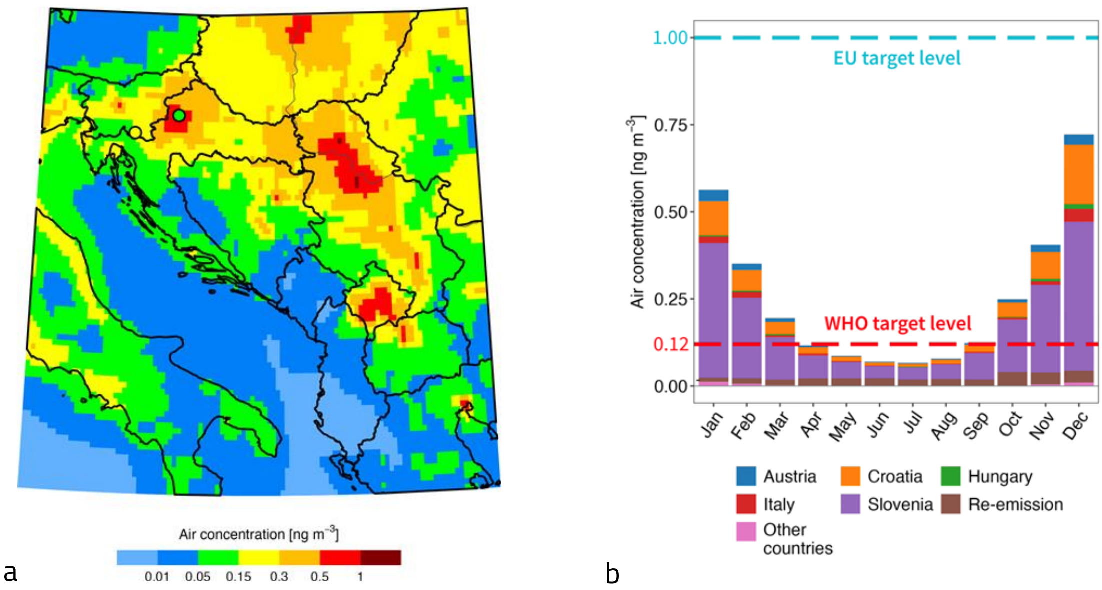


Fig. 4.12. *B(a)P air concentration distribution over the Western Balkans, Slovenia and Croatia (a) and Contribution of national and foreign sources to B(a)P air pollution in Slovenia in 2022 (b).*

County-country source-receptor analysis indicates that national emissions account for roughly 60% of B(a)P concentrations in Slovenia, with Croatia, Italy, Hungary, and Austria identified as the main foreign contributors. Although B(a)P levels in Slovenia remain below the EU target value of 1 ng/m³, winter concentrations exceed the WHO reference level of 0.12 ng/m³, which is associated with increased lung cancer risk. It is important to note that the country-level averages used in this preliminary assessment may underestimate pollution hotspots in urban areas, which can be better evaluated through high-resolution modelling.

Two EMEP monitoring sites in the Balkans region provide continuous PAH measurements: SI0008R "Iskrba," located in a non-urban area in southern Slovenia, and HR0002R "Puntijarka," situated at 988 m altitude on Medvednica National Park near Zagreb, Croatia. The model successfully reproduces the observed seasonality at SI0008R (Fig. 4.13a) but fails to capture it at HR0002R, where it substantially overestimates winter concentrations (Fig. 413b). The elevated modelled values are likely explained by the proximity of the measurement site to the city of Zagreb, which results in the 0.1°×0.1° gridded emission field assigning both sites to adjacent cells with high anthropogenic emissions. The HR0002R station is located at an altitude of 988 m (a.s.l.) on the peak of Medvednica National Park, where local B(a)P emissions from residential heating are expected to be minimal. The altitude difference of more than 700 m between the city centre and the station contributes to the observed seasonality but makes accurate representation of the site pollution levels unattainable with the current model resolution. Achieving a better representation of seasonality at HR0002R in such complex terrains will likely require high-resolution simulations supported by more detailed spatially resolved emission data.

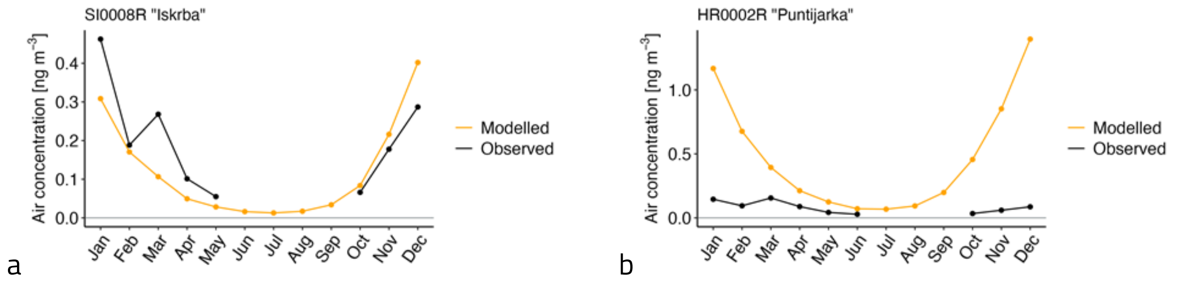


Fig. 4.13. *Comparison of modelled and observed monthly mean B(a)P air concentrations at monitoring sites Iskrba (SI0008R) (a) and Puntijarka (HR0002R) (b) in 2022.*

Source attribution analysis shows that most Balkan countries follow similar sectoral composition patterns of PAH deposition, with stationary combustion (*C_OSC*) providing the largest contribution to both total deposition and air concentrations (Fig. 4.14). Bosnia and Herzegovina exhibits somewhat lower contributions from this sector. The industrial sector (*B_Ind*) is the second most important source for the Western Balkan countries, with Bosnia and Herzegovina showing the highest industrial contribution. Road transport (*F_RTr*) accounts for 1–5% of PAH deposition in all Balkan countries, with Montenegro having the highest relative contribution and Slovenia the highest deposition flux. Additional contributions from waste combustion are observed in North Macedonia, Croatia, and Slovenia, while Serbia, Montenegro, and Albania show contributions from other agricultural combustion sources.

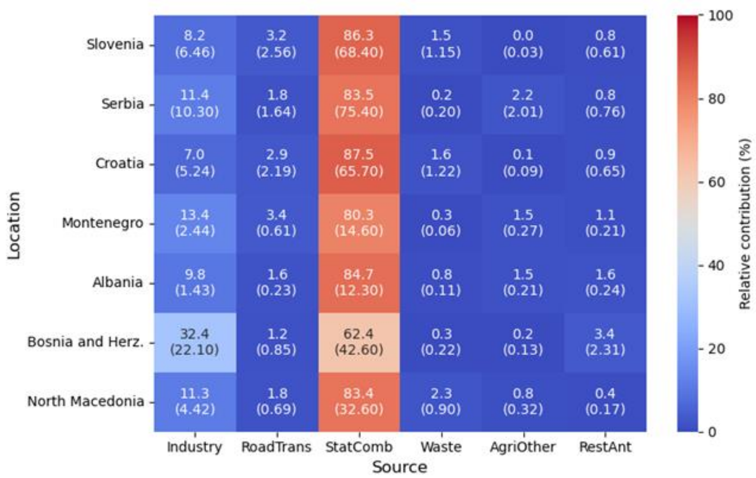
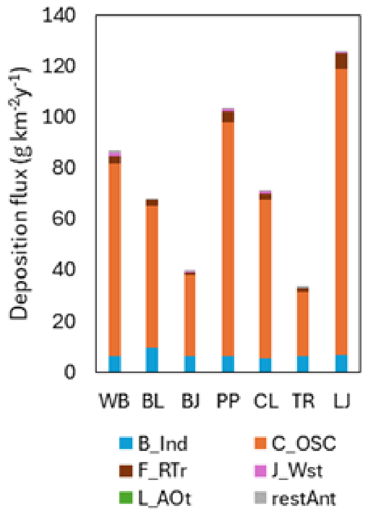


Fig. 4.14. *Heatmap of Sectors Relative contribution (%) of the total deposition for B(a)P, B(b)F, B(k)F), and IP during 2022 for B_Industry, F_Road Transport, C_Other Stationary Combustion, J_Waste, L_Other Agricultural and a summatory of the rest of Anthropogenic sectors with deposition flux in g km^{-2} y^{-1} in brackets.*

To further assess PAH atmospheric pollution over Slovenia, source-receptor simulations were conducted for environmentally sensitive areas including Triglav National Park, ecologically important sites such as Lake Bohinj, Lake Bled, Planinsko Polje wetland, and Lake Cerkniško, as well as the Ljubljana region for urban background comparison (Fig. 4.15). Results indicate higher relative contributions of PAH deposition from stationary combustion across all studied areas for B(a)P, followed by IP, B(b)F, and B(k)F. However, Triglav National Park, Lake Bohinj, and Lake Bled show higher relative contributions from industrial sources to both air concentrations and total deposition compared to other water bodies and the Ljubljana area. While the absolute industrial contribution remains comparable across all regions, with somewhat higher contributions observed at Bled, the primary difference in deposition patterns is attributed to stationary combustion sources. Water bodies, Planinsko Polje wetland, and Lake Cerkniško exhibit sectoral contribution patterns similar to the Ljubljana region with comparable deposition flux levels (Fig. 4.15b). These findings highlight that PAH pollution remains a significant environmental concern even in sensitive areas distant from urban settlements. Reducing residential combustion emissions represents one of the most impactful pathways for achieving improved air quality and protecting public health in the region.



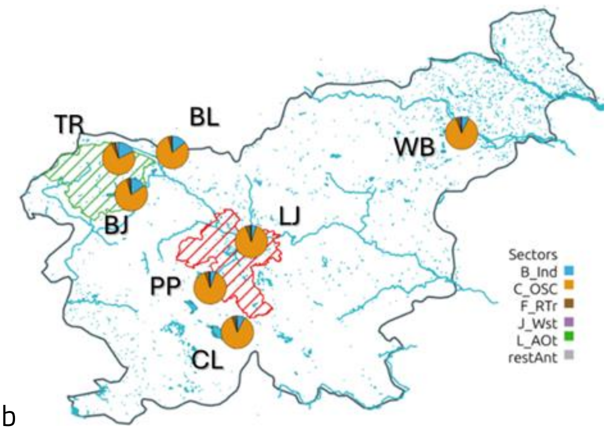


Fig. 4.15. *Absolute (a) and relative (b) contribution of emission sectors to deposition of the sum of 4 PAHs to different terrestrial regions and water bodies in Slovenia in 2022: Ljubljana region (LJ), Triglav National Park (TR), Planisko Polje wetland (PP), lake Bohinj (BJ), lake Bled (BL), lake Cerkniško (CL), and all other water bodies (WB).*

4.4. Trend and uncertainty analysis of reactive mercury

Atmospheric mercury behaves uniquely in comparison to other atmospheric pollutants due to the existence of different atmospheric Hg forms, each characterized by different roles in the biogeochemical Hg cycle. Gaseous elemental mercury (GEM) is the relatively inert Hg fraction, relevant for global Hg transport, while reactive mercury (RM), which comprises gaseous oxidized mercury (GOM) and particulate-bound mercury (PBM), reflects the chemistry of atmospheric Hg and plays an important role in Hg deposition. Therefore, observations of different Hg forms, including RM, are needed to fully capture the behaviour of Hg in the atmosphere and adequately evaluate model simulation results.

However, widespread observations of atmospheric Hg have been shown to underestimate GOM concentrations due to limitations in the most commonly used measurement technique – the KCl-coated denuder. This method has been reported to introduce substantial biases, resulting in systematically low GOM values (e.g., Marusczak et al., 2017; Gustin et al., 2013; Dunham-Cheatham et al., 2023). Such underestimations compromise the reliability of long-term speciated mercury datasets, making them unreliable for evaluation of chemical transport models that simulate Hg.

Long-term observations of RM exist and would be very valuable for model evaluation if accurate. Therefore, the aim of the current study was to develop a correction model for RM observations that takes into account local environmental factors (meteorology/air pollutant data) and accounts for the biases occurring during measurements. Several studies have quantified these biases and linked them to environmental factors such as relative humidity and ozone levels (e.g., McClure et al., 2014; Lyman et al., 2010). To address this issue and improve the usability of existing reactive mercury datasets, we developed an empirical correction model:

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

This model estimates underestimation factors (F_u) based on ancillary data available at RM monitoring sites, including ozone concentration ($[O^3]$) and specific humidity (*SH*). Additional details on establishing the correction model are available elsewhere (Travnikov et al., 2024).

The correction model was applied on a global 2010-2020 dataset, resulting in corrected RM data. Globally, corrected monthly RM values range from 2 to 930 pg m^{-3}, with a median value of 18 (9-27, 25th-75th percentile) pg m^{-3}. High-altitude sites exhibit highest mean RM concentrations (385 pg m^{-3}), followed by urban sites (36 pg m^{-3}), while suburban/rural/isolated locations exhibit the lowest RM concentrations (16 pg m^{-3}). The dataset includes predominantly North American sites (25 sites), with only 2 European and 2 East-Asian sites available with multi-year RM data. This indicates that there are still some limitations to the global RM dataset, and that additional observation sites outside of North America are needed.

To illustrate the use of the corrected RM dataset for model evaluation, we used the results of multi-model Hg simulations on a global scale, conducted as part of the MCHgMAP project (a more detailed description of the project is available in Section 5.2). The average simulated RM concentrations for the period 2010-2020 were compared with long-term observations. The obtained results are shown in Fig. 4.16.

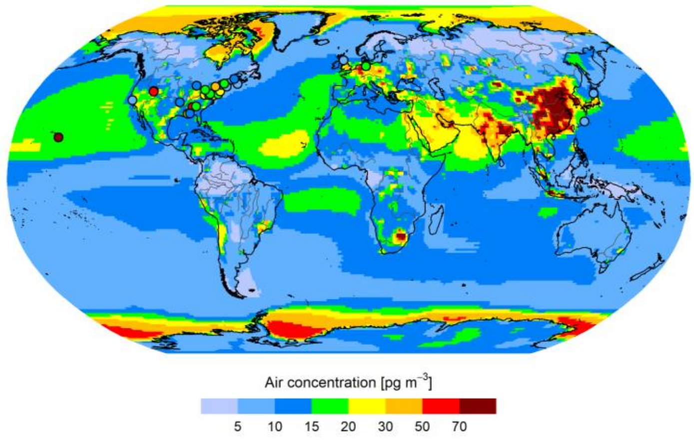


Fig. 4.16. *Mean reactive mercury air concentrations for the 2010-2020 period, showing simulated RM values (MCHgMAP ensemble) versus corrected RM observations (circles in the same colour legend).*

Simulated RM and corrected observed RM air concentrations are in good agreement, with a few notable exceptions. Observation sites with >50 pg m^{-3} air RM concentrations (dark red and red circles) represent either high-elevation sites (e.g., Mauna Loa, Hawaii) or urban/industrial areas (e.g., Salt Lake City), and are not in good agreement with the simulated values. This is due to local sources that cannot be captured by global-scale models due to low spatial resolution. Therefore, urban/industrial and high-elevation sites were filtered out from further analysis. The time trends at the remaining observation sites with corresponding model ensemble values are shown in Fig. 4.17. It should be noted that large areas in the high latitudes, the tropics, and industrial regions of Asia with predicted high RM concentrations remain without observational coverage.

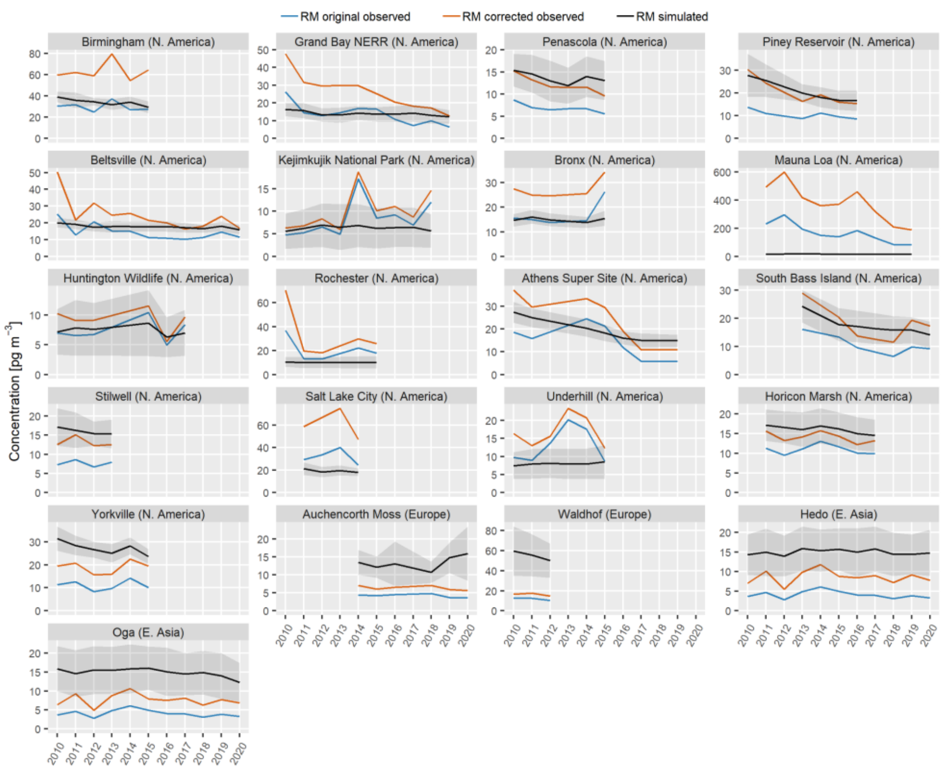


Fig. 4.17. *Time trends of simulated reactive mercury concentrations from the MCHgMAP model ensemble compared with observations. Both original and corrected observational datasets are shown.*

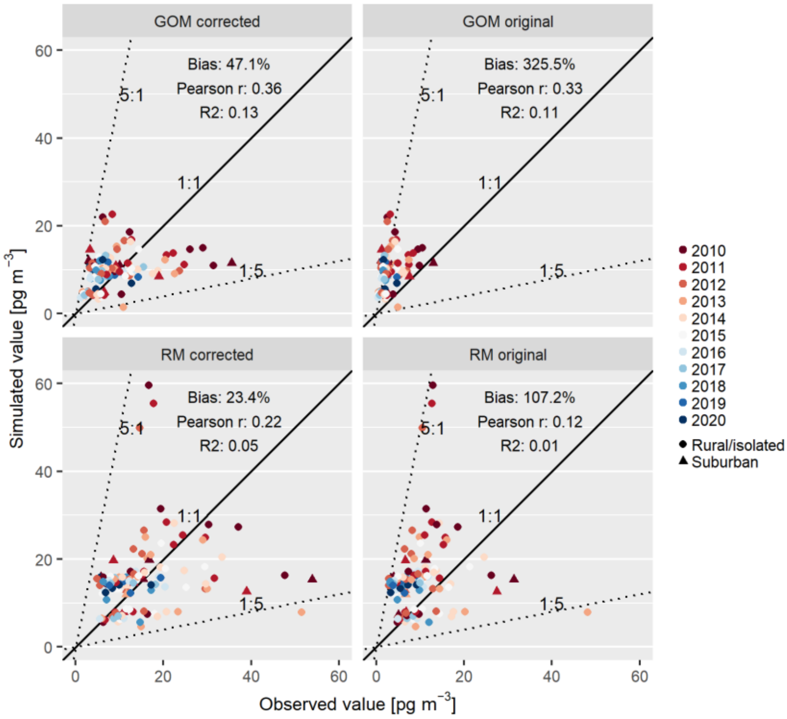


Fig. 4.18. *Model evaluation of the MCHgMAP ensemble versus GOM and RM observations, yearly averages. Corresponding statistical parameters are shown on each plot.*

In Fig. 4.17, some North American sites exhibit decreasing trends whereas no trends are observed at the two Asian sites (Japan). Available data for Europe are insufficient for the detection of long-term changes. The model ensemble partly captures decreasing trends at several sites. Statistical evaluation of the biases for model ensemble versus observations is shown in Fig. 4.18.

Figure 4.18 clearly shows that the applied GOM/RM correction model greatly lowered the bias values when comparing simulated and observed values, for both GOM and RM. When looking at yearly variation of the biases, higher bias values occur for early observations (2010-2014, red colors) than for more recent observations (2017-2020, blue colors). Correlations (Pearson r) between simulations and observations and the R2 values also improved after correcting RM observations with the established empirical model.

Speciated Hg measurements, including RM, are very important for evaluation of modelling results on both global and regional scale. The lack of such measurements in Europe on a multi-year scale restricts our ability to improve model estimates of Hg pollution in the EMEP countries. This highlights the importance of developing accurate speciated Hg measurements in Europe and including RM observations in the EMEP monitoring program, which would be highly beneficial for EMEP pollution assessment.

4.5. POP multi-media dispersion modelling in the environment

Persistent organic pollutants, such as hexachlorobenzene (HCB), polychlorinated biphenyls (PCBs), and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), are characterised by multi-media cycling and their ability to accumulate in environmental compartments. To re-establish operational model assessment of these pollutants, we performed long-term simulations of their global dispersion and accumulation in the atmosphere, soil, vegetation, and ocean water. These simulations were used to analyse the historical dynamics of pollution and to provide appropriate initial and boundary conditions for EMEP regional modelling.

Inventory of POP model parameterisations

As a first step in revisiting the modelling approaches, a comprehensive inventory of the parameterisations used in the GLEMOS model for POP-related processes was compiled to support both its current applications and future development. The inventory systematically documents the historical development and present status of POP parameterisations in GLEMOS. The processes are categorised by environmental compartment – atmosphere, water, soil, and vegetation – and include detailed records of specific mechanisms such as wet and dry deposition, degradation, gas–particle partitioning, and inter-media exchange, as well as their successive refinement over time. The inventory also addresses input data requirements, including meteorological, emission, and land cover datasets.

The current state of the modelling approaches was applied in the subsequent long-term simulations of legacy POPs.

Hexachlorobenzene (HCB)

Hexachlorobenzene (HCB) was widely used as a fungicide and pesticide from the 1950s until the 1970s, when its agricultural application was banned or severely restricted. Current pollution levels are largely sustained by unintentional releases from industrial and combustion processes. Due to the high environmental persistence of HCB, historical accumulation in main environmental media continues to significantly influence on current contamination levels. Therefore, historical emissions over a long period of time must be considered when modelling HCB air pollution. Three scenarios of historical HCB emissions (maximum, average and minimum) were previously developed in MSC-E to support long-term modelling of pollutant accumulation in environmental compartments (Shatalov et al., 2010). Preliminary calculations with the GLEMOS model indicate that the maximum scenario gives the best agreement with the observed data. Accordingly, this scenario was used in the global simulations, assuming that most emissions enter the atmosphere and soil.

To assess intercontinental transport and the contribution of global HCB emission sources to pollution levels in the EMEP region, a long-term simulation (1945–2022) was performed using the GLEMOS model with a spatial resolution of 3°×3°. This long-term simulation was conducted to assess the distribution and accumulation of HCB in the environmental media and to provide initial concentrations for more detailed short-term model simulations for 2023. The long-term evolution of global net mass fluxes of HCB – between the atmosphere and other media as well as emissions and degradation – is shown in Fig. 4.19.

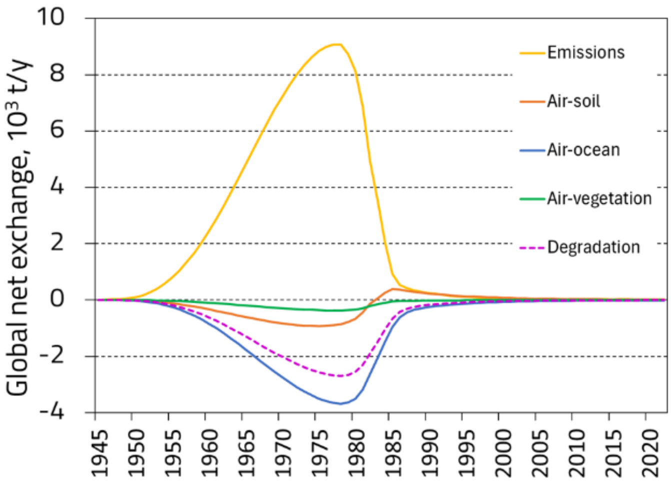


Fig. 4.19. *Long-term changes in HCB mass fluxes between the atmosphere and other environmental media (positive values indicate fluxes from media to the atmosphere, negative values indicate fluxes in the opposite direction).*

The temporal trend shows a slow increase in global HCB emissions since the early 1950s, which reached a peak in 1978 and then fell sharply due to international regulations and the ban on agricultural use. The subsequent decline in concentrations varied in the different compartments: atmospheric concentrations decreased in parallel with emissions, while soil concentrations decreased more slowly. Throughout the assessment period, the net flux from the atmosphere to the ocean remained consistently negative, indicating that the ocean continues to act as a net sink. In contrast, the flux between air and soil showed a more dynamic pattern. Initially, the soil acted as a net sink, but after the decline in emissions, the net flux reversed and the soil became a net source due to re-emissions from the accumulated residues. From the early 1980s, re-emission from soil exceeded deposition, emphasizing the role of soil as a long-term reservoir and potential secondary source of HCB emissions decades after the end of primary emissions. Although degradation occurred in all media, its strongest impact was in soil, where it progressively reduced the amount of HCB available for re-emission.

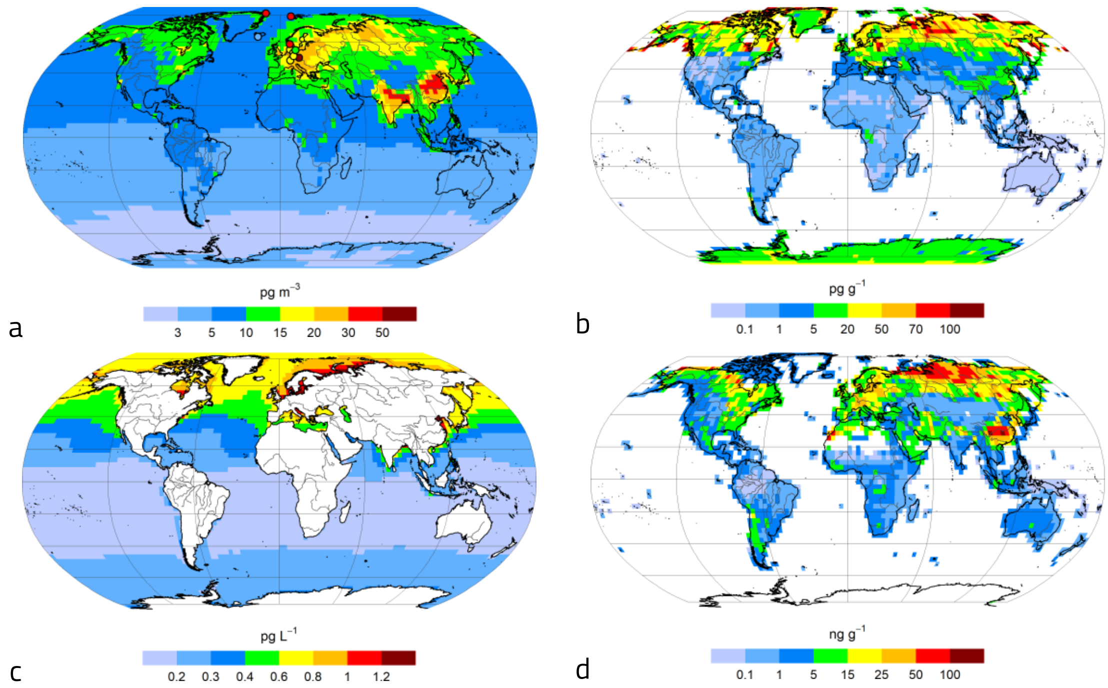


Fig. 4.20. *Spatial distribution of HCB annual mean concentrations in air (a), soil (b), ocean water (c), and vegetation (d) in 2022 (circles on the map (a) show observed values in the same colour scale).*

Figure 4.20 shows the spatial distribution of global HCB annual mean concentrations in air, soil, ocean water and vegetation for 2022. The model results show elevated HCB concentrations in the atmosphere over regional hotspots in Europe, South Asia and Southeast Asia, especially in countries such as India and China. Lower concentrations were observed in Africa, North and South America and other regions. For example, atmospheric HCB concentrations in Africa are between 5 and 10 pg/m^3. In Europe, the observed values range from 10 to 30 pg/m^3, which is in satisfactory agreement with the values predicted by the model estimates. In other compartments – vegetation, ocean and soil – higher concentrations were found in the Northern Hemisphere compared to the Southern Hemisphere, particularly in North America, Europe, Central and East Asia.

Polychlorinated biphenyls (PCBs)

After the ban on the use of PCBs in the 1980s, PCBs emissions were significantly reduced. However, PCBs are still detectable in various regions and continue to pose a risk to human health and biota. In this study, PCB-153, the representative congener, was used to assess PCB pollution levels. Modelling based on historical emissions confirms the high persistence of PCBs, especially in soil, which acts as an important environmental reservoir. The peak value of the total PCB-153 content in soil was reached in 1989, about 14 years after the peak of emissions. Figure 4.21 shows the long-term evolution of global net mass fluxes of PCB-153 between the atmosphere and other environmental compartments as well as the emission and degradation fluxes.

To assess intercontinental transport and the contribution of global PCB-153 emission sources to pollution levels in the EMEP region, a pilot long-term simulation (1930-2022) was conducted using the GLEMOS model with a spatial resolution of 3°×3°. The congener-specific global emission inventory developed by Breivik et al. (2007) was used for the modelling. These long-term simulations provided insights into the global dispersion and accumulation of PCB-153 in different environmental compartments as well as initial concentrations for more detailed short-term model simulations for 2022.

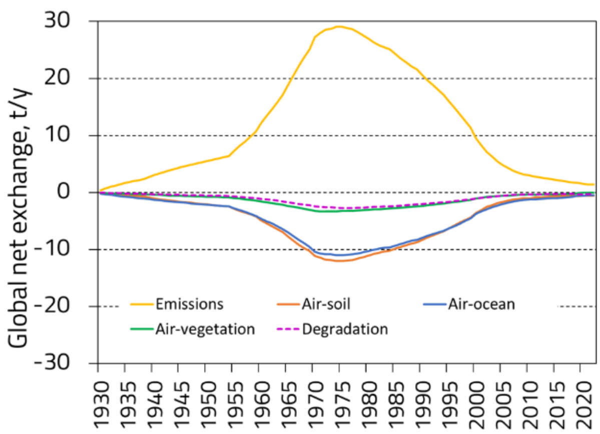


Fig. 4.22. *Long-term changes of PCB-153 mass fluxes between the atmosphere and other environmental media (positive values indicate fluxes from media to the atmosphere, negative values indicate fluxes in the opposite direction).*

The behaviour of PCB-153 in the environment is similar to that of HCB, but with notable differences in the magnitude and distribution of intermedia fluxes. Its emissions have increased steadily since the 1930s, peaking in the late 1970s and declining thereafter due to international bans and restrictions. During the emission peak periods, both the soil and the ocean acted as net sinks, but their contributions differed from those for HCB. PCB-153 showed a greater affinity for terrestrial environments, leading to a greater dispersion in soil. Similar to HCB, degradation fluxes for PCB-153 remained low during the simulation period, confirming the persistence of the pollutant in the environment. Despite the significant decrease in emissions, PCBs continue to circulate between environmental compartments, with the soil and the ocean serving as long-term reservoirs.

Figure 4.23 shows the spatial distribution of global PCB-153 annual mean concentrations in air, soil, ocean, and vegetation in 2022. The results show elevated air concentrations (0.2–6 pg/m^3) in Europe, which are consistent with the emission distributions. Concentration gradients in other compartments follow a similar pattern, with higher values observed in the Northern Hemisphere than in the Southern Hemisphere, while comparatively lower values are observed in Africa, North and South America and other regions. In Europe, the measured air concentrations ranged from 0.2 to 3 pg/m^3, which is in good agreement with the model simulations.

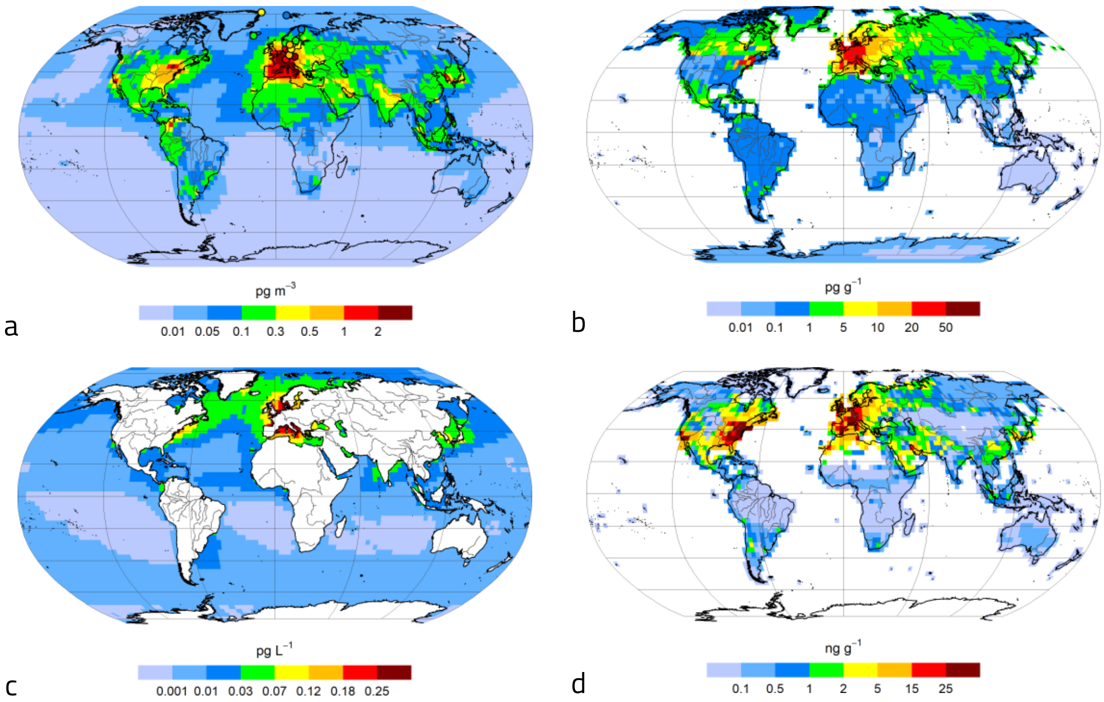


Fig. 4.23. *Spatial distribution of PCB-153 annual mean concentrations in air (a), soil (b), ocean water (c), and vegetation (d) in 2022 (circles on the map (a) show observed values in the same colour scale).*

Polychlorinated dibenzo(p)dioxins and dibenzofurans (PCDD/Fs)

Polychlorinated dibenzo(p)dioxins and dibenzofurans (PCDD/Fs) are highly toxic POPs formed mainly as unintentional by-products of combustion and certain industrial processes. Historically, emissions were linked to waste incineration, metal production, and the use of chlorinated herbicides, leading to widespread environmental contamination.

Long-term global modelling of PCDD/Fs (2002–2022) was conducted using the latest global emissions inventory by Song et al. (2023). These simulations provided insights into the global dispersion and accumulation of PCDD/Fs across different compartments, as well as boundary and initial conditions for more detailed short-term model simulations within the EMEP domain in 2023.

Figure 4.24 illustrates the long-term temporal evolution of global net mass fluxes of PCDD/Fs between the atmosphere and other compartments as well as atmospheric emissions and degradation processes over past 20 years. PCDD/Fs emissions decreased significantly from 2002 to 2008, then stabilized and showed only minor interannual fluctuations. In contrast, degradation processes contributed to a negligible net removal flux, underlining the limited capacity of natural reduction and the priority of source control measures.

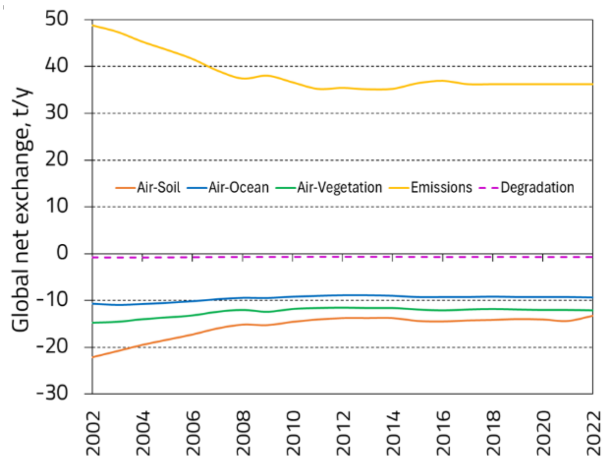


Fig. 4.24. *Long-term changes of PCDD/F mass fluxes between the atmosphere and other environmental media (positive values indicate fluxes from media to the atmosphere, negative values indicate fluxes in the opposite direction).*

The net exchange between air and soil started at 22 t/y in 2002, reflecting significant deposition, and decreased to 15 t/y by 2008, confirming the role of soil as a primary atmospheric sink. From 2008 to 2022, the deposition flux from soil remained essentially constant, reflecting the plateau of emissions. The exchange between air and ocean also remained constant throughout the period, indicating the consistent sink function of the oceans. Net deposition to vegetation decreased slightly from 2002 to 2022. These data show that source control efforts have led to a decrease in global atmospheric PCDD/Fs emissions by about 25% since 2002. This decrease has in turn led to a 15–30% lower net deposition flux to the soil, ocean and vegetation compartments, all of which reached quasi-steady levels by 2008.

Figure 4.25 shows the spatial distribution of global PCDD/Fs annual mean concentrations in air, soil, ocean and vegetation in 2022. The model results indicate elevated atmospheric PCDD/Fs concentrations (5-10 fg TEQ/m^3) over Central and Southern Europe and the Caucasus region (such as Austria, Czechia, Italy and Turkey). Most EMEP countries have concentrations of 2-5 fg TEQ/m^3, with the Scandinavian countries remaining comparatively clean (~0.5 fg TEQ/m^3). Globally, the highest concentrations occur in southern Central Asia, East Asia and Southeast Asia — over 10 fg TEQ/m^3 in China and 25 fg TEQ/m^3 in India — while values below 0.5 fg TEQ/m^3 were estimated in large parts of Australia and North America. The air concentration measured at the Swedish station (SE0022) in 2022 corresponds to the prediction of the model (circle in Fig. 4.25a), which confirms the accuracy of the simulation. In other environmental compartments, elevated concentrations were mainly observed in certain regions. In the ocean compartment, higher concentrations were found around Southeast Asia. In the soil compartment, elevated levels were found in Europe, in East and Southeast Asia and in local hotspots in Africa and South America. Higher concentrations were also found in the vegetation compartment in Europe, North Africa, South Asia and Southeast Asia. In contrast, the rest of the world showed relatively low concentrations in all compartments, indicating generally cleaner conditions.

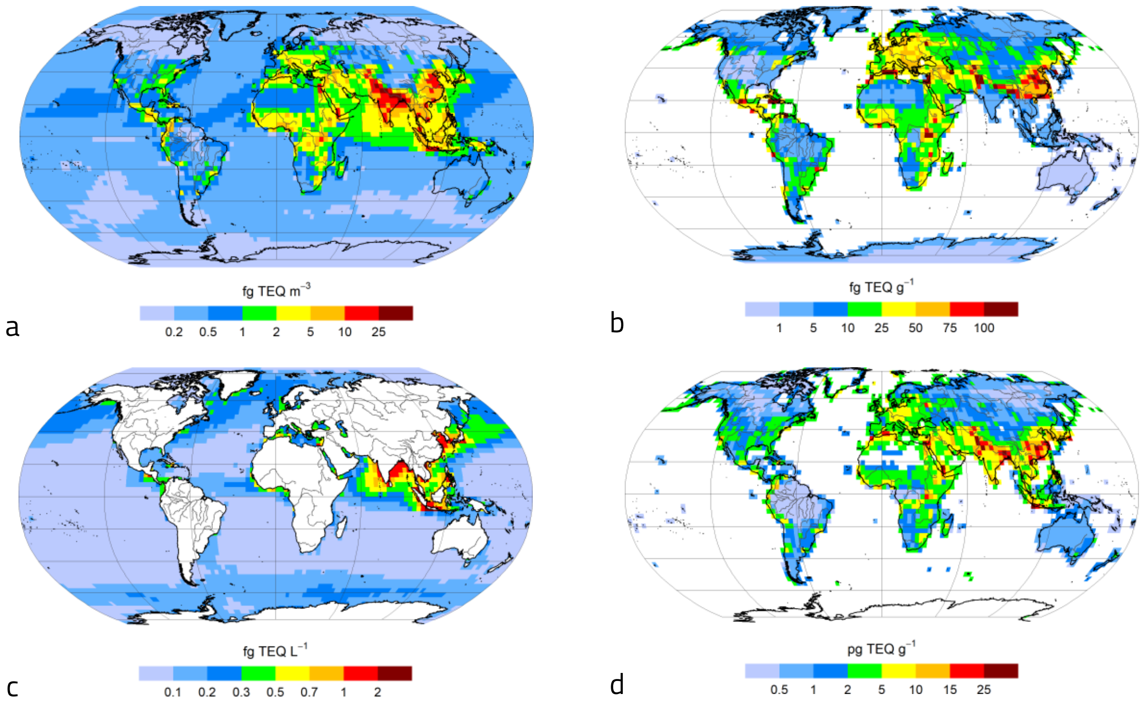


Fig. 4.25. *Spatial distribution of PCDD/F annual mean concentrations in air (a), soil (b), ocean water (c), and vegetation (d) in 2022 (circles on the map (a) show observed values in the same colour scale).*

5. Cooperation

MSC-E continues its scientific collaboration with various international and national bodies, aiming to improve research and assessment approaches applied by the Centre and to disseminate scientific knowledge gained under the Convention. These bodies include the EMEP Task Forces, the International Cooperative Programmes of the Working Group on Effects (WGE), the Minamata Convention on Mercury, the Baltic Marine Environment Protection Commission (HELCOM), the Arctic Monitoring and Assessment Programme (AMAP), and other international organisations.

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-sixth meeting (Potsdam, Germany, 5-7 May 2025). MSC-E presented an overview of its ongoing research and model development activities, with a focus on studies of heavy metal wind re-suspension, mercury atmospheric chemistry and air-surface exchange processes, polycyclic aromatic hydrocarbon (PAH) pollution, including a country-scale pilot study for Slovenia and the Western Balkan countries, and multimedia modelling of persistent organic pollutants (POPs). Additionally, representatives of the Centre shared details of studies on the model evaluation of wind-blown mineral dust and its impact on heavy metal pollution in Europe, as well as source apportionment of PAH pollution in selected EMEP countries based on model simulations and moss measurements.

5.2. Task Force on Hemispheric Transport of Air Pollution and Minamata Convention on Mercury

MSC-E continues its collaboration with the Task Force on Hemispheric Transport of Air Pollution (TF HTAP). The Centre participates in the Multi-Compartment Mercury Modelling and Analysis Project (MCHgMAP), a multi-model research initiative recently launched under TF HTAP in cooperation with the Minamata Convention on Mercury for assessing the effectiveness of current and future mitigation policies. In addition, MSC-E participated to the annual TF HTAP meeting contributing to discussions on current research topics and future plans.

MCHgMAP Project

The Multi-Compartment Mercury Modelling and Analysis Project (MCHgMAP) is an international scientific initiative originally designed under TF HTAP to inform the effectiveness evaluation of both the Air Convention and the Minamata Convention on Mercury through multi-model assessment and attribution of geospatial variation and temporal trends in mercury pollution. MCHgMAP combines models of the atmosphere, oceans, land, and global mercury budgets, and promotes collaboration between emissions reporting, monitoring, and modelling communities to improve data and inform global policy decisions. A comprehensive description of the multi-model experiment programme was recently published in the white paper (*Dastoor et al.*, 2024).

MSC-E participates in the MCHgMAP project, contributing to the development of the assessment programme and coordination of the atmospheric modelling activities at all stages of the project. Specifically, MSC-E has been involved in designing the overall model simulation and analysis framework, formulating the multi-model experiments, and specifying the output requirements. In addition, MSC-E developed a harmonised approach for estimating mercury exchange between the atmosphere and the ocean, ensuring consistent application across the project. It also contributes to the analysis and reporting of the model assessment results.

The current phase of MCHgMAP simulations focuses on assessing spatial patterns and temporal trends of Hg levels in both remote and affected regions under the baseline scenario and on evaluating simulated trends against a compilation of long-term measurements. In addition, a perturbation scenario is used to isolate the impact of temporal changes in anthropogenic emissions on Hg levels from the effects of varying environmental factors (Table 5.1).

Table 5.1. *MCHgMAP simulation scenarios*

Scenario	***Description***	***Purpose***
BASE	Full time series of anthropogenic emissions (EDGAR v8.1), geogenic, and secondary emissions	Reproduce geospatial variation and historical trends
MOSAIC	Anthropogenic EDGAR emissions for China replaced with the national P-CAME inventory	Test alternative emissions trend data for China
NATURE	Anthropogenic emissions fixed at 2010; time-variable geogenic and secondary emissions	Isolate the effect of non-anthropogenic sources and drivers on temporal trends
AGSM	Emissions from ASGM fixed at 2010; time-variable geogenic and secondary emissions	Isolate the effect of ASGM emissions on temporal trends

The study of geospatial patterns in atmospheric Hg concentrations and deposition levels is based on multi-model simulations for the period 2010-2020, with preliminary results presented in Fig. 5.1. The analysis reveals strong latitudinal variations in Hg^0 concentrations, primarily driven by the distribution of anthropogenic emissions. Elevated concentrations are observed in major industrial regions and artisanal and small-scale gold mining (ASGM) areas (Fig. 5.1a). Mercury wet deposition shows high variability influenced by primary and secondary emissions, atmospheric chemistry, and precipitation patterns (Fig. 5.1b). The model ensemble captures the latitudinal variation in atmospheric Hg well, increasing confidence in its scientific representation, and successfully reproduces spatial gradients of wet deposition observed in Europe and North America. In contrast to wet deposition, total atmospheric Hg deposition is markedly higher over forested regions due to vegetation uptake (Fig. 5.1c), with particularly elevated fluxes over tropical forests in South America and Africa, as well as in industrial regions of East Asia, Europe, and North America.

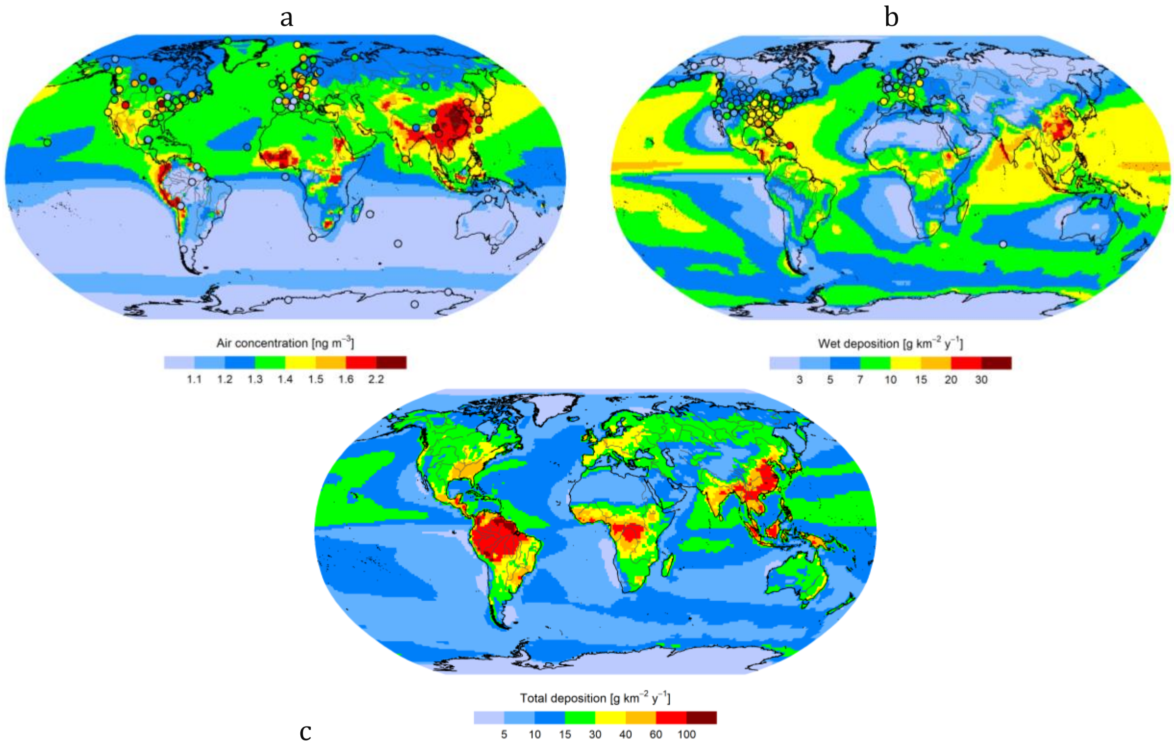


Fig. 5.1. *Spatial distribution of the multi-model ensemble mean Hg^0 concentration (a), Hg wet deposition (b), and total Hg deposition (c), averaged over the period 2010–2020. Coloured circles indicate measured values using the same colour palette.*

To better understand the anthropogenic and environmental drivers of geospatial variations in Hg pollution, a statistical analysis was performed using Hg concentrations and deposition levels averaged across the IPCC land and ocean regions (Iturbide et al., 2020). The analysis shows that hotspots of elevated Hg concentrations are primarily linked to regions with high anthropogenic and/or secondary emissions, such as East, South, and Southeast Asia, Western Africa, and Northwestern South America. Atmospheric Hg dry deposition dominates over land, whereas wet deposition prevails over the ocean. Deposition levels are strongly affected by surface and environmental conditions, with the highest fluxes occurring in vegetated areas with substantial precipitation (Fig. 5.2). Notably, many regions with high simulated Hg concentrations remain underrepresented in current observational datasets.

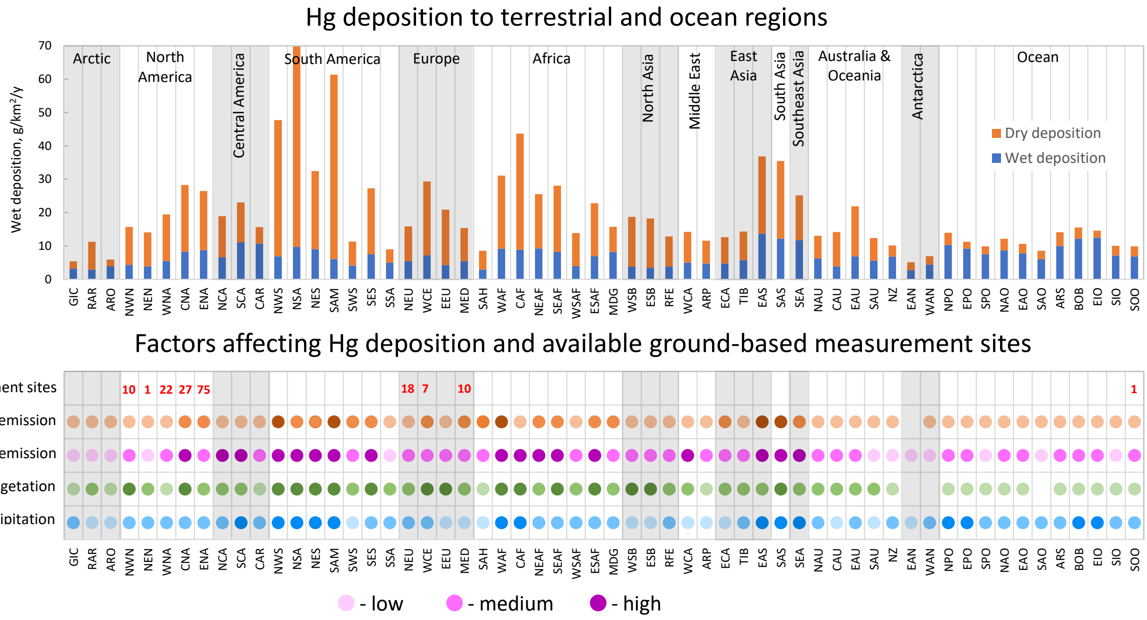


Fig. 5.2. *Average atmospheric Hg concentrations across IPCC regions, complemented by a qualitative analysis of factors influencing these levels and the availability of ground-based Hg wet deposition) measurement sites*

TF HTAP Annual Meeting

MSC-E participated in the annual meeting of the Task Force (Potsdam, Germany, 7-9 May 2025), presenting progress on its ongoing activities and contributing to discussions on current research topics and future plans. In particular, the Centre was responsible for organising a dedicated session on the MCHgMAP project. During the session, a representative of MSC-E presented an overview of the project design and modelling experiments, along with preliminary results from atmospheric simulations. Additionally, the Centre shared findings from a recent study on trend and uncertainty analysis for simulated and observed reactive mercury concentrations.

MSC-E also contributed to discussions on the FIRES project, which aims to evaluate the impact of wildfires and biomass burning on environmental pollution by mercury and selected POPs (PAHs and PCDD/Fs). During this session, participants reviewed available modelling capabilities, as well as emissions and measurement data required for multi-model simulations. Practical steps for initiating project activities were also discussed, and MSC-E expressed its interest in and readiness to participate.

Finally, a joint session of TFMM and TF HTAP focused on a new initiative launched under TF HTAP to assess global environmental contamination by per- and polyfluoroalkyl substances (PFAS). The initial discussion addressed the current understanding of PFAS-related processes, available data, and modelling capabilities, including a newly developed emissions database and recent regional and global model simulations. Although current knowledge of PFAS processes is limited and modelling approaches are still in early development, this topic appears highly promising for the Centre's future involvement.

5.3. ICP-Vegetation

MSC-E participated in the 38th Task Force meeting of the International Cooperative Programme on Effects of Air Pollution on Natural Vegetation and Crops (ICP-Vegetation) of the Working Group on Effects (WGE), held in Tirana, Albania, from 10 to 12 February 2025. A representative of MSC-E highlighted the use of moss measurements for model evaluation and integrated analyses of heavy metal and POP pollution in the EMEP region. Successful previous applications were presented, including assessments of spatial distribution, temporal trends, pollution hotspots, and source attribution using both moss measurements and modelling results. Preliminary findings from the 2020 moss survey were discussed, along with proposals for future collaboration. In addition, MSC-E presented a study combining moss biomonitoring and modelling to assess PAH spatial distribution and source attribution across Europe.

The collaboration between MSC-E and ICP-Vegetation remains pivotal in advancing understanding of environmental pollution by heavy metals and POPs. These joint efforts aim to improve the accuracy of pollution assessments, particularly in regions with limited air monitoring infrastructure, such as Eastern Europe and the Western Balkans.

5.4. Baltic Marine Environment Protection Commission (HELCOM)

In accordance with the Memorandum of Understanding between the Baltic Marine Environment Protection Commission (HELCOM) and the Air Convention, MSC-E is responsible for the regular evaluation of atmospheric inputs of heavy metals and POPs to the Baltic Sea. This work is carried out under a long-term contract between the EMEP Centres and HELCOM. As part of this agreement, atmospheric deposition of Cd, Hg, and B(a)P to the Baltic Sea was estimated for the period 1990-2022. Updated data on emissions, modelled deposition fields, and source apportionment are presented in the Joint Report of the EMEP Centres for HELCOM (HELCOM, 2025). This section provides a brief overview of MSC-E's contribution to the Joint EMEP report.

Annual atmospheric emissions of Cd, Hg, and B(a)P in the HELCOM contracting parties decreased by 65%, 66%, and 25%, respectively, between 1990 and 2022. In 2022, total anthropogenic Cd, Hg, and B(a)P emissions from the HELCOM Contracting Parties amounted to 61, 28, and 217 tonnes, respectively. For the example of Hg, the largest contributors of total anthropogenic emissions were Russia (49%), Germany (23%), and Poland (22%). On the other hand, largest reduction in Hg emissions were seen for Denmark (92%), followed by Estonia (84%), and Germany (82%). The timeseries of atmospheric Hg emissions are shown in Figure 5.3.

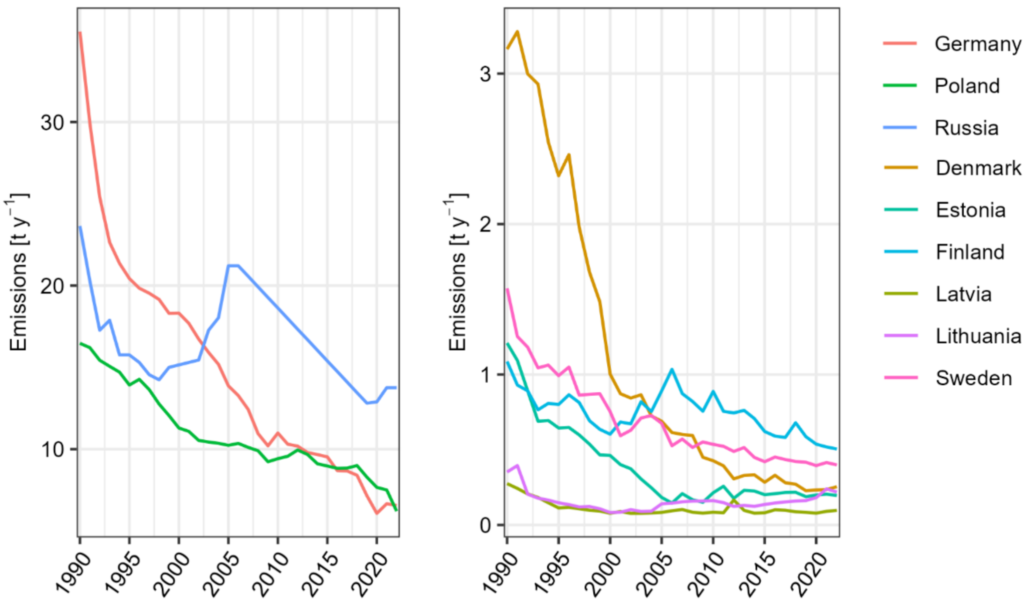


Fig. 5.3. *Atmospheric Hg emissions from the HELCOM Contracting Parties during the period 1990-2022.*

Airborne deposition of Cd, Hg, and B(a)P to the Baltic Sea has been calculated for the period 1990-2022 using the GLEMOS model (v2.2.2). According to the model calculations, annual total atmospheric deposition levels of Cd, Hg, and B(a)P to the Baltic Sea decreased by 78%, 41%, and 42%, respectively, from 1990 to 2022. An example of deposition assessment results for Hg is shown in Fig. 5.4. Higher rate of decrease of all selected pollutants was observed in the early part of the assessment period (1990-1996 for Cd and Hg, 1990-2002 for B(a)P) than in the later part of the period.

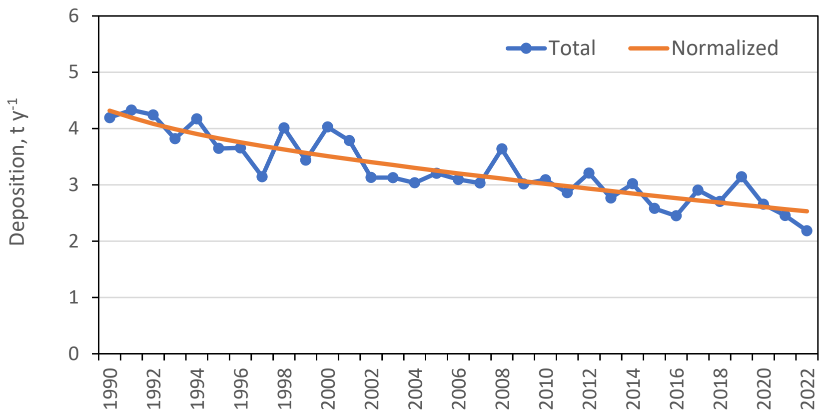


Fig. 5.4. *Changes in modelled total annual atmospheric deposition of Hg to the Baltic Sea for the period 1990-2020.*

The spatial distribution of annual total deposition fluxes of selected pollutants within the Baltic Sea region in 1990 and 2022 varies across sub-basins. For example, in 2022, the highest spatially averaged Cd flux was recorded in the Sound sub-basin, which has the smallest area and is influenced by significant nearby land-based emission sources (Fig. 5.5.). The lowest flux was observed in the Bothnian Bay sub-basin, which can be attributed to its relatively large area and low surrounding emission levels.

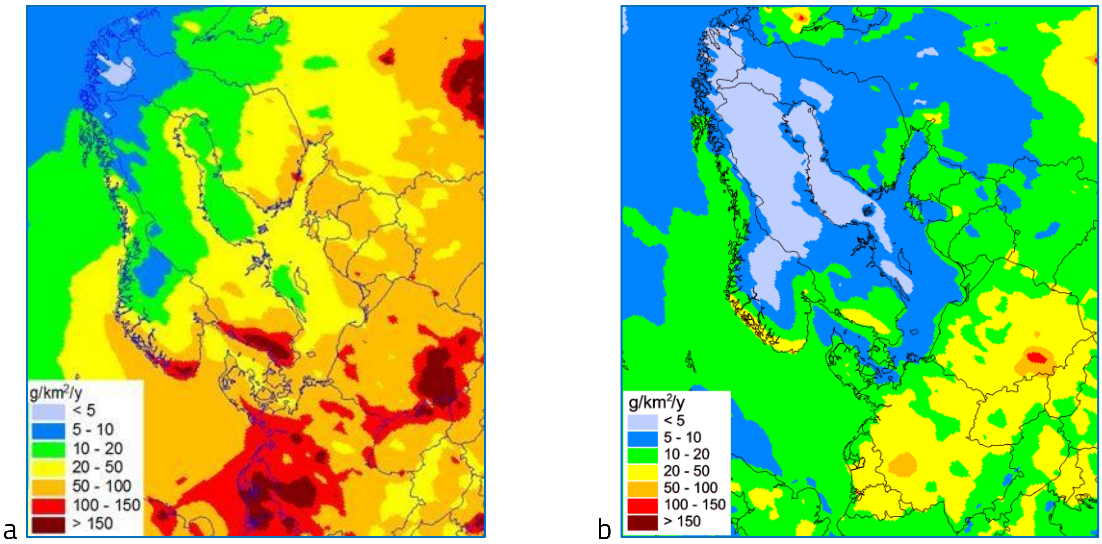


Fig. 5.5. *Spatial distribution of modelled annual total Cd deposition fluxes in the Baltic Sea region for 1990 (a) and 2022 (b).*

In 2022, Germany and Poland were the largest contributors to the annual total deposition of Hg and Cd to the Baltic Sea. In contrast, the highest contributions to B(a)P deposition came from Poland, Finland, and Russia (Fig. 5.6). Among non-HELCOM countries, Czechia completed the list of the top ten contributors.

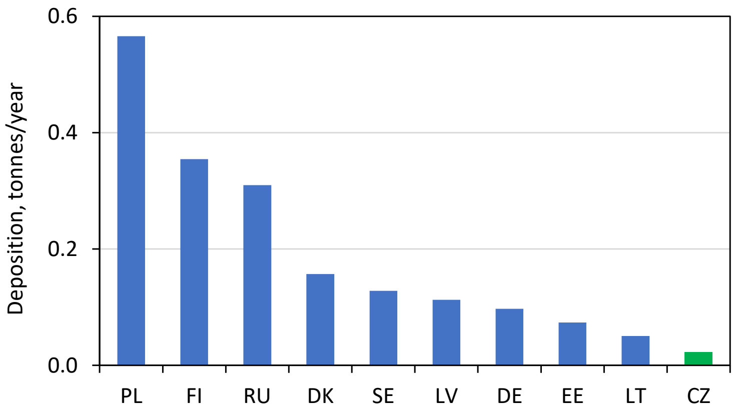


Fig 5.6. *Top ten countries with the highest contributions to the annual total deposition of B(a)P to the Baltic Sea, estimated for 2022. Green bars indicate non-HELCOM countries.*

6. Future directions

Future research and development activities at MSC-E, in accordance with the revised mandate (ECE/EB.AIR/144/Add.1) and the draft 2026-2027 workplan for the implementation of the Convention (ECE/EB.AIR/GE.1/2025/3–ECE/EB.AIR/WG.1/2025/3), 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 environmental media, with particular emphasis on the multi-media aspects of POP modelling.
- Distribution of the updated GLEMOS code, making it accessible to the wider scientific community and experts from the Parties through an open-source repository (https://github.com/glemos-model).
- Investigation of the potential influence of heterogeneous Hg processes and high dust pollution events on Hg chemistry and pollution levels [1.1.11].
- Revision and re-evaluation of modelling approaches for gas-particle partitioning and chemical degradation of POPs in the atmosphere [1.1.12].
- Conducting a country-scale assessment of PAH pollution as part of a pilot study for Slovenia and other Balkan countries, in cooperation with TFMM [1.1.10].
- Participation in TFMM cooperative activities, focusing on the impact of natural emissions and long-range transport on air quality [1.1.2], as well as monitoring of chemicals of emerging concern [1.1.4].
- Collaboration with TF HTAP on the assessment and attribution of Hg pollution trends as part of the MCHgMAP project [1.1.60], contributing to the multi-pollutant, multi-effects wildfire study [1.1.61], and participating in preparatory activities for a global multi-compartment modelling exercise on PFAS [1.1.63].
- Continued collaboration with ICP-Vegetation for joint analyses of temporal trends and spatial changes in heavy metal and POP deposition, using both model simulations and moss measurements [1.1.21].
- Cooperation with Marine Conventions (HELCOM and OSPAR) to assess heavy metal and POP pollution in the Baltic Sea and North Atlantic waters through multilateral or bilateral agreements.

References

Aas, W., Halvorsen, H. L., Nipen, M., Hartz, W. F., David-Martin, C. L., Mayer, L., etc. (2024) Towards a harmonized approach for atmospheric monitoring of chemicals of emerging concern (CECs). Workshop 8-10 NOV 2023, NILU, Kjeller, Norway.

Aas, W., Pfaffhuber, K. A., and Lunder Halvorsen, H. (2025) Heavy metals and POP measurements 2023, NILU, Kjeller, Norway.

AMAP/ UN Environment (2019) Technical Background Report for the Global Mercury Assessment 2018. Arctic Monitoring and Assessment Programme, Oslo, Norway/UN Environment Programme, Chemicals and Health Branch, Geneva, Switzerland. viii + 426 pp including E-Annexes.

Bidleman, T. F., Wong, F., Dryfhout-Clark, H., Hung, H., and Tysklind, M. (2025) Collecting Airborne Organochlorines on Polyurethane Foam: Comparison of Field Observations with a Breakthrough Model, ACS EST Air, 2, 548–556, doi: 10.1021/acsestair.4c00281.

Breivik, K., Sweetman, A., Pacyna, J., and Jones, K. (2002) Towards a global historical emission inventory for selected PCB congeners — a mass balance approach1. Global production and consumption, Sci. Total Environ., 290, 181–198, doi: 10.1016/S0048-9697(01)01075-0.

Breivik K., Alcock R., Li Y.-F., Bailey R.E., Fiedler H. and Pacyna J.M. (2004) Primary sources of selected POPs: regional and global scale emission inventories. Environmental Pollution, 128, 3–16. doi: 10.1016/j.envpol.2003.08.031.

Breivik K., Sweetman A., Pacyna J.M. and Jones K.C. (2007) Towards a global historical emission inventory for selected PCB congeners - A mass balance approach: 3. An update. Science of the Total Environment, 377, 296-307, doi: 10.1016/j.scitotenv.2007.02.026.

CEIP (2025) Schindlbacher S., B. Ullrich, R. Wankmüller, Oscar Redeyoff: Inventory Review 2025. Review of emission data reported under the LRTAP Convention and NEC Directive, Stage 1, 2 and 3 review, Status of gridded and LPS data. Technical Report CEIP 03/2025. In preparation.

CEIP (2021) Schindlbacher S., B. Matthews, B. Ullrich: Uncertainties and recalculations of emission inventories submitted under CLRTAP, Technical Report CEIP 1/2021 Available at https://www.ceip.at/fileadmin/inhalte/ceip/00_pdf_other/2021/uncertainties_and_recalculations_of_emission_inventories_submitted_under_clrtap.pdf.

Cuevas-Agulló E., Barriopedro D., García R.D., Alonso-Pérez S., González-Alemán J.J., Werner E., Suárez D., Bustos J.J., García-Castrillo G., García O., Barreto Á., and Basart S. (2024) Sharp increase in Saharan dust intrusions over the western Euro-Mediterranean in February–March 2020–2022 and associated atmospheric circulation, Atmos. Chem. Phys., 24, 4083-4104, doi: 10.5194/acp-24-4083-2024.

Dastoor A., Angot H., Biese, J., Brocza F., Edwards B., Feinberg A., Feng X., Geyman B., Gournia C., He Y., Hedgecock I. M., Ilyin I., Keatin, T., Kirk J., Lin C.-J., Lehnher, I., Mason R., McLagan D., Muntean M., Rafa, P., Roy E. M., Ryjkov A., Selin N. E., De Simone F., Soerensen A. L., Steenhuisen F., Travnikov O., Wang S., Wang X., Wilson S., Wu R., Wu Q., Zhang Y., Zhou J., Zhu W., and Zolkos S. (2024) The Multi-Compartment Hg Modeling and Analysis Project (MCHgMAP): Mercury modeling to support international environmental policy. Geoscientific Model Development, doi: 10.5194/gmd-2024-65.

Dunham-Cheatham S.M., Lyman S., Gustin M.S. (2023) Comparison and calibration of methods for ambient reactive mercury quantification. Science of The Total Environment, 856, 159219.

EMEP/EEA (2016) EMEP/EEA air pollutant emission inventory guidebook – 2016. EEA Technical report No 21/2016. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2016.

EMEP/EEA (2019) EMEP/EEA air pollutant emission inventory guidebook – 2019. EEA Technical report No 13/2019. Available at: https://www.eea.europa.eu/publications/emep-eea-guidebook-2019.

EMEP/EEA (2023) EMEP/EEA air pollutant emission inventory guidebook – 2023. Technical guidance to prepare national emission inventories.EEA Technical report No 06/2023. Available at https://www.eea.europa.eu/publications/emep-eea-guidebook-2019.

Frontasyeva, M., Vergel, K., Aničić Urošević, M., Tepanosyan, G., Steinnes, E., Chaligava, O., Aleksiayenak, Y., Harmens, H., Uzhinskiy, A., Zinicovscaia, I., Tabors, G., Gorelova, S., Krmar, M., Ene, A., Dulama, I., Radulescu, C. & Stihi, C. (2020). Mosses as biomonitors of air pollution: 2015/2016 survey on heavymetals, nitrogen and POPs in Europe and beyond. 10.13140/RG.2.2.30159.71848.

GEOS-Chem (2024) GEOS-Chem website. https://geoschem.github.io/ (accessed 27.08.2025).

Gomes L., Rajot J. L., Alfaro S. C., and Gaudichet A. (2003) Validation of a dust production model from measurements performed in semi-arid agricultural areas of Spain and Niger, Catena 52, 3-4, 257-271, doi: 10.1016/S0341-8162(03)00017-1.

Gustin M. S., Huang J., Miller M.B., Peterson C., Jaffe D.A., Ambrose J., Finley B.D., Lyman S.N., Call K., Talbot R., Feddersen D., Mao H., Lindberg S.E. (2013) Do we understand what the mercury speciation instruments are actually measuring? Results of RAMIX. Environ Sci Technol 47(13), 7295-306.

Halvorsen, H. L., Bohlin-Nizzetto, P., Eckhardt, S., Gusev, A., Moeckel, C., Shatalov, V., Skogeng, L. P., and Breivik, K. (2023) Spatial variability and temporal changes of POPs in European background air, Atmos. Environ., 299, 119658, doi: 10.1016/j.atmosenv.2023.119658.

Harmens, H., Foan, L., Simon, V., & Mills, G. (2013). Terrestrial mosses as biomonitors of atmospheric POPs pollution: A review. Environmental Pollution, 173, 245–254. doi:10.1016/j.envpol.2012.10.005

Harmens, H., Norris, D., Steinnes, E., Kubin, E., Piispanen, J., Alber, R., Aleksiayenak, Y., Blum, O., Coskun, M., Dam, M., De Temmerman, L., Fernandez Escribano, J. A., Frovola, M., Frontasyeva, M., Gonzales Miqueo, L., Grodzińska, K., Jeran, Z., Korzekwa, S., Krmar, M., … Zechmeister, H. G. (2008). Spatial and temporal trends in heavy metal accumulation in mosses in Europe (1990-2005). Available at https://bib.irb.hr/prikazi-rad?&rad=474506.

HELCOM (2025) Atmospheric Supply of Nitrogen, Cadmium, Mercury and B(a)P to the Baltic Sea in 2022. Available at https://helcom.fi/wp-content/uploads/2025/02/Atmospheric-Supply-of-Nitrogen_Cadmium_Mercury_and_BaP_to_the_Baltic_Sea_in_2022.pdf

Hoyeck M.P., Matteo G., MacFarlane E.M., Perera I., and Bruin J. E. (2022) Persistent organic pollutants and β-cell toxicity: a comprehensive review. Am J Physiol Endocrinol Metab 322: E383–E413, 2022. doi: 10.1152/ajpendo.00358.2021.

Hung, H., Blanchard, P., Halsall, C. J., Bidleman, T. F., Stern, G. A., Fellin, P., Muir, D. C. G., Barrie, L. A., Jantunen, L. M., Helm, P. A., Ma, J., and Konoplev, A. (2005) Temporal and spatial variabilities of atmospheric polychlorinated biphenyls (PCBs), organochlorine (OC) pesticides and polycyclic aromatic hydrocarbons (PAHs) in the Canadian Arctic: Results from a decade of monitoring, Sci. Total Environ., 342, 119–144, doi: 10.1016/j.scitotenv.2004.12.058.

Hung, H., Katsoyiannis, A. A., Brorstrom-Lunden, E., Olafsdottir, K., Aas, W., Breivik, K., Bohlin-Nizzetto, P., Sigurdsson, A., Hakola, H., Bossi, R., Skov, H., Sverko, E., Barresi, E., Fellin, P., and Wilson, S. (2016) Temporal trends of Persistent Organic Pollutants (POPs) in arctic air: 20 years of monitoring under the Arctic Monitoring and Assessment Programme (AMAP), Environ. Pollut., 217, 52–61, doi: 10.1016/j.envpol.2016.01.079.

Jaward, F. M., Farrar, N. J., Harner, T., Sweetman, A. J., and Jones, K. C. (2004) Passive Air Sampling of PCBs, PBDEs, and Organochlorine Pesticides Across Europe, Environ. Sci. Technol., 38, 34–41, doi: 10.1021/es034705n.

Ilyin I., Rozovskaya O., Sokovykh V., Travnikov O. (2007). Atmospheric modelling of heavy metal pollution in Europe: Further development and evaluation of the MSCE-HM model. EMEP/MSC-E Technical Report 4/2007. Meteorological Synthesizing Centre - East (MSC-E), doi: 10.5281/zenodo.16759808.

Ilyin I., Rozovskaya O., Travnikov O., Aas W., Pfaffhuber K.A. (2018) Assessment of heavy metal transboundary pollution on global, regional and national scales. EMEP Status Report 2/2018. Available at https://msc-east.org/wp-content/uploads/2024/08/2018_2.pdf.

Ilyin I., Batrakova N., Gusev A., Kleimenov M., Rozovskaya O., Shatalov V., Strizhkina I., Travnikov O., Breivik K., Nizzetto P.B., Pfaffuffer K.A., Aas W., Poupa S., Wankmueller R., Ullrich B., Bank M., Ho Q.T., Vivanco M.G., Theobald M.R., Garrido J.L., Gil V., Couvidat F., Collette A., Mircea M., Adani M., D'Elia I., Kouznetsov R.D., Kadantsev E.V. (2022) Assessment of heavy metal and POP pollution on global, regional and national scales. EMEP Status report 2/2022. Available at https://msc-east.org/wp-content/uploads/2024/08/2022_2.pdf.

Iturbide, M., Gutiérrez, J. M., Alves, L. M., Bedia, J., Cerezo-Mota, R., Cimadevilla, E., Cofiño, A. S., Di Luca, A., Faria, S. H., Gorodetskaya, I. V., Hauser, M., Herrera, S., Hennessy, K., Hewitt, H. T., Jones, R. G., Krakovska, S., Manzanas, R., Martínez-Castro, D., Narisma, G. T., Nurhati, I. S., Pinto, I., Seneviratne, S. I., van den Hurk, B., and Vera, C. S. (2020) An update of IPCC climate reference regions for subcontinental analysis of climate model data: definition and aggregated datasets, Earth Syst. Sci. Data, 12, 2959–2970, doi: essd-12-2959-2020.

JRC (2021) Monforti Ferrario, Fabio Crippa, Monica Guizzardi, Diego Muntean, Marilena Schaaf, Edwin Lo Vullo, Eleonora Solazzo, Efisio Olivier, Jos Vignati, Elisabetta (2021): EDGAR v6.0 Greenhouse Gas Emissions. European Commission, Joint Research Centre (JRC). Available at http://data.europa.eu/89h/97a67d67-c62e-4826-b873-9d972c4f670b.

JRC (2024) EDGAR v8.1. Available at https://edgar.jrc.ec.europa.eu/index.php/dataset_ap81.

Kok J. F., Parteli E. J R, Michaels T. I, and Karam D. B. (2012) The physics of wind-blown sand and dust, Rep. Prog. Phys. 75 106901, doi: 10.1088/0034-4885/75/10/106901

Kozak, K., Ruman, M., Kosek, K., Karasiński, G., Stachnik, L. & Polkowska, Ż. (2017). Impact of Volcanic Eruptions on the Occurrence of PAHs Compounds in the Aquatic Ecosystem of the Southern Part of West Spitsbergen (Hornsund Fjord, Svalbard). Water. 9. 1. doi:10.3390/w9010042.

Li Q., Rende W., Wang. H., Jiang H., Yuan Y., Fu. G, Zhou N., and Zheng. Z. (2024) Characteristics of dust emission over desert steppe , Geoderma, 448, 116958, doi: 10.1016/j.geoderma.2024.116958.

Liger E., Hernández F., Expósito F.J., Díaz J.P., Salazar-Carballo P.A., Gordo E., González C., and López-Pérez M. (2024) Transport and deposition of radionuclides from northern Africa to the southern Iberian Peninsula and the Canary Islands during the intense dust intrusions of March 2022, Chemosphere, 352, 141303, doi: 10.1016/j.chemosphere.2024.141303.

Liu, Y., Zhang, Y.-A., Zeng, M., and Zhao, J.: A novel distance measure based on dynamic time warping to improve time series classification, Information Sciences, 656, 119921, https://doi.org/10.1016/j.ins.2023.119921, 2024.

Lyman S.N., Jaffe D.A., Gustin M.S. (2010) Release of mercury halides from KCl denuders in the presence of ozone. Atmos. Chem. Phys. 10, 8197–8204.

Ma, J., Hung, H., Tian, C., and Kallenborn, R. (2011) Revolatilization of persistent organic pollutants in the Arctic induced by climate change, Nat. Clim. Change, 1, 255–260, doi: 10.1038/nclimate1167.

Marticorena B. and Bergametti G. (1995) Modeling the atmospheric dust cycle: 1. Design of a soil-derived dust emission scheme**,** J. Geophys. Res. Atmos. 100, D8, 16415-16430, doi: 10.1029/95JD00690.

Marusczak N., Sonke J. E., Fu X., Jiskra M. (2017) Tropospheric GOM at the Pic du Midi Observatory-Correcting Bias in Denuder Based Observations. Environmental Science & Technology, 51, (2), 863-869.

Melymuk, L., Bohlin, P., Sáňka, O., Pozo, K., and Klánová, J. (2014) Current Challenges in Air Sampling of Semivolatile Organic Contaminants: Sampling Artifacts and Their Influence on Data Comparability, Environ. Sci. Technol., 48, 14077−14091, doi: 10.1021/es502164r.

McClure C.D., Jaffe D.A., Edgerton E.S. (2014) Evaluation of the KCl denuder method for gaseous oxidized mercury using HgBr2 at an in-service AMNet site. Environ. Sci. Technol. 48, 11437−11444.

Mishra A., Kumari M., Swati, Kumar R., Iqbal K., Shekhar T.I. (2022) Persistent organic pollutants in the environment: Risk assessment, hazards, and mitigation strategies. Bioresource Technology Reports, Volume 19, 2022, 101143. doi: 10.1016/j.biteb.2022.101143.

Platt, S. M., Svendby, T., Hermansen, O., Lunder, C., Fiebig, M., Fj, A. M., Myhre, C. L., and Stebel, K. (2023) Monitoring of greenhouse gases and aerosols at Svalbard and Birkenes in 2022, NILU, Kjeller.

Ravindra, K., Sokhi, R., & Van Grieken, R. (2008). Atmospheric polycyclic aromatic hydrocarbons: Source attribution, emission factors and regulation. Atmospheric Environment, 42(13), 2895-2921.

Rodríguez S. and López-Darias J. (2024) Emerging extreme Saharan-dust events expand northward over the Atlantic and Europe prompting record-breaking PM 10 and PM 2.5 episodes, doi: 10.5194/egusphere-2023-3083.

Shao Y. (2004) Simplification of a dust emission scheme and comparison with data, J. Geophys. Res. Atmos. 109, D10202, doi: 10.1029/2003JD004372.

Shao Y., Ishizuka M., Mikami M., and Leys J. F. (2011) Parameterization of size-resolved dust emission and validation with measurement, J. Geophys. Res. Atmos. 116, D08203, doi: 10.1029/2010JD014527.

Shatalov V., Gusev A., Dutchak S., Rozovskaya O., Sokovykh V., Vulykh N., Aas W., Breivik K. (2010) Persistent Organic Pollutants in the Environment. EMEP Status Report 3/2010. Meteorological Synthesizing Centre - East (MSC-E). Available at https://msc-east.org/wp-content/uploads/2024/08/2010_3.pdf.

Shen H., Huang Y., Wang R., Zhu D., Li W., Shen G., Wang B., Zhang Y., Chen Y., Lu Y., Chen H., Li T., Sun K., Li B., Liu W., Liu J., Tao S. (2013) Global atmospheric emissions of polycyclic aromatic hydrocarbons from 1960 to 2008 and future predictions, Environ. Sci. Technol. 47, 6415–6424.

Song, S., Chen, K., Huang, T., Ma, J., Wang, J., Mao, X., Gao, H., Zhao, Y., and Zhou, Z. (2023) New emission inventory reveals termination of global dioxin declining trend, Journal of Hazardous Materials, 443, 130357, doi: 10.1016/j.jhazmat.2022.130357.

Sulla-Menashe D. and Friedl M. (2023) MCD12Q1 v006. MODIS/Terra+Aqua Land Cover Type Yearly L3 Global 500 m SIN Grid (dataset), NASA EOSDIS Land Processes DAAC, doi: 10.5067/MODIS/MCD12Q1.006 (accessed 15.08.2024).

Tista M., Mareckova K. and R.Wankmueller (2017) Methodologies applied to the CEIP GNFR gap-filling 2017. Part I: Heavy Metals (Pb, Cd, Hg). Technical report CEIP 01/2017.

Tobiszewski, M., & Namieśnik, J. (2012). PAH diagnostic ratios for the identification of pollution emission sources. Environmental Pollution, 162, 110-119.

Travnikov, O., Gačnik, J., Ali, S. W., Kosjek, T., Ogrinc, N., Horvat, M., Poupa, S., Bernhard, U., Wankmüller, R., Schindlbacher, S., Redeyoff, O., Aas, W., Lunder Halvorsen, H., & Pfaffhuber, K. A. (2024) Assessment of transboundary pollution with heavy metals and POPs. EMEP Status Report 2/2024. Meteorological Synthesizing Centre - East (MSC-E). doi: 10.5281/zenodo.14831196.

UNECE (1979) The 1979 Geneva Convention on Long-range Transboundary Air Pollution. United Nations Economic Commission for Europe. Available at http://www.unece.org/env/lrtap/welcome.html.

UNECE (2019) Monitoring strategy for the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe for the period 2020–2029.

UNECE (2022a) Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution. United Nations Economic Commission for Europe (ECE/EB.AIR/GE.1/2022/20–ECE/EB.AIR/WG.1/2022/13). Available at https://unece.org/sites/default/files/2022-08/ECE_EB.AIR_GE.1_2022_20-2210473E.pdf.

UNECE (2022b) Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution 2023 as adopted by Decision 2022/1 (ECE/EB.AIR/150/Add.1). Available at https://unece.org/sites/default/files/2023-09/ECE_EB.AIR_150_Add.1_2305250E.pdf.

Wania, F. and MacKay, D.(1996) Peer Reviewed: Tracking the Distribution of Persistent Organic Pollutants, Environ. Sci. Technol., 30, 390A-396A. doi: 10.1021/es962399q.

WHO (2000) Air Quality Guidelines for Europe - Second Edition. Chapter 5.11 Polychlorinated dibenzodioxins and dibenzofurans. WHO Regional Publications, European Series, No. 91. Available at https://iris.who.int/bitstream/handle/10665/107335/9789289013581-eng.pdf

WHO (2003) Concise International Chemical Assessment Document 55. Polychlorinated biphenyls: human health aspects. ISBN 92 4 153055 3; ISSN 1020-6167. Available at https://iris.who.int/bitstream/handle/10665/42640/9241530553.pdf.

Wong, F., Hung, H., Dryfhout-Clark, H., Aas, W., Bohlin-Nizzetto, P., Breivik, K., Mastromonaco, M. N., Lunden, E. B., Olafsdottir, K., Sigurdsson, A., Vorkamp, K., Bossi, R., Skov, H., Hakola, H., Barresi, E., Sverko, E., Fellin, P., Li, H., Vlasenko, A., Zapevalov, M., Samsonov, D., and Wilson, S. (2021) Time trends of persistent organic pollutants (POPs) and Chemicals of Emerging Arctic Concern (CEAC) in Arctic air from 25 years of monitoring, Sci. TOTAL Environ., 775, doi: 10.1016/j.scitotenv.2021.145109.

WRF (2024) WRF Source Codes and Graphics Software Download Page. https://www2.mmm.ucar.edu/wrf/users/download/get_sources.html#WRF-ARW (accessed 27.08.2025).

Wu, Q., Wang, X., & Zhou, Q. (2014). Biomonitoring persistent organic pollutants in the atmosphere with mosses: Performance and application. Environment International, 66, 28–37. doi: 10.1016/j.envint.2013.12.021

Yunker, M.B., Macdonald, R.W., Vingarzan, R., Mitchell, H., Goyette, D., & Sylvestre, S. (2002). PAHs in the Fraser River basin: a critical appraisal of PAH ratios as indicators of PAH source and composition. Organic Geochemistry, 33(4), 489-515.

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***	***2025***
Armenia	2008 - 2013 (only Pb, only a few sectors)	2014		2016	2017		2019	2020	2021	2022	2016-2023
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 (Hg: 1990-2017)					1990-2022	
Belarus	2013			2014-2016	2017	2018	2019	2020	2020, 2021	2022	2010-2023
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	1990-2023
Kazakhstan		2013-2014	1990, 2000, 2005, 2010 - 2015	1990 - 2016		1990 - 2018	1990-2019	1990-2020	1990-2021	1990-2022	1990-2023
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				1990-2023
Russian Federation											
Ukraine	2013	2014	2015	2016		2016, 2017, 2018	2019	2020	1990-2021	1990-2022	1990-2023
Türkiye					1990 - 2017 *(just for very few IPPU categories)*	1990 - 2018 *(just for very few IPPU categories)*	1990-2019	1990-2020	1990-2021	1990-2022	1990-2023

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***	***2025***
Armenia		2014		2016 (only PCDD/Fs)	2017 (no HCB, no PCBs)		2019	2020	2021	2022	2016-2023
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	2010-2023
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	1990-2023
Kazakhstan		2013-2014	1990, 2000, 2005, 2010-2015	1990-2016		1990 -2018	1990-2019	1990-2020	1990-2021	1990-2022	1990-2023
Kyrgyzstan					2017	2018				1990-2022	
Republic of Moldova	2013	1990-2014 (no emissions calculated for the waste sector)	1990-2015			1990-2017	1990-2019				1990-2023
Russian Federation											
Ukraine	2013 (no PCDD/Fs)				2017	2017, 2018	2019	2020	1990-2021	1990-2022	1990-2023
Türkiye											

Annex A.2. Significant changes (over ±15 %) between national totals used in models in year 2025 and national totals used in models in 2024

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

- "reported": both 2022 and 2023 data are reported by country.
- "gapfilled": both 2022 and 2023 data are gap-filled by expert estimates
- "new gapfilled": 2022 data was reported by country and 2023 data had to be gap-filled by expert estimates (because it was not reported by country)
- "new reported": 2022 data was gap-filled, 2023 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	2023 value	2022 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	2023 value	2022 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
IP	AL	New reported	t	0.197	0.574	-66%	-0.377
IP	AZ	New reported	t	0.106	0.080	32%	0.025
IP	DE	gapfilled	t	20.267	17.437	16%	2.830
IP	ES	gapfilled	t	17.169	5.362	220%	11.806
IP	KG	New reported	t	3.203	1.944	65%	1.258
IP	LU	gapfilled	t	0.090	0.077	17%	0.013
IP	PT	gapfilled	t	2.226	3.289	-32%	-1.063
IP	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 2025

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

	Cd	Hg	Pb
Albania	R	R	R
Armenia	R	R	R
Aral Lake	-	-	-
Asian Areas	exp.	exp.	exp.
Austria	R	R	R
Atlantic Ocean	-	-	-
Azerbaijan	exp.	exp.	exp.
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	exp.	exp.	exp.
Kazakhstan	R	R	R

	Cd	Hg	Pb
Liechtenstein	R	R	R
Lithuania	R	R	R
Luxembourg	R	R	R
Latvia	R	R	R
Monaco	R	R	R
Republic of Moldova	R	R	R
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 2023*

	B(a)P	B(b)F	B(k)F	PCDD/F	HCB	IP	PAH	PCB
Albania	R	R	R	R	R	R	sum	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	exp.	exp.	exp.	exp.	exp.	exp.	exp.	-
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	R	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	R	R	R	R	R	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	R	R	R	R	R	R	R	R
Lithuania	R	R	R	R	R	R	sum	R
Luxembourg	R	R	R	R	R	R	R	R
Latvia	R	R	R	R	R	R	sum	R
Monaco	R	R	R	R	R	R	R	R
Republic of Moldova	R	R	R	R	R	R	sum	R
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 2023

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 2023, kg/year. 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	2.37E+02	6.48E-02	8.24E+00	3.79E-02	8.16E+01	1.27E+00	3.76E+01	1.19E+00	4.35E+00	2.28E-01	7.05E+00	2.19E+01	7.23E-01	9.27E-02	1.99E+02	2.41E-01	4.24E+01	3.67E+00	4.23E-01	1.54E+02	1.47E+01	1.39E+01	1.54E-01	3.03E-03	1.18E+03	3.29E-02
AM	1.53E-01	2.49E+02	8.31E-01	1.69E+01	3.05E+00	1.56E-01	3.09E+00	5.95E-01	5.06E-01	3.18E+00	6.95E-01	2.96E+00	1.86E-01	5.60E-02	7.50E+00	1.24E-01	2.37E+00	8.33E-01	2.59E+02	4.06E+00	6.23E-01	7.00E-01	2.07E-02	1.66E-03	2.13E+01	7.29E-02
AT	9.13E-01	4.90E-02	3.62E+03	3.56E-02	1.49E+02	3.60E+01	1.46E+01	7.48E+00	4.20E+02	1.66E-01	6.43E+02	2.90E+03	1.70E+01	1.25E+00	4.43E+02	4.32E+00	5.68E+02	1.00E+02	2.21E-01	4.06E+00	2.05E+02	2.18E+02	3.10E+00	4.80E-02	3.13E+03	1.06E-01
AZ	1.93E-01	7.55E+01	1.35E+00	9.16E+01	5.15E+00	3.29E-01	5.02E+00	1.60E+00	7.20E-01	2.63E+00	1.37E+00	5.95E+00	5.50E-01	1.68E-01	1.09E+01	4.18E-01	3.71E+00	2.21E+00	1.88E+02	4.43E+00	9.85E-01	1.18E+00	3.70E-02	3.96E-03	2.92E+01	9.75E-01
BA	1.22E+01	1.05E-01	1.43E+02	7.48E-02	1.13E+04	5.43E+00	4.91E+01	5.95E+00	2.03E+01	2.51E-01	1.54E+02	1.88E+02	5.66E+00	8.37E-01	4.12E+02	2.92E+00	1.58E+02	1.95E+01	5.38E-01	2.50E+01	5.44E+02	3.23E+02	7.11E-01	1.36E-02	3.03E+03	1.75E-01
BE	1.33E-02	6.69E-03	7.23E+00	4.41E-03	1.15E+00	2.75E+03	4.32E-01	1.55E+00	2.33E+01	2.44E-03	1.32E+01	1.15E+03	2.04E+01	6.84E-01	2.32E+02	2.00E+00	2.29E+03	1.06E+03	1.91E-02	8.17E-02	8.29E-01	2.24E+00	2.00E+01	1.96E-01	4.35E+01	1.78E-02
BG	2.02E+01	1.44E+00	7.03E+01	5.78E-01	4.01E+02	4.86E+00	4.23E+03	2.09E+01	1.84E+01	3.13E+00	6.86E+01	1.50E+02	6.57E+00	1.68E+00	2.83E+02	4.54E+00	9.59E+01	2.03E+01	8.29E+00	2.74E+02	6.06E+01	1.66E+02	6.79E-01	2.35E-02	1.14E+03	1.17E+00
BY	3.67E+00	1.13E+00	2.48E+02	8.18E-01	3.42E+02	7.77E+01	1.21E+02	2.72E+03	8.68E+01	2.88E-01	5.09E+02	1.75E+03	1.67E+02	5.52E+01	2.71E+02	7.39E+01	3.86E+02	4.21E+02	5.04E+00	3.89E+01	1.03E+02	2.88E+02	1.35E+01	3.60E-01	9.29E+02	2.00E+00
CH	1.07E-01	6.15E-03	6.77E+01	3.41E-03	6.48E+00	2.32E+01	8.71E-01	8.72E-01	1.44E+03	1.40E-02	2.49E+01	8.25E+02	3.72E+00	1.10E-01	3.94E+02	3.92E-01	1.02E+03	6.58E+01	2.36E-02	5.96E-01	8.11E+00	4.19E+00	2.07E+00	3.27E-02	2.05E+03	1.03E-02
CY	2.61E-01	3.73E-02	5.18E-01	8.24E-03	2.81E+00	1.04E-01	3.72E+00	1.72E-01	4.94E-01	7.40E+01	3.51E-01	1.58E+00	7.34E-02	6.20E-03	5.82E+00	1.60E-02	2.62E+00	4.58E-01	8.58E-02	1.15E+01	6.56E-01	4.72E-01	1.53E-02	2.75E-04	4.46E+01	5.68E-03
CZ	8.99E-01	5.19E-02	7.95E+02	4.46E-02	2.06E+02	9.09E+01	1.17E+01	1.49E+01	1.96E+02	1.04E-01	5.51E+03	4.86E+03	3.65E+01	3.69E+00	2.89E+02	1.15E+01	6.68E+02	2.46E+02	2.07E-01	3.62E+00	1.23E+02	2.63E+02	7.60E+00	1.09E-01	7.55E+02	1.32E-01
DE	4.88E-01	1.32E-01	8.00E+02	1.22E-01	6.13E+01	2.82E+03	1.08E+01	5.85E+01	1.43E+03	6.98E-02	1.56E+03	6.48E+04	5.73E+02	1.63E+01	1.64E+03	3.98E+01	8.36E+03	5.73E+03	4.27E-01	2.89E+00	4.15E+01	1.17E+02	1.42E+02	1.40E+00	1.37E+03	3.84E-01
DK	1.49E-02	1.53E-02	2.36E+01	1.24E-02	6.31E+00	1.67E+02	3.13E-01	7.61E+00	2.42E+01	3.51E-03	5.61E+01	1.85E+03	1.71E+03	4.86E+00	1.24E+02	1.26E+01	3.70E+02	1.10E+03	4.13E-02	1.08E-01	3.49E+00	9.12E+00	2.84E+01	4.11E-01	3.53E+01	2.81E-02
EE	1.48E-01	7.03E-02	2.75E+01	3.75E-02	2.63E+01	3.08E+01	4.25E+00	6.78E+01	1.13E+01	2.37E-02	6.82E+01	4.36E+02	8.17E+01	8.77E+02	5.79E+01	2.81E+02	9.82E+01	1.97E+02	3.45E-01	1.27E+00	9.02E+00	2.28E+01	6.46E+00	1.96E-01	7.81E+01	9.01E-02
ES	9.04E-01	5.27E-02	3.69E+01	1.98E-02	5.79E+01	1.63E+02	4.69E+00	2.34E+00	3.03E+01	7.23E-02	4.87E+01	7.24E+02	3.71E+01	3.98E-01	3.55E+04	7.92E-01	1.64E+03	6.46E+02	3.02E-01	4.53E+00	3.36E+01	1.99E+01	2.57E+01	4.33E-01	1.50E+03	6.22E-02
FI	3.93E-01	6.58E-01	6.30E+01	3.12E-01	7.06E+01	8.16E+01	1.46E+01	1.32E+02	2.61E+01	1.06E-01	1.58E+02	9.90E+02	2.39E+02	4.44E+02	1.60E+02	4.71E+03	2.34E+02	5.14E+02	1.94E+00	3.91E+00	2.40E+01	6.12E+01	1.34E+01	1.40E+00	2.09E+02	1.22E+00
FR	8.43E-01	8.39E-02	1.96E+02	4.83E-02	6.45E+01	1.27E+03	7.57E+00	1.39E+01	8.07E+02	9.79E-02	3.06E+02	5.95E+03	1.35E+02	3.11E+00	9.72E+03	9.32E+00	3.24E+04	3.69E+03	3.25E-01	4.48E+00	4.58E+01	3.93E+01	1.35E+02	1.17E+00	3.35E+03	2.03E-01
GB	1.85E-02	4.99E-02	1.56E+01	3.03E-02	3.07E+00	4.38E+02	3.53E-01	6.75E+00	2.68E+01	9.52E-03	2.92E+01	1.23E+03	1.36E+02	3.99E+00	7.65E+02	1.22E+01	1.74E+03	3.53E+04	1.42E-01	1.96E-01	1.89E+00	3.34E+00	8.50E+02	5.03E+00	6.18E+01	5.34E-02
GE	1.71E+00	6.88E+01	8.47E+00	7.88E+00	4.22E+01	8.66E-01	3.40E+01	2.82E+00	4.52E+00	4.00E+00	4.69E+00	2.03E+01	1.19E+00	3.01E-01	2.47E+01	8.97E-01	1.85E+01	5.21E+00	6.98E+02	2.19E+01	7.49E+00	6.54E+00	1.90E-01	1.05E-02	1.89E+02	2.53E-01
GR	3.79E+01	8.72E-01	2.35E+01	5.47E-01	1.70E+02	3.84E+00	4.41E+02	6.35E+00	1.22E+01	3.09E+00	2.06E+01	6.65E+01	2.72E+00	5.32E-01	3.81E+02	1.43E+00	1.06E+02	1.34E+01	5.55E+00	2.36E+03	3.16E+01	4.20E+01	5.12E-01	1.11E-02	2.07E+03	8.51E-01
HR	6.89E+00	6.40E-02	2.79E+02	4.65E-02	2.07E+03	7.90E+00	3.46E+01	4.89E+00	2.75E+01	1.76E-01	1.83E+02	2.54E+02	6.58E+00	6.37E-01	6.30E+02	2.19E+00	2.53E+02	2.06E+01	3.15E-01	1.41E+01	1.79E+03	4.18E+02	7.03E-01	1.54E-02	4.08E+03	1.37E-01
HU	1.34E+01	8.98E-02	7.05E+02	6.89E-02	1.60E+03	1.27E+01	1.64E+02	1.38E+01	6.35E+01	1.50E-01	4.33E+02	5.97E+02	1.48E+01	1.20E+00	4.61E+02	3.38E+00	2.55E+02	3.97E+01	4.28E-01	4.55E+01	5.19E+02	3.35E+03	1.30E+00	2.86E-02	2.70E+03	1.44E-01
IE	5.55E-03	1.05E-02	3.18E+00	1.00E-02	5.77E-01	6.81E+01	6.53E-02	1.97E+00	8.91E+00	2.52E-03	6.91E+00	2.93E+02	1.23E+01	5.85E-01	1.47E+02	1.76E+00	2.21E+02	1.77E+03	3.45E-02	5.99E-02	4.00E-01	3.48E-01	1.73E+03	1.85E+00	2.84E+01	7.25E-03
IS	6.73E-03	7.52E-03	1.23E+00	3.75E-03	1.01E+00	8.23E+00	1.16E-01	9.85E-01	1.03E+00	1.95E-03	2.99E+00	6.55E+01	1.18E+01	8.58E-01	4.45E+01	3.96E+00	2.89E+01	2.07E+02	2.28E-02	5.83E-02	5.83E-01	6.56E-01	1.84E+01	1.42E+02	1.13E+01	2.49E-02
IT	2.58E+01	2.77E-01	4.67E+02	1.97E-01	1.29E+03	3.26E+01	6.03E+01	8.01E+00	3.66E+02	4.36E-01	2.04E+02	8.44E+02	1.37E+01	1.26E+00	2.85E+03	4.68E+00	2.07E+03	1.00E+02	1.41E+00	7.44E+01	6.10E+02	1.94E+02	4.51E+00	6.68E-02	4.98E+04	3.29E-01
KY	2.53E-01	6.61E+00	1.67E+00	3.34E+00	5.64E+00	3.42E-01	3.53E+00	8.85E-01	1.36E+00	1.66E+00	1.39E+00	6.64E+00	3.13E-01	1.37E-01	1.89E+01	4.13E-01	5.96E+00	1.65E+00	1.27E+01	3.80E+00	1.28E+00	1.20E+00	5.95E-02	8.13E-03	4.12E+01	8.29E+02
KZ	6.98E+00	1.12E+02	7.81E+01	7.14E+01	2.12E+02	1.53E+01	2.09E+02	7.96E+01	3.81E+01	1.27E+01	8.88E+01	3.28E+02	3.14E+01	1.11E+01	2.56E+02	3.26E+01	1.51E+02	1.08E+02	2.74E+02	9.89E+01	4.69E+01	8.48E+01	4.33E+00	5.01E-01	9.58E+02	1.12E+03
LI	3.36E-04	3.26E-05	1.01E+00	1.89E-05	2.47E-02	1.30E-01	3.67E-03	4.20E-03	9.56E+00	4.97E-05	1.10E-01	6.09E+00	1.93E-02	7.80E-04	1.59E+00	3.03E-03	3.43E+00	3.46E-01	1.24E-04	2.10E-03	3.16E-02	1.98E-02	9.25E-03	1.74E-04	7.55E+00	5.72E-05
LT	5.97E-01	1.60E-01	7.99E+01	1.17E-01	6.55E+01	6.59E+01	1.78E+01	4.34E+02	3.19E+01	4.62E-02	1.96E+02	1.05E+03	1.58E+02	3.01E+01	1.13E+02	4.30E+01	2.18E+02	3.84E+02	5.99E-01	3.43E+00	2.50E+01	6.56E+01	1.06E+01	1.97E-01	1.84E+02	1.85E-01
LU	1.38E-03	4.80E-04	9.04E-01	3.28E-04	1.22E-01	5.46E+01	3.50E-02	1.54E-01	4.15E+00	2.46E-04	2.02E+00	1.46E+02	1.42E+00	5.18E-02	2.46E+01	1.49E-01	2.06E+02	3.35E+01	1.41E-03	8.60E-03	8.44E-02	2.65E-01	9.19E-01	8.61E-03	6.80E+00	1.31E-03
LV	3.56E-01	1.33E-01	5.42E+01	7.22E-02	4.49E+01	5.70E+01	1.06E+01	1.95E+02	2.28E+01	5.59E-02	1.42E+02	8.49E+02	1.54E+02	1.29E+02	1.09E+02	1.10E+02	1.85E+02	3.44E+02	5.72E-01	2.41E+00	1.65E+01	4.42E+01	1.03E+01	2.49E-01	1.29E+02	1.49E-01
MC	1.30E-04	3.22E-06	9.63E-03	1.32E-06	8.21E-03	1.33E-03	8.34E-04	2.25E-04	1.31E-02	9.83E-06	5.85E-03	3.32E-02	3.80E-04	5.55E-05	1.24E-01	2.17E-04	5.67E-01	3.29E-03	2.09E-05	5.71E-04	6.75E-03	2.85E-03	2.02E-04	1.68E-06	7.19E-01	3.81E-06
MD	1.76E+00	6.52E-01	1.65E+01	3.45E-01	5.99E+01	1.68E+00	9.87E+01	1.53E+01	4.65E+00	2.21E-01	1.53E+01	4.40E+01	2.72E+00	9.95E-01	5.19E+01	2.35E+00	2.33E+01	8.70E+00	2.61E+00	1.94E+01	1.20E+01	2.54E+01	2.55E-01	1.05E-02	1.94E+02	5.13E-01
ME	1.56E+01	2.79E-02	1.12E+01	2.07E-02	3.45E+02	1.09E+00	1.42E+01	9.17E-01	4.33E+00	7.96E-02	1.15E+01	2.46E+01	8.57E-01	7.11E-02	1.24E+02	2.63E-01	3.57E+01	2.73E+00	1.54E-01	1.67E+01	2.81E+01	2.27E+01	1.18E-01	3.15E-03	9.69E+02	1.65E-02
MK	5.17E+01	8.92E-02	1.16E+01	5.85E-02	7.47E+01	8.40E-01	1.15E+02	1.63E+00	3.78E+00	2.76E-01	9.96E+00	2.32E+01	7.22E-01	1.23E-01	8.34E+01	3.53E-01	2.39E+01	2.66E+00	6.03E-01	2.86E+02	1.23E+01	2.58E+01	1.05E-01	2.75E-03	4.51E+02	6.67E-02
MT	2.20E-02	1.97E-04	3.97E-02	1.27E-04	3.31E-01	1.20E-02	4.64E-02	4.81E-03	2.64E-02	9.67E-05	4.14E-02	1.32E-01	2.30E-03	4.49E-04	8.83E-01	1.18E-03	3.50E-01	4.20E-02	7.84E-04	1.05E-01	5.75E-02	3.68E-02	2.32E-03	1.41E-05	8.55E+00	5.06E-04
NL	1.11E-02	1.26E-02	1.13E+01	9.86E-03	1.73E+00	1.46E+03	2.00E-01	2.23E+00	2.04E+01	3.20E-03	2.07E+01	2.04E+03	2.90E+01	6.54E-01	2.06E+02	1.88E+00	1.24E+03	2.06E+03	4.04E-02	8.15E-02	1.20E+00	3.14E+00	3.82E+01	3.88E-01	3.46E+01	1.96E-02
NO	1.34E-01	3.06E-01	5.12E+01	1.54E-01	2.30E+01	2.48E+02	3.22E+00	3.67E+01	3.91E+01	6.12E-02	1.53E+02	2.04E+03	5.59E+02	2.97E+01	2.50E+02	1.53E+02	6.47E+02	2.17E+03	8.84E-01	1.43E+00	9.91E+00	3.00E+01	6.64E+01	5.80E+00	1.18E+02	8.76E-01
PL	5.58E+00	3.76E-01	9.58E+02	3.51E-01	8.38E+02	4.03E+02	1.00E+02	5.06E+02	3.08E+02	4.52E-01	4.00E+03	1.13E+04	4.79E+02	4.04E+01	7.38E+02	9.04E+01	1.55E+03	1.70E+03	1.57E+00	2.47E+01	3.16E+02	8.52E+02	5.27E+01	6.62E-01	1.92E+03	1.05E+00
PT	4.35E-02	7.75E-03	1.91E+00	2.79E-03	2.30E+00	2.28E+01	2.26E-01	2.04E-01	2.41E+00	5.53E-03	3.67E+00	9.17E+01	3.99E+00	3.48E-02	1.22E+03	4.54E-02	1.17E+02	1.17E+02	2.73E-02	2.33E-01	1.14E+00	6.77E-01	3.56E+00	7.13E-02	5.46E+01	8.80E-03
RO	2.35E+01	2.89E+00	3.88E+02	9.97E-01	1.42E+03	1.78E+01	9.77E+02	6.47E+01	8.27E+01	2.06E+00	2.56E+02	6.66E+02	2.20E+01	5.37E+00	5.85E+02	1.33E+01	3.13E+02	7.97E+01	1.24E+01	1.67E+02	2.88E+02	9.94E+02	2.77E+00	7.08E-02	3.02E+03	2.41E+00
RS	3.78E+01	3.51E-01	1.58E+02	2.11E-01	1.73E+03	7.67E+00	4.50E+02	1.19E+01	2.72E+01	4.27E-01	1.58E+02	2.59E+02	8.37E+00	1.38E+00	3.09E+02	4.31E+00	1.35E+02	2.86E+01	2.06E+00	1.61E+02	2.03E+02	5.81E+02	1.01E+00	1.79E-02	2.00E+03	5.12E-01
RU	3.37E+01	2.09E+02	7.46E+02	1.33E+02	1.49E+03	3.24E+02	1.17E+03	2.17E+03	3.06E+02	3.16E+01	1.17E+03	5.16E+03	7.62E+02	9.47E+02	1.98E+03	2.43E+03	1.61E+03	2.02E+03	6.95E+02	4.86E+02	3.67E+02	8.15E+02	6.65E+01	9.53E+00	5.62E+03	4.71E+02
SE	4.48E-01	5.77E-01	1.13E+02	3.00E-01	9.32E+01	3.28E+02	1.13E+01	1.35E+02	7.22E+01	9.12E-02	3.24E+02	4.05E+03	1.96E+03	1.81E+02	3.92E+02	1.00E+03	8.35E+02	2.36E+03	2.04E+00	3.91E+00	3.31E+01	7.91E+01	6.33E+01	2.59E+00	2.44E+02	8.59E-01
SI	7.69E-01	1.67E-02	3.88E+02	1.41E-02	1.15E+02	3.82E+00	7.70E+00	2.01E+00	1.88E+01	4.83E-02	6.57E+01	1.51E+02	3.01E+00	2.46E-01	2.33E+02	8.38E-01	1.20E+02	8.76E+00	7.47E-02	2.17E+00	4.53E+02	9.47E+01	2.27E-01	7.28E-03	1.85E+03	4.10E-02
SK	3.55E+00	5.39E-02	5.09E+02	4.60E-02	6.28E+02	1.55E+01	4.93E+01	1.23E+01	6.59E+01	8.71E-02	7.82E+02	7.26E+02	1.59E+01	1.33E+00	2.13E+02	4.16E+00	2.05E+02	5.31E+01	2.33E-01	1.11E+01	1.97E+02	8.79E+02	1.73E+00	3.61E-02	1.13E+03	7.92E-02
TJ	1.32E-01	3.28E+00	8.41E-01	1.92E+00	2.67E+00	1.91E-01	1.86E+00	5.03E-01	7.19E-01	7.59E-01	7.65E-01	3.65E+00	1.62E-01	6.66E-02	9.88E+00	1.97E-01	3.15E+00	8.56E-01	6.15E+00	1.84E+00	5.94E-01	5.93E-01	3.07E-02	3.55E-03	1.98E+01	2.30E+01
TM	2.40E-01	1.03E+01	1.65E+00	8.94E+00	5.49E+00	3.07E-01	5.25E+00	1.37E+00	1.08E+00	1.37E+00	1.42E+00	6.23E+00	4.55E-01	3.24E-01	1.20E+01	7.68E-01	4.66E+00	1.93E+00	2.35E+01	3.48E+00	1.15E+00	1.48E+00	6.20E-02	6.01E-03	3.02E+01	1.05E+01
TR	2.06E+01	1.69E+02	6.52E+01	1.31E+01	2.65E+02	1.02E+01	7.86E+02	4.76E+01	3.18E+01	1.87E+02	5.47E+01	2.02E+02	1.85E+01	3.72E+00	6.74E+02	8.82E+00	1.92E+02	5.02E+01	1.59E+02	8.26E+02	5.42E+01	8.03E+01	1.78E+00	6.23E-02	2.69E+03	3.05E+00
UA	2.00E+01	1.41E+01	5.43E+02	9.64E+00	1.25E+03	6.15E+01	8.25E+02	5.63E+02	1.35E+02	6.08E+00	7.19E+02	1.81E+03	1.13E+02	2.73E+01	7.49E+02	5.34E+01	5.43E+02	3.09E+02	6.08E+01	2.46E+02	3.01E+02	9.71E+02	1.03E+01	3.20E-01	3.51E+03	8.95E+00
UZ	3.98E-01	1.36E+01	3.31E+00	9.47E+00	8.24E+00	1.19E+00	9.37E+00	3.47E+00	1.71E+00	1.85E+00	4.38E+00	1.99E+01	1.33E+00	4.46E-01	2.18E+01	1.15E+00	8.47E+00	8.29E+00	2.97E+01	5.28E+00	1.85E+00	3.19E+00	2.98E-01	1.20E-02	4.90E+01	7.19E+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	1.46E+00	2.27E-02	3.16E-01	2.35E-01	2.14E-01	9.84E-03	7.21E-01	8.65E+00	2.66E+02	4.09E+00	2.56E-01	9.70E-02	5.30E+01	2.09E+01	3.39E+01	2.96E+02	2.82E+01	1.73E-01	4.02E+00	6.77E+00	1.80E-01	1.02E+00	3.17E+01	3.47E+01	1.36E+00
AM	7.41E+00	2.76E-03	1.80E-01	2.12E-02	1.38E-01	6.23E-04	1.88E-01	5.22E-02	1.27E+00	6.03E-02	3.85E-02	2.90E-02	7.09E+00	1.39E+00	3.73E+00	3.22E+00	4.13E+01	6.80E-02	3.81E-01	4.64E-01	9.65E-01	3.95E+01	3.13E+02	2.38E+01	1.91E+01
AT	1.58E+00	5.11E+00	3.96E+00	9.79E+00	3.41E+00	9.43E-02	1.21E+00	8.91E-01	4.78E+00	4.70E-01	7.04E+00	1.91E+00	1.81E+03	5.31E+01	5.47E+01	1.07E+02	3.03E+01	4.25E+00	5.84E+02	2.44E+02	6.26E-01	9.89E-01	2.15E+01	4.17E+01	2.72E+00
AZ	5.07E+01	4.08E-03	5.08E-01	4.00E-02	3.58E-01	8.55E-04	4.03E-01	8.60E-02	1.73E+00	8.33E-02	9.11E-02	9.33E-02	1.62E+01	1.88E+00	7.12E+00	5.41E+00	1.88E+02	2.39E-01	6.04E-01	8.60E-01	1.54E+01	2.57E+02	2.48E+02	7.12E+01	1.41E+02
BA	3.57E+00	1.27E-01	2.63E+00	1.22E+00	1.85E+00	5.67E-02	1.81E+00	3.56E+01	3.30E+01	3.44E+00	1.18E+00	6.79E-01	8.83E+02	4.67E+01	1.59E+02	1.00E+03	6.66E+01	1.96E+00	4.91E+01	1.28E+02	8.82E-01	2.02E+00	3.56E+01	8.76E+01	4.65E+00
BE	2.44E-01	7.15E-02	1.26E+00	1.63E+02	1.41E+00	6.19E-03	2.65E-01	9.24E-03	7.87E-02	1.54E-02	1.18E+02	2.05E+00	1.18E+02	2.67E+01	4.29E+00	1.05E+00	7.99E+00	2.31E+00	8.08E-01	3.26E+00	1.41E-01	1.62E-01	5.33E-01	4.28E+00	5.26E-01
BG	4.10E+01	1.12E-01	5.36E+00	8.93E-01	3.34E+00	2.83E-02	3.75E+01	7.92E+00	3.06E+02	3.01E+00	1.36E+00	1.10E+00	6.80E+02	4.24E+01	2.07E+03	1.52E+03	7.45E+02	2.42E+00	2.59E+01	7.94E+01	5.44E+00	1.42E+01	7.66E+02	8.99E+02	3.07E+01
BY	4.92E+01	6.22E-01	5.33E+02	1.15E+01	2.30E+02	3.32E-02	5.44E+01	3.10E+00	3.09E+01	1.10E+00	2.22E+01	1.96E+01	1.13E+04	3.18E+01	5.23E+02	3.58E+02	1.51E+03	6.59E+01	6.95E+01	2.90E+02	1.17E+01	2.50E+01	3.41E+02	1.79E+03	5.91E+01
CH	2.01E-01	1.01E+01	5.22E-01	7.42E+00	4.33E-01	1.02E-01	9.58E-02	5.05E-02	6.39E-01	1.09E-01	4.14E+00	3.78E-01	1.06E+02	3.96E+01	3.12E+00	4.14E+00	3.64E+00	7.04E-01	9.85E+00	4.53E+00	7.96E-02	9.80E-02	1.26E+00	3.12E+00	3.03E-01
CY	3.01E-01	2.57E-03	4.32E-02	1.53E-02	1.87E-02	8.21E-04	1.19E-01	6.92E-02	1.47E+00	2.07E-01	2.07E-02	8.60E-03	3.22E+00	4.66E-01	2.76E+00	2.47E+00	6.82E+00	1.62E-02	3.00E-01	2.75E-01	3.32E-02	2.02E-01	9.03E+01	7.18E+00	2.16E-01
CZ	2.12E+00	1.45E+00	8.69E+00	2.51E+01	8.13E+00	2.82E-02	1.95E+00	1.13E+00	6.39E+00	3.13E-01	1.84E+01	3.69E+00	6.14E+03	3.64E+01	7.30E+01	1.30E+02	4.29E+01	9.19E+00	1.03E+02	4.61E+02	8.22E-01	1.24E+00	1.38E+01	5.87E+01	3.62E+00
DE	7.16E+00	9.52E+00	4.38E+01	6.55E+02	4.24E+01	9.15E-02	3.30E+00	4.39E-01	3.42E+00	3.11E-01	7.59E+02	3.34E+01	5.42E+03	1.93E+02	7.05E+01	6.87E+01	1.25E+02	6.08E+01	4.82E+01	1.45E+02	2.65E+00	4.07E+00	1.36E+01	7.45E+01	1.18E+01
DK	6.62E-01	1.37E-01	8.81E+00	1.36E+01	1.04E+01	3.17E-03	2.95E-01	4.31E-02	1.41E-01	8.83E-03	6.48E+01	2.03E+01	4.70E+02	2.07E+01	4.82E+00	6.05E+00	1.79E+01	3.80E+01	3.54E+00	9.52E+00	2.31E-01	4.45E-01	7.57E-01	4.06E+00	1.02E+00
EE	2.25E+00	6.71E-02	8.91E+01	3.04E+00	2.69E+02	4.16E-03	2.10E+00	2.47E-01	1.75E+00	6.02E-02	9.71E+00	1.19E+01	1.25E+03	9.13E+00	2.39E+01	2.41E+01	1.69E+02	6.80E+01	6.85E+00	2.58E+01	7.08E-01	1.18E+00	1.57E+01	5.15E+01	3.28E+00
ES	2.58E+00	1.29E-01	2.08E+00	1.42E+01	1.78E+00	7.93E-02	3.45E-01	4.17E-01	5.33E+00	1.73E+00	3.31E+01	2.93E+00	3.17E+02	4.23E+03	1.48E+01	2.96E+01	2.52E+01	3.36E+00	2.46E+01	1.45E+01	5.96E-01	7.59E-01	7.77E+00	2.10E+01	2.30E+00
FI	3.07E+01	1.49E-01	1.25E+02	7.37E+00	2.27E+02	1.14E-02	5.77E+00	5.37E-01	4.24E+00	1.18E-01	2.66E+01	9.52E+01	2.81E+03	2.13E+01	6.88E+01	6.79E+01	1.84E+03	6.38E+02	1.74E+01	6.70E+01	1.50E+01	1.85E+01	5.60E+01	1.85E+02	6.06E+01
FR	3.44E+00	1.77E+00	1.06E+01	2.21E+02	9.27E+00	9.91E-01	1.64E+00	5.14E-01	5.47E+00	1.02E+00	1.60E+02	1.21E+01	1.68E+03	7.88E+02	3.60E+01	3.74E+01	6.15E+01	1.63E+01	4.07E+01	5.09E+01	1.62E+00	1.63E+00	1.25E+01	4.72E+01	6.02E+00
GB	1.12E+00	1.18E-01	6.38E+00	1.78E+01	6.94E+00	6.74E-03	1.22E-01	2.10E-02	1.42E-01	3.19E-02	1.15E+02	2.56E+01	2.22E+02	2.27E+02	2.17E+00	3.02E+00	4.68E+01	1.99E+01	1.90E+00	4.29E+00	6.85E-01	8.51E-01	1.91E+00	4.35E+00	2.53E+00
GE	1.09E+01	2.76E-02	8.27E-01	1.39E-01	6.63E-01	6.22E-03	1.74E+00	7.84E-01	1.32E+01	2.55E-01	2.19E-01	2.36E-01	4.49E+01	3.54E+00	3.96E+01	4.80E+01	1.99E+02	6.07E-01	4.56E+00	3.67E+00	2.44E+00	2.99E+01	7.52E+02	1.54E+02	1.99E+01
GR	2.68E+01	6.39E-02	1.61E+00	6.97E-01	1.08E+00	2.53E-02	7.57E+00	4.10E+00	4.62E+02	1.03E+01	8.24E-01	4.17E-01	1.81E+02	4.46E+01	2.11E+02	4.07E+02	2.92E+02	8.14E-01	1.11E+01	2.09E+01	4.12E+00	1.54E+01	7.18E+02	3.19E+02	2.89E+01
HR	2.08E+00	1.75E-01	2.12E+00	1.74E+00	1.52E+00	9.24E-02	1.31E+00	6.68E+00	1.96E+01	2.83E+00	1.60E+00	6.83E-01	1.00E+03	6.60E+01	1.02E+02	4.41E+02	3.01E+01	1.63E+00	3.04E+02	1.44E+02	7.81E-01	1.33E+00	2.59E+01	4.39E+01	3.49E+00
HU	2.46E+00	4.35E-01	5.19E+00	3.14E+00	3.54E+00	7.77E-02	3.50E+00	1.47E+01	1.02E+02	2.16E+00	3.02E+00	1.66E+00	2.63E+03	5.96E+01	6.21E+02	1.84E+03	7.33E+01	3.39E+00	2.51E+02	1.05E+03	8.22E-01	1.49E+00	4.38E+01	1.35E+02	3.64E+00
IE	2.56E-01	3.58E-02	1.35E+00	4.22E+00	1.16E+00	4.20E-03	2.01E-02	4.36E-03	3.62E-02	1.35E-02	1.87E+01	3.56E+00	5.44E+01	3.36E+01	2.56E-01	3.38E-01	1.48E+01	2.12E+00	4.04E-01	7.15E-01	8.39E-02	1.62E-01	5.46E-01	9.01E-01	3.37E-01
IS	6.70E-01	5.06E-03	9.58E-01	6.74E-01	1.12E+00	8.94E-04	1.93E-02	8.22E-03	5.37E-02	6.82E-03	2.58E+00	1.04E+01	3.16E+01	1.19E+01	2.82E-01	2.91E-01	9.30E+00	4.90E+00	4.83E-01	5.79E-01	2.02E-01	1.80E-01	4.26E-01	7.11E-01	7.68E-01
IT	1.09E+01	2.38E+00	3.62E+00	7.26E+00	2.93E+00	1.19E+00	3.02E+00	1.29E+01	8.37E+01	1.88E+01	5.55E+00	1.63E+00	1.35E+03	2.71E+02	1.50E+02	3.92E+02	1.32E+02	3.43E+00	4.45E+02	1.14E+02	2.03E+00	6.87E+00	5.70E+01	1.30E+02	1.26E+01
KY	1.27E+03	7.50E-03	2.73E-01	5.42E-02	2.35E-01	1.48E-03	2.29E-01	9.70E-02	1.99E+00	8.34E-02	7.67E-02	1.39E-01	1.45E+01	3.48E+00	5.36E+00	4.89E+00	1.23E+02	2.40E-01	8.38E-01	8.16E-01	5.62E+03	5.11E+02	1.08E+02	3.06E+01	2.31E+04
KZ	3.65E+04	2.18E-01	2.36E+01	2.11E+00	1.82E+01	3.29E-02	3.10E+01	3.30E+00	5.63E+01	1.76E+00	4.60E+00	1.10E+01	1.47E+03	3.97E+01	5.29E+02	2.74E+02	1.34E+04	2.42E+01	3.19E+01	6.35E+01	7.43E+03	6.03E+03	2.17E+03	2.90E+03	3.70E+04
LI	1.03E-03	5.58E-01	3.03E-03	4.06E-02	2.80E-03	3.94E-04	4.29E-04	1.77E-04	2.22E-03	4.19E-04	2.11E-02	1.90E-03	4.26E-01	1.80E-01	1.41E-02	1.68E-02	1.71E-02	4.25E-03	4.51E-02	1.98E-02	4.12E-04	5.26E-04	6.36E-03	1.41E-02	1.60E-03
LT	6.44E+00	2.03E-01	1.18E+03	6.65E+00	2.12E+02	7.10E-03	6.56E+00	6.33E-01	5.80E+00	1.77E-01	2.03E+01	1.08E+01	4.33E+03	1.69E+01	8.50E+01	7.30E+01	2.23E+02	4.58E+01	1.86E+01	7.82E+01	1.14E+00	3.92E+00	2.05E+01	1.69E+02	7.27E+00
LU	1.94E-02	1.06E-02	1.32E-01	9.36E+01	1.43E-01	9.75E-04	1.45E-02	9.38E-04	8.67E-03	2.56E-03	3.17E+00	1.16E-01	1.38E+01	2.44E+00	2.49E-01	1.27E-01	5.02E-01	1.84E-01	8.68E-02	3.23E-01	1.01E-02	1.20E-02	4.65E-02	3.55E-01	3.80E-02
LV	4.45E+00	1.40E-01	3.73E+02	5.64E+00	1.43E+03	5.69E-03	4.52E+00	4.46E-01	3.74E+00	1.11E-01	1.82E+01	1.47E+01	2.83E+03	1.69E+01	5.09E+01	4.45E+01	2.30E+02	7.58E+01	1.23E+01	5.30E+01	1.09E+00	2.49E+00	2.37E+01	1.38E+02	5.40E+00
MC	1.88E-04	8.53E-05	1.25E-04	4.23E-04	1.17E-04	5.12E-03	4.60E-05	7.24E-05	8.43E-04	6.41E-05	2.12E-04	6.49E-05	2.90E-02	1.01E-02	2.43E-03	4.90E-03	2.76E-03	1.32E-04	7.27E-03	1.79E-03	3.50E-05	4.68E-05	1.03E-03	2.65E-03	1.43E-04
MD	1.48E+01	2.93E-02	4.08E+00	2.79E-01	2.18E+00	6.59E-03	1.74E+02	8.34E-01	1.52E+01	3.43E-01	4.74E-01	4.74E-01	2.80E+02	7.70E+00	4.42E+02	7.79E+01	3.26E+02	1.54E+00	6.71E+00	1.48E+01	2.26E+00	7.58E+00	1.23E+02	5.42E+02	1.47E+01
ME	7.69E-01	2.30E-02	2.82E-01	2.33E-01	1.71E-01	1.05E-02	4.02E-01	7.50E+01	2.69E+01	2.25E+00	2.34E-01	1.16E-01	7.34E+01	1.35E+01	2.74E+01	2.16E+02	1.57E+01	2.82E-01	4.63E+00	1.01E+01	9.60E-02	5.50E-01	9.42E+00	1.99E+01	7.91E-01
MK	2.42E+00	2.15E-02	4.11E-01	1.75E-01	2.73E-01	6.79E-03	1.18E+00	2.37E+00	1.50E+03	1.41E+00	2.00E-01	1.05E-01	6.91E+01	1.12E+01	5.86E+01	4.80E+02	3.96E+01	2.17E-01	4.41E+00	1.15E+01	3.34E-01	1.54E+00	5.87E+01	4.85E+01	2.34E+00
MT	7.92E-03	1.37E-04	1.92E-03	2.61E-03	8.54E-04	4.88E-05	2.75E-03	9.15E-03	5.94E-02	1.25E+00	1.97E-03	3.57E-04	3.75E-01	7.55E-02	7.99E-02	1.22E-01	5.62E-02	7.01E-04	2.34E-02	2.44E-02	3.46E-03	4.47E-03	7.36E-02	6.50E-02	1.31E-02
NL	3.37E-01	8.72E-02	1.41E+00	3.14E+01	1.39E+00	3.59E-03	7.75E-02	1.07E-02	6.95E-02	1.10E-02	6.73E+02	4.03E+00	1.42E+02	3.26E+01	1.48E+00	1.40E+00	8.15E+00	2.65E+00	1.16E+00	4.24E+00	1.76E-01	2.18E-01	7.24E-01	4.24E+00	6.41E-01
NO	1.87E+01	1.98E-01	2.89E+01	2.05E+01	3.46E+01	9.94E-03	1.17E+00	1.96E-01	1.42E+00	6.43E-02	8.08E+01	1.66E+03	1.43E+03	3.24E+01	1.59E+01	1.92E+01	4.15E+02	2.68E+02	8.07E+00	3.35E+01	7.88E+00	8.04E+00	1.72E+01	4.64E+01	2.78E+01
PL	2.32E+01	2.10E+00	2.04E+02	5.59E+01	1.17E+02	6.80E-02	2.30E+01	6.98E+00	4.86E+01	1.46E+00	1.14E+02	2.94E+01	9.43E+04	9.20E+01	5.55E+02	8.75E+02	4.94E+02	9.67E+01	2.21E+02	1.24E+03	6.48E+00	1.10E+01	1.00E+02	5.03E+02	3.27E+01
PT	1.68E-01	1.03E-02	2.24E-01	1.83E+00	2.05E-01	3.00E-03	1.79E-02	2.09E-02	2.61E-01	4.89E-02	4.94E+00	3.12E-01	1.82E+01	7.35E+03	6.52E-01	1.35E+00	1.32E+00	3.31E-01	8.90E-01	5.14E-01	9.33E-02	1.15E-01	6.23E-01	1.33E+00	3.46E-01
RO	4.79E+01	5.68E-01	1.96E+01	3.84E+00	1.16E+01	8.81E-02	1.20E+02	1.87E+01	2.25E+02	3.74E+00	4.65E+00	3.49E+00	2.61E+03	8.06E+01	9.75E+03	2.81E+03	1.16E+03	8.52E+00	1.50E+02	3.51E+02	9.54E+00	2.01E+01	7.63E+02	1.67E+03	4.99E+01
RS	9.17E+00	1.81E-01	4.76E+00	1.60E+00	3.05E+00	4.27E-02	5.71E+00	5.76E+01	6.90E+02	3.30E+00	1.98E+00	1.10E+00	1.03E+03	3.68E+01	7.63E+02	8.87E+03	1.79E+02	2.71E+00	4.94E+01	2.11E+02	2.40E+00	4.92E+00	1.15E+02	2.50E+02	1.16E+01
RU	3.02E+04	1.88E+00	7.96E+02	3.85E+01	9.83E+02	2.02E-01	2.34E+02	1.99E+01	2.93E+02	9.41E+00	9.50E+01	2.68E+02	2.16E+04	2.71E+02	3.17E+03	1.70E+03	1.50E+05	8.22E+02	2.47E+02	7.21E+02	4.08E+03	5.85E+03	8.04E+03	2.28E+04	1.74E+04
SE	2.25E+01	4.37E-01	1.40E+02	2.75E+01	2.08E+02	1.73E-02	5.81E+00	9.02E-01	4.43E+00	1.29E-01	1.16E+02	4.55E+02	4.16E+03	5.49E+01	6.57E+01	8.85E+01	9.54E+02	2.38E+03	2.34E+01	7.75E+01	9.11E+00	1.25E+01	3.18E+01	2.35E+02	3.57E+01
SI	6.36E-01	1.23E-01	8.75E-01	9.17E-01	6.73E-01	4.76E-02	4.63E-01	6.97E-01	2.77E+00	5.12E-01	6.97E-01	2.95E-01	3.66E+02	2.46E+01	2.43E+01	7.00E+01	9.07E+00	7.20E-01	1.02E+03	3.79E+01	2.44E-01	4.26E-01	7.40E+00	1.36E+01	1.10E+00
SK	1.55E+00	4.75E-01	5.38E+00	3.89E+00	3.71E+00	3.45E-02	2.28E+00	5.10E+00	2.87E+01	7.52E-01	3.60E+00	1.58E+00	6.41E+03	2.66E+01	2.20E+02	6.16E+02	4.19E+01	3.64E+00	1.20E+02	2.25E+03	4.38E-01	9.18E-01	1.70E+01	6.65E+01	2.06E+00
TJ	2.50E+02	3.95E-03	1.57E-01	2.73E-02	1.28E-01	7.61E-04	1.26E-01	5.04E-02	1.08E+00	3.48E-02	4.18E-02	7.62E-02	8.09E+00	1.96E+00	2.69E+00	2.57E+00	6.94E+01	1.28E-01	3.93E-01	4.23E-01	1.51E+04	4.68E+02	5.48E+01	1.97E+01	6.79E+03
TM	3.04E+02	5.83E-03	5.56E-01	4.59E-02	4.91E-01	1.20E-03	4.63E-01	1.08E-01	2.16E+00	5.44E-02	7.71E-02	1.87E-01	1.94E+01	1.93E+00	8.99E+00	7.06E+00	2.10E+02	4.30E-01	7.67E-01	9.89E-01	7.19E+02	4.02E+03	1.41E+02	4.92E+01	3.27E+03
TR	1.15E+02	1.83E-01	1.30E+01	1.48E+00	7.91E+00	5.04E-02	4.06E+01	5.97E+00	1.52E+02	1.24E+01	2.63E+00	2.65E+00	6.55E+02	8.20E+01	6.33E+02	4.33E+02	2.83E+03	5.84E+00	2.94E+01	4.71E+01	2.21E+01	1.33E+02	3.09E+04	2.79E+03	1.32E+02
UA	3.83E+02	9.45E-01	1.23E+02	1.13E+01	7.31E+01	1.11E-01	3.41E+02	1.47E+01	1.66E+02	5.65E+00	1.76E+01	1.51E+01	1.48E+04	9.01E+01	3.15E+03	1.56E+03	9.84E+03	4.33E+01	1.81E+02	7.71E+02	5.05E+01	2.41E+02	2.43E+03	2.57E+04	3.76E+02
UZ	1.02E+03	1.05E-02	1.11E+00	1.35E-01	7.92E-01	1.88E-03	1.18E+00	1.60E-01	3.28E+00	1.00E-01	3.42E-01	3.54E-01	6.77E+01	3.59E+00	2.16E+01	1.13E+01	3.99E+02	7.93E-01	1.20E+00	2.59E+00	4.56E+03	1.70E+03	1.88E+02	1.17E+02	2.51E+04

Table B3. *Source-receptor matrix of Cd deposition to EMEP countries in 2023, kg/year. 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	6.39E+01	2.20E-03	5.33E-01	1.01E-02	3.54E+00	7.31E-02	4.50E+00	9.03E-02	2.25E-01	7.27E-03	3.85E-01	1.26E+00	2.55E-02	8.88E-03	1.04E+01	1.13E-02	1.15E+00	1.18E-01	1.80E-02	9.78E+00	1.17E+00	1.20E+00	4.73E-03	6.23E-04	2.19E+01	1.56E-03
AM	3.55E-02	1.12E+01	5.01E-02	5.50E+00	1.15E-01	9.62E-03	4.67E-01	4.50E-02	2.92E-02	8.61E-02	3.51E-02	1.80E-01	5.92E-03	4.92E-03	4.39E-01	5.36E-03	7.11E-02	2.93E-02	6.02E+00	4.21E-01	4.86E-02	5.64E-02	7.29E-04	3.46E-04	4.30E-01	3.65E-03
AT	3.36E-01	2.24E-03	2.13E+02	9.75E-03	6.13E+00	2.31E+00	1.95E+00	5.59E-01	2.22E+01	5.27E-03	3.63E+01	1.71E+02	6.16E-01	1.13E-01	2.11E+01	2.13E-01	1.51E+01	3.40E+00	1.18E-02	4.83E-01	1.71E+01	1.79E+01	9.35E-02	8.74E-03	6.67E+01	3.91E-03
AZ	4.50E-02	3.10E+00	8.28E-02	3.09E+01	1.96E-01	2.02E-02	7.85E-01	1.27E-01	4.08E-02	7.35E-02	7.11E-02	3.70E-01	1.76E-02	1.57E-02	6.49E-01	2.02E-02	1.10E-01	7.31E-02	6.57E+00	5.02E-01	8.03E-02	9.98E-02	1.27E-03	8.08E-04	5.89E-01	4.64E-02
BA	6.36E+00	5.55E-03	1.07E+01	2.24E-02	4.94E+02	3.50E-01	6.87E+00	4.53E-01	1.03E+00	9.26E-03	9.46E+00	1.08E+01	1.98E-01	8.21E-02	2.07E+01	1.42E-01	4.19E+00	6.48E-01	3.24E-02	2.78E+00	5.26E+01	2.74E+01	2.09E-02	2.38E-03	6.04E+01	8.30E-03
BE	3.21E-03	3.40E-04	4.48E-01	1.45E-03	4.54E-02	1.93E+02	5.54E-02	1.32E-01	1.14E+00	8.98E-05	7.22E-01	8.12E+01	1.02E+00	7.86E-02	1.17E+01	1.11E-01	5.95E+01	4.30E+01	1.13E-03	1.15E-02	7.75E-02	1.92E-01	6.48E-01	3.36E-02	8.40E-01	9.14E-04
BG	5.05E+00	8.08E-02	4.66E+00	1.71E-01	1.67E+01	3.01E-01	6.61E+02	1.68E+00	9.49E-01	1.10E-01	3.77E+00	8.66E+00	2.40E-01	1.60E-01	1.51E+01	2.03E-01	2.64E+00	6.87E-01	5.26E-01	6.45E+01	5.48E+00	1.40E+01	2.10E-02	4.74E-03	2.24E+01	5.44E-02
BY	9.13E-01	5.58E-02	1.56E+01	2.44E-01	1.37E+01	5.13E+00	1.95E+01	2.67E+02	3.97E+00	9.85E-03	3.06E+01	9.85E+01	7.57E+00	6.56E+00	1.53E+01	3.86E+00	1.00E+01	1.51E+01	3.29E-01	6.03E+00	9.09E+00	2.60E+01	4.01E-01	6.38E-02	1.84E+01	8.85E-02
CH	2.70E-02	2.71E-04	3.45E+00	9.08E-04	2.38E-01	1.45E+00	1.04E-01	6.50E-02	8.44E+01	4.38E-04	1.21E+00	5.23E+01	1.51E-01	1.07E-02	1.90E+01	2.12E-02	2.88E+01	2.18E+00	1.11E-03	5.80E-02	5.41E-01	2.74E-01	6.13E-02	5.31E-03	4.40E+01	4.50E-04
CY	7.38E-02	1.86E-03	3.34E-02	2.24E-03	1.12E-01	6.74E-03	5.88E-01	1.24E-02	2.38E-02	1.40E+00	2.04E-02	8.91E-02	2.43E-03	6.78E-04	3.32E-01	8.03E-04	7.19E-02	1.64E-02	4.30E-03	1.28E+00	6.04E-02	4.12E-02	5.66E-04	7.16E-05	8.55E-01	2.75E-04
CZ	3.27E-01	2.40E-03	5.65E+01	1.35E-02	8.98E+00	6.16E+00	1.54E+00	1.19E+00	9.81E+00	3.10E-03	3.39E+02	2.94E+02	1.60E+00	3.69E-01	1.47E+01	6.03E-01	1.74E+01	8.77E+00	1.12E-02	3.51E-01	1.15E+01	2.30E+01	2.36E-01	1.95E-02	1.64E+01	5.62E-03
DE	1.28E-01	5.86E-03	4.60E+01	3.52E-02	2.40E+00	2.08E+02	1.40E+00	4.59E+00	7.17E+01	2.41E-03	8.30E+01	4.15E+03	2.64E+01	1.66E+00	8.31E+01	2.05E+00	2.17E+02	2.23E+02	2.29E-02	3.37E-01	3.48E+00	9.17E+00	4.52E+00	2.41E-01	2.92E+01	1.74E-02
DK	3.99E-03	6.51E-04	1.43E+00	3.50E-03	3.01E-01	1.16E+01	3.94E-02	5.92E-01	1.13E+00	1.07E-04	3.34E+00	1.18E+02	9.22E+01	5.12E-01	6.03E+00	6.66E-01	9.91E+00	4.26E+01	1.93E-03	1.21E-02	3.56E-01	8.62E-01	8.85E-01	8.39E-02	7.22E-01	1.31E-03
EE	4.23E-02	3.54E-03	1.72E+00	1.04E-02	1.08E+00	2.00E+00	6.35E-01	5.62E+00	5.17E-01	7.38E-04	3.74E+00	2.56E+01	3.48E+00	1.12E+02	2.88E+00	1.35E+01	2.47E+00	6.89E+00	2.30E-02	1.69E-01	8.03E-01	1.89E+00	1.86E-01	3.52E-02	1.55E+00	3.82E-03
ES	2.51E-01	2.35E-03	2.02E+00	5.58E-03	2.21E+00	9.98E+00	5.67E-01	1.64E-01	1.54E+00	2.28E-03	2.30E+00	4.51E+01	1.37E+00	3.92E-02	1.94E+03	3.98E-02	4.97E+01	2.25E+01	1.45E-02	4.09E-01	2.51E+00	1.46E+00	7.85E-01	6.50E-02	2.86E+01	2.90E-03
FI	9.87E-02	3.56E-02	3.98E+00	9.16E-02	2.85E+00	5.19E+00	2.28E+00	1.04E+01	1.23E+00	3.32E-03	8.42E+00	5.76E+01	9.24E+00	4.51E+01	8.19E+00	3.57E+02	6.12E+00	1.76E+01	1.13E-01	5.09E-01	2.08E+00	5.07E+00	3.90E-01	2.49E-01	4.15E+00	6.24E-02
FR	2.20E-01	4.03E-03	9.98E+00	1.39E-02	2.47E+00	9.20E+01	9.41E-01	1.04E+00	4.20E+01	3.33E-03	1.37E+01	3.87E+02	5.53E+00	3.37E-01	5.28E+02	5.10E-01	9.06E+02	1.34E+02	1.73E-02	4.53E-01	3.56E+00	2.92E+00	4.26E+00	1.86E-01	6.62E+01	8.95E-03
GB	4.27E-03	2.09E-03	9.21E-01	8.75E-03	1.20E-01	2.81E+01	4.43E-02	5.31E-01	1.31E+00	2.86E-04	1.46E+00	7.88E+01	5.79E+00	4.05E-01	3.52E+01	6.34E-01	4.99E+01	1.44E+03	5.55E-03	2.44E-02	1.59E-01	2.92E-01	2.71E+01	8.25E-01	1.23E+00	2.52E-03
GE	3.78E-01	3.04E+00	4.97E-01	2.26E+00	1.58E+00	5.60E-02	5.36E+00	2.18E-01	2.12E-01	1.24E-01	2.85E-01	1.14E+00	4.94E-02	2.86E-02	1.52E+00	4.33E-02	4.77E-01	1.75E-01	4.19E+01	2.97E+00	6.72E-01	6.02E-01	6.06E-03	2.06E-03	3.52E+00	1.26E-02
GR	8.92E+00	3.75E-02	1.48E+00	1.59E-01	6.85E+00	2.26E-01	6.55E+01	5.28E-01	6.29E-01	1.02E-01	1.10E+00	3.82E+00	9.72E-02	5.43E-02	2.02E+01	6.63E-02	2.85E+00	4.35E-01	2.88E-01	2.77E+02	2.45E+00	3.42E+00	1.60E-02	2.43E-03	3.82E+01	3.97E-02
HR	3.21E+00	3.52E-03	2.11E+01	1.39E-02	9.14E+01	4.98E-01	5.00E+00	3.76E-01	1.40E+00	6.62E-03	1.15E+01	1.47E+01	2.28E-01	6.39E-02	3.14E+01	1.10E-01	6.68E+00	7.04E-01	2.02E-02	1.61E+00	1.85E+02	3.75E+01	2.08E-02	2.58E-03	8.35E+01	6.07E-03
HU	4.79E+00	4.15E-03	5.63E+01	1.95E-02	7.16E+01	8.41E-01	2.28E+01	1.08E+00	3.20E+00	4.98E-03	2.71E+01	3.53E+01	5.15E-01	1.17E-01	2.38E+01	1.63E-01	6.67E+00	1.41E+00	2.28E-02	5.04E+00	5.94E+01	3.39E+02	4.07E-02	5.34E-03	5.51E+01	6.00E-03
IE	1.33E-03	4.11E-04	1.83E-01	3.11E-03	2.10E-02	4.15E+00	8.23E-03	1.65E-01	4.62E-01	8.08E-05	3.18E-01	1.81E+01	4.48E-01	6.54E-02	7.06E+00	9.86E-02	6.37E+00	6.00E+01	1.36E-03	7.54E-03	3.09E-02	2.83E-02	5.03E+01	2.78E-01	5.83E-01	3.22E-04
IS	1.63E-03	3.73E-04	7.21E-02	1.05E-03	3.72E-02	4.95E-01	1.67E-02	7.63E-02	5.00E-02	6.57E-05	1.40E-01	3.98E+00	3.86E-01	8.86E-02	2.30E+00	2.13E-01	7.92E-01	7.11E+00	1.03E-03	6.64E-03	5.13E-02	5.43E-02	5.16E-01	2.53E+01	2.15E-01	1.15E-03
IT	9.00E+00	1.15E-02	2.49E+01	5.19E-02	5.02E+01	1.86E+00	7.74E+00	5.74E-01	2.07E+01	1.39E-02	1.07E+01	4.69E+01	4.47E-01	1.08E-01	1.46E+02	2.06E-01	5.59E+01	2.98E+00	6.87E-02	7.22E+00	4.52E+01	1.45E+01	1.26E-01	1.06E-02	1.14E+03	1.44E-02
KY	5.49E-02	2.47E-01	9.53E-02	9.49E-01	1.92E-01	2.12E-02	4.75E-01	6.25E-02	7.96E-02	4.69E-02	6.92E-02	3.99E-01	1.10E-02	1.22E-02	1.14E+00	1.96E-02	1.85E-01	6.32E-02	4.81E-01	4.19E-01	9.00E-02	9.05E-02	2.34E-03	1.57E-03	8.50E-01	4.56E+01
KZ	1.43E+00	5.68E+00	4.86E+00	2.13E+01	7.99E+00	1.04E+00	3.28E+01	6.14E+00	1.89E+00	3.99E-01	5.48E+00	1.83E+01	1.54E+00	1.22E+00	1.52E+01	1.75E+00	4.24E+00	3.94E+00	1.24E+01	1.23E+01	4.31E+00	8.11E+00	1.42E-01	9.72E-02	1.91E+01	5.25E+01
LI	8.40E-05	1.43E-06	4.55E-02	4.96E-06	8.97E-04	8.16E-03	4.43E-04	3.13E-04	5.81E-01	1.65E-06	5.55E-03	3.77E-01	7.81E-04	7.36E-05	7.61E-02	1.58E-04	9.24E-02	1.13E-02	5.90E-06	2.13E-04	2.10E-03	1.28E-03	2.71E-04	2.90E-05	1.63E-01	2.45E-06
LT	1.72E-01	5.39E-03	5.00E+00	3.31E-02	2.62E+00	4.43E+00	2.71E+00	4.03E+01	1.38E+00	1.35E-03	1.12E+01	5.99E+01	7.34E+00	3.77E+00	5.98E+00	2.27E+00	5.48E+00	1.41E+01	2.73E-02	4.59E-01	2.11E+00	5.57E+00	3.20E-01	3.44E-02	3.65E+00	7.57E-03
LU	3.30E-04	2.47E-05	5.66E-02	1.11E-04	4.85E-03	5.29E+00	4.55E-03	1.28E-02	2.18E-01	9.12E-06	1.03E-01	1.05E+01	7.16E-02	5.74E-03	1.33E+00	8.17E-03	5.38E+00	1.24E+00	8.74E-05	1.18E-03	6.87E-03	2.03E-02	2.87E-02	1.52E-03	1.33E-01	7.06E-05
LV	1.02E-01	5.73E-03	3.41E+00	2.13E-02	1.82E+00	3.85E+00	1.63E+00	1.68E+01	9.97E-01	1.65E-03	8.01E+00	4.93E+01	6.81E+00	1.68E+01	5.66E+00	5.54E+00	4.66E+00	1.24E+01	3.40E-02	3.37E-01	1.44E+00	3.74E+00	3.09E-01	4.46E-02	2.56E+00	6.70E-03
MC	3.74E-05	1.26E-07	4.77E-04	3.39E-07	3.08E-04	7.33E-05	1.07E-04	1.53E-05	6.66E-04	3.05E-07	2.59E-04	1.75E-03	1.34E-05	4.19E-06	6.58E-03	8.35E-06	1.19E-02	9.17E-05	9.41E-07	5.30E-05	4.67E-04	1.98E-04	5.12E-06	2.52E-07	1.52E-02	1.62E-07
MD	4.11E-01	4.05E-02	1.03E+00	1.04E-01	2.34E+00	9.89E-02	1.64E+01	1.26E+00	2.34E-01	8.59E-03	8.74E-01	2.52E+00	1.06E-01	9.79E-02	2.90E+00	1.09E-01	6.22E-01	2.92E-01	1.75E-01	3.71E+00	1.01E+00	2.26E+00	7.82E-03	2.11E-03	3.80E+00	2.45E-02
ME	1.06E+01	1.14E-03	7.24E-01	5.98E-03	1.40E+01	6.19E-02	1.79E+00	7.02E-02	2.16E-01	2.73E-03	6.21E-01	1.34E+00	2.87E-02	7.31E-03	6.54E+00	1.32E-02	9.54E-01	8.78E-02	7.57E-03	1.72E+00	2.05E+00	1.97E+00	3.54E-03	5.50E-04	1.79E+01	8.34E-04
MK	1.06E+01	3.39E-03	7.78E-01	1.54E-02	3.04E+00	5.15E-02	1.23E+01	1.23E-01	1.92E-01	9.56E-03	5.69E-01	1.35E+00	2.65E-02	1.22E-02	4.39E+00	1.69E-02	6.48E-01	8.88E-02	2.86E-02	2.21E+01	1.03E+00	2.21E+00	3.25E-03	5.59E-04	8.43E+00	3.05E-03
MT	7.36E-03	1.02E-05	2.58E-03	3.42E-05	1.36E-02	8.06E-04	6.81E-03	3.36E-04	1.29E-03	3.32E-06	2.71E-03	7.55E-03	9.83E-05	4.31E-05	4.99E-02	5.42E-05	1.00E-02	1.33E-03	4.18E-05	1.47E-02	5.94E-03	3.82E-03	6.87E-05	2.87E-06	1.67E-01	2.03E-05
NL	2.76E-03	5.28E-04	6.77E-01	2.90E-03	7.02E-02	1.12E+02	2.64E-02	1.78E-01	9.91E-01	1.06E-04	1.09E+00	1.32E+02	1.46E+00	7.13E-02	9.81E+00	1.02E-01	3.48E+01	8.44E+01	1.77E-03	1.01E-02	1.16E-01	2.66E-01	1.21E+00	6.11E-02	6.95E-01	9.38E-04
NO	3.26E-02	1.59E-02	3.01E+00	4.58E-02	9.45E-01	1.59E+01	4.63E-01	2.93E+00	1.80E+00	1.93E-03	7.37E+00	1.23E+02	2.45E+01	3.16E+00	1.21E+01	8.65E+00	1.66E+01	7.91E+01	4.48E-02	1.66E-01	8.19E-01	2.27E+00	1.97E+00	1.11E+00	2.33E+00	4.11E-02
PL	1.79E+00	1.66E-02	6.43E+01	1.03E-01	3.45E+01	2.75E+01	1.40E+01	4.44E+01	1.41E+01	1.38E-02	2.55E+02	6.64E+02	2.22E+01	4.39E+00	3.76E+01	4.69E+00	3.91E+01	6.31E+01	8.91E-02	2.79E+00	2.78E+01	7.87E+01	1.62E+00	1.20E-01	3.91E+01	4.60E-02
PT	1.17E-02	3.97E-04	9.93E-02	7.77E-04	8.92E-02	1.23E+00	2.75E-02	1.40E-02	1.18E-01	1.68E-04	1.53E-01	5.53E+00	1.27E-01	3.25E-03	7.10E+01	2.36E-03	3.10E+00	3.73E+00	1.37E-03	2.15E-02	9.22E-02	5.15E-02	1.03E-01	1.08E-02	1.03E+00	4.33E-04
RO	6.99E+00	1.97E-01	2.67E+01	3.03E-01	6.40E+01	1.15E+00	1.57E+02	5.27E+00	4.16E+00	7.80E-02	1.47E+01	3.85E+01	8.57E-01	5.22E-01	3.17E+01	5.96E-01	8.51E+00	2.75E+00	8.94E-01	2.57E+01	3.01E+01	9.51E+01	8.53E-02	1.40E-02	6.25E+01	1.15E-01
RS	1.53E+01	1.92E-02	1.17E+01	6.15E-02	7.84E+01	5.08E-01	5.92E+01	9.24E-01	1.35E+00	1.46E-02	9.82E+00	1.50E+01	3.28E-01	1.38E-01	1.63E+01	2.08E-01	3.62E+00	9.88E-01	1.23E-01	1.67E+01	2.27E+01	5.42E+01	3.06E-02	3.47E-03	3.96E+01	2.38E-02
RU	7.91E+00	9.75E+00	4.66E+01	3.90E+01	5.83E+01	2.05E+01	1.85E+02	1.83E+02	1.47E+01	1.00E+00	6.72E+01	2.93E+02	3.16E+01	1.12E+02	1.12E+02	1.35E+02	4.29E+01	7.05E+01	3.67E+01	6.95E+01	3.33E+01	7.42E+01	1.99E+00	1.66E+00	1.11E+02	2.25E+01
SE	1.29E-01	2.34E-02	7.07E+00	8.71E-02	3.87E+00	2.17E+01	1.67E+00	1.09E+01	3.27E+00	2.76E-03	1.77E+01	2.48E+02	9.11E+01	1.90E+01	1.95E+01	5.89E+01	2.16E+01	8.80E+01	1.01E-01	4.69E-01	2.89E+00	6.76E+00	1.94E+00	5.05E-01	4.88E+00	3.97E-02
SI	3.11E-01	8.39E-04	2.22E+01	4.09E-03	4.62E+00	2.28E-01	1.06E+00	1.55E-01	9.93E-01	1.79E-03	3.89E+00	8.81E+00	1.01E-01	2.24E-02	1.13E+01	4.06E-02	3.10E+00	2.90E-01	4.66E-03	2.85E-01	4.15E+01	7.72E+00	6.73E-03	1.17E-03	4.01E+01	1.61E-03
SK	1.29E+00	2.45E-03	4.10E+01	1.36E-02	2.79E+01	1.02E+00	6.78E+00	9.99E-01	3.25E+00	2.68E-03	5.25E+01	4.22E+01	5.86E-01	1.40E-01	1.08E+01	2.23E-01	5.31E+00	1.86E+00	1.19E-02	1.23E+00	1.95E+01	9.57E+01	5.36E-02	6.37E-03	2.37E+01	3.43E-03
TJ	3.13E-02	1.38E-01	5.18E-02	5.59E-01	9.96E-02	1.20E-02	2.66E-01	3.74E-02	4.51E-02	2.27E-02	3.90E-02	2.25E-01	5.73E-03	6.31E-03	6.23E-01	1.00E-02	1.04E-01	3.48E-02	2.46E-01	2.15E-01	4.79E-02	4.76E-02	1.27E-03	7.31E-04	4.55E-01	1.45E+00
TM	5.44E-02	5.10E-01	1.08E-01	2.80E+00	2.11E-01	2.20E-02	8.15E-01	1.11E-01	6.31E-02	4.41E-02	8.73E-02	3.98E-01	1.90E-02	3.27E-02	8.04E-01	4.07E-02	1.47E-01	7.81E-02	9.79E-01	4.18E-01	1.06E-01	1.35E-01	2.43E-03	1.45E-03	6.76E-01	5.50E-01
TR	5.01E+00	5.37E+00	4.16E+00	4.15E+00	1.05E+01	6.32E-01	1.44E+02	3.76E+00	1.66E+00	5.71E+00	3.05E+00	1.17E+01	6.92E-01	3.71E-01	3.79E+01	4.06E-01	5.39E+00	1.69E+00	6.86E+00	1.16E+02	4.89E+00	7.03E+00	5.72E-02	1.39E-02	4.98E+01	1.40E-01
UA	4.92E+00	6.02E-01	3.59E+01	2.87E+00	5.15E+01	4.00E+00	1.37E+02	4.85E+01	6.68E+00	1.99E-01	4.49E+01	1.02E+02	4.88E+00	2.97E+00	4.11E+01	2.65E+00	1.42E+01	1.09E+01	3.44E+00	3.95E+01	2.84E+01	1.00E+02	3.13E-01	6.26E-02	6.86E+01	3.97E-01
UZ	8.74E-02	6.52E-01	2.14E-01	2.84E+00	3.15E-01	8.38E-02	1.51E+00	2.67E-01	9.85E-02	5.76E-02	2.73E-01	1.14E+00	6.45E-02	4.69E-02	1.40E+00	6.22E-02	2.58E-01	3.12E-01	1.23E+00	6.27E-01	1.68E-01	3.13E-01	1.00E-02	2.74E-03	1.07E+00	4.76E+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	1.28E-01	1.66E-03	1.28E-02	5.92E-03	2.94E-02	1.94E-04	1.68E-01	4.11E+00	7.89E+00	4.59E-02	2.58E-02	1.23E-02	1.97E+00	9.69E-01	2.33E+00	2.68E+01	4.30E+00	1.16E-02	3.49E-01	2.67E-01	1.39E-02	3.06E-03	2.83E+00	1.17E+00	2.06E-02
AM	7.04E-01	2.17E-04	6.75E-03	5.90E-04	1.78E-02	1.42E-05	4.32E-02	1.27E-02	4.17E-02	6.23E-04	4.12E-03	3.79E-03	2.53E-01	7.10E-02	2.89E-01	2.58E-01	6.17E+00	4.24E-03	3.35E-02	1.70E-02	7.38E-02	1.28E-01	3.16E+01	6.84E-01	2.77E-01
AT	1.15E-01	4.03E-01	1.59E-01	2.70E-01	4.58E-01	1.67E-03	2.77E-01	1.95E-01	1.52E-01	4.51E-03	7.76E-01	2.27E-01	6.94E+01	2.41E+00	4.75E+00	8.84E+00	4.36E+00	2.85E-01	5.15E+01	9.29E+00	4.00E-02	3.09E-03	1.70E+00	1.48E+00	3.83E-02
AZ	4.54E+00	3.17E-04	2.06E-02	1.08E-03	4.98E-02	1.92E-05	9.70E-02	2.01E-02	6.08E-02	8.96E-04	9.66E-03	1.20E-02	5.99E-01	9.89E-02	5.91E-01	4.32E-01	3.16E+01	1.50E-02	5.26E-02	3.25E-02	1.20E+00	9.20E-01	2.31E+01	2.09E+00	2.31E+00
BA	3.16E-01	9.40E-03	1.14E-01	3.26E-02	2.73E-01	1.09E-03	4.46E-01	8.41E+00	1.22E+00	3.73E-02	1.27E-01	8.25E-02	3.40E+01	2.12E+00	1.31E+01	9.54E+01	1.12E+01	1.25E-01	4.62E+00	5.40E+00	6.68E-02	7.07E-03	3.15E+00	3.17E+00	7.84E-02
BE	2.05E-02	5.44E-03	5.88E-02	2.47E+00	2.25E-01	1.12E-04	5.51E-02	1.83E-03	2.56E-03	1.59E-04	1.53E+01	2.77E-01	4.40E+00	1.42E+00	3.23E-01	8.57E-02	1.09E+00	1.80E-01	7.35E-02	1.23E-01	1.20E-02	6.00E-04	5.10E-02	1.61E-01	9.77E-03
BG	3.77E+00	8.10E-03	2.19E-01	2.36E-02	4.86E-01	5.57E-04	9.72E+00	2.11E+00	1.02E+01	3.36E-02	1.41E-01	1.39E-01	2.48E+01	1.99E+00	1.46E+02	1.18E+02	1.26E+02	1.58E-01	2.30E+00	3.02E+00	4.22E-01	4.88E-02	6.83E+01	3.70E+01	5.19E-01
BY	4.24E+00	4.45E-02	2.45E+01	2.94E-01	4.04E+01	6.07E-04	1.26E+01	6.59E-01	1.18E+00	1.16E-02	2.41E+00	2.64E+00	4.78E+02	1.72E+00	5.25E+01	2.89E+01	2.24E+02	4.71E+00	6.18E+00	1.16E+01	9.42E-01	8.60E-02	2.84E+01	8.03E+01	9.92E-01
CH	1.67E-02	8.92E-01	2.03E-02	1.96E-01	5.60E-02	1.76E-03	2.02E-02	1.10E-02	1.83E-02	1.03E-03	4.38E-01	4.80E-02	3.97E+00	1.81E+00	2.21E-01	3.01E-01	5.02E-01	4.98E-02	7.31E-01	1.61E-01	5.54E-03	3.05E-04	9.95E-02	1.03E-01	4.75E-03
CY	2.84E-02	2.17E-04	1.55E-03	4.26E-04	2.76E-03	1.59E-05	3.01E-02	2.05E-02	5.28E-02	2.48E-03	2.24E-03	1.11E-03	1.18E-01	2.44E-02	2.14E-01	2.06E-01	1.17E+00	1.06E-03	2.81E-02	1.08E-02	2.52E-03	6.01E-04	7.75E+00	2.51E-01	3.41E-03
CZ	1.74E-01	1.12E-01	3.79E-01	7.16E-01	1.20E+00	5.24E-04	4.60E-01	2.50E-01	2.20E-01	3.04E-03	2.10E+00	4.78E-01	2.61E+02	1.77E+00	6.38E+00	1.21E+01	6.20E+00	6.55E-01	9.78E+00	1.89E+01	6.25E-02	4.26E-03	1.20E+00	2.24E+00	5.85E-02
DE	6.10E-01	7.94E-01	1.83E+00	1.82E+01	6.06E+00	1.65E-03	7.35E-01	8.20E-02	1.10E-01	3.03E-03	9.54E+01	4.31E+00	2.16E+02	9.96E+00	5.56E+00	5.38E+00	1.66E+01	4.50E+00	4.03E+00	5.51E+00	2.07E-01	1.34E-02	1.21E+00	2.98E+00	1.93E-01
DK	5.80E-02	9.97E-03	3.93E-01	3.51E-01	1.58E+00	5.72E-05	7.90E-02	8.04E-03	5.81E-03	9.12E-05	7.35E+00	2.71E+00	1.86E+01	1.13E+00	7.30E-01	5.75E-01	2.53E+00	3.03E+00	3.28E-01	4.05E-01	1.83E-02	1.47E-03	6.40E-02	1.54E-01	1.73E-02
EE	1.86E-01	4.67E-03	4.43E+00	7.43E-02	4.51E+01	7.69E-05	4.92E-01	5.22E-02	6.91E-02	6.32E-04	1.05E+00	1.58E+00	5.00E+01	4.77E-01	2.52E+00	2.03E+00	2.06E+01	4.84E+00	5.98E-01	1.02E+00	5.29E-02	3.86E-03	1.18E+00	1.91E+00	5.20E-02
ES	2.33E-01	9.01E-03	7.93E-02	3.68E-01	2.24E-01	1.47E-03	7.26E-02	9.46E-02	1.48E-01	1.73E-02	3.61E+00	3.68E-01	1.09E+01	2.35E+02	1.02E+00	2.16E+00	3.70E+00	2.28E-01	1.95E+00	5.49E-01	4.45E-02	2.49E-03	6.41E-01	6.51E-01	3.75E-02
FI	2.63E+00	1.05E-02	5.71E+00	1.81E-01	3.58E+01	2.15E-04	1.33E+00	1.11E-01	1.71E-01	1.22E-03	2.79E+00	1.21E+01	1.08E+02	1.13E+00	7.00E+00	5.50E+00	3.00E+02	4.33E+01	1.50E+00	2.65E+00	1.19E+00	6.51E-02	4.59E+00	6.73E+00	1.07E+00
FR	2.75E-01	1.27E-01	4.18E-01	5.64E+00	1.27E+00	1.77E-02	3.52E-01	1.11E-01	1.59E-01	1.02E-02	1.96E+01	1.49E+00	5.86E+01	4.16E+01	2.79E+00	2.88E+00	8.61E+00	1.14E+00	3.37E+00	1.85E+00	1.19E-01	5.42E-03	1.02E+00	1.58E+00	9.72E-02
GB	9.38E-02	8.66E-03	2.63E-01	4.38E-01	9.91E-01	1.30E-04	2.75E-02	3.73E-03	4.63E-03	3.25E-04	1.30E+01	3.23E+00	7.98E+00	1.36E+01	2.01E-01	2.41E-01	6.72E+00	1.44E+00	1.61E-01	1.73E-01	4.85E-02	2.79E-03	1.45E-01	1.51E-01	4.11E-02
GE	9.44E-01	1.97E-03	3.23E-02	3.65E-03	9.34E-02	1.12E-04	4.32E-01	1.74E-01	4.99E-01	2.86E-03	2.30E-02	2.88E-02	1.66E+00	2.03E-01	3.69E+00	3.76E+00	2.89E+01	3.72E-02	3.93E-01	1.51E-01	1.87E-01	9.93E-02	6.70E+01	4.83E+00	3.13E-01
GR	2.28E+00	4.68E-03	6.88E-02	1.78E-02	1.67E-01	4.89E-04	1.97E+00	1.27E+00	1.44E+01	1.19E-01	8.34E-02	5.25E-02	6.64E+00	2.15E+00	1.63E+01	3.13E+01	4.95E+01	5.34E-02	9.58E-01	7.76E-01	3.17E-01	5.14E-02	6.77E+01	1.25E+01	4.65E-01
HR	1.66E-01	1.32E-02	9.21E-02	4.67E-02	2.30E-01	1.74E-03	3.19E-01	1.97E+00	7.65E-01	2.80E-02	1.68E-01	8.17E-02	3.92E+01	3.04E+00	1.05E+01	4.82E+01	5.00E+00	1.12E-01	3.38E+01	6.24E+00	5.56E-02	4.58E-03	2.23E+00	1.58E+00	5.60E-02
HU	2.00E-01	3.23E-02	2.17E-01	8.70E-02	4.96E-01	1.41E-03	8.51E-01	3.72E+00	3.98E+00	2.21E-02	3.31E-01	2.00E-01	1.00E+02	2.88E+00	6.51E+01	1.68E+02	1.07E+01	2.26E-01	2.81E+01	4.19E+01	5.57E-02	4.82E-03	3.94E+00	4.81E+00	5.61E-02
IE	2.34E-02	2.69E-03	5.65E-02	1.05E-01	1.73E-01	8.06E-05	4.27E-03	8.93E-04	1.14E-03	1.35E-04	2.01E+00	4.42E-01	1.97E+00	1.82E+00	1.99E-02	2.51E-02	2.26E+00	1.52E-01	3.25E-02	2.90E-02	5.95E-03	5.48E-04	4.31E-02	3.01E-02	5.46E-03
IS	5.55E-02	3.52E-04	3.95E-02	1.61E-02	1.68E-01	1.59E-05	4.34E-03	1.70E-03	2.00E-03	7.02E-05	2.73E-01	1.23E+00	1.06E+00	7.77E-01	2.43E-02	2.66E-02	1.42E+00	3.05E-01	4.09E-02	2.27E-02	1.50E-02	6.40E-04	3.35E-02	2.39E-02	1.31E-02
IT	9.43E-01	1.74E-01	1.40E-01	1.78E-01	3.80E-01	2.11E-02	6.97E-01	3.50E+00	2.80E+00	2.04E-01	5.48E-01	1.89E-01	4.71E+01	1.28E+01	1.15E+01	3.21E+01	2.09E+01	2.09E-01	3.69E+01	4.25E+00	1.40E-01	2.03E-02	4.84E+00	4.53E+00	1.79E-01
KY	1.23E+02	5.80E-04	1.00E-02	1.42E-03	2.84E-02	3.48E-05	4.81E-02	2.15E-02	7.36E-02	9.31E-04	8.34E-03	1.82E-02	5.08E-01	1.81E-01	3.95E-01	3.75E-01	1.71E+01	1.50E-02	6.67E-02	2.90E-02	4.01E+02	1.75E+00	9.07E+00	8.09E-01	3.84E+02
KZ	3.62E+03	1.63E-02	1.03E+00	5.56E-02	3.01E+00	6.87E-04	7.46E+00	7.14E-01	2.10E+00	2.03E-02	4.87E-01	1.38E+00	5.61E+01	2.22E+00	4.69E+01	2.07E+01	2.25E+03	1.58E+00	2.84E+00	2.64E+00	5.73E+02	2.19E+01	1.76E+02	8.86E+01	6.66E+02
LI	8.58E-05	5.04E-02	1.22E-04	1.09E-03	3.74E-04	6.77E-06	8.94E-05	3.69E-05	6.31E-05	4.03E-06	2.23E-03	2.40E-04	1.58E-02	8.33E-03	1.01E-03	1.20E-03	2.41E-03	2.90E-04	3.35E-03	7.15E-04	2.79E-05	1.61E-06	4.92E-04	4.73E-04	2.46E-05
LT	6.23E-01	1.37E-02	4.92E+01	1.63E-01	3.56E+01	1.32E-04	1.51E+00	1.41E-01	2.17E-01	1.71E-03	2.24E+00	1.51E+00	1.88E+02	8.97E-01	8.09E+00	5.76E+00	2.93E+01	3.45E+00	1.64E+00	3.16E+00	8.61E-02	1.27E-02	1.71E+00	6.66E+00	1.13E-01
LU	1.74E-03	8.68E-04	5.79E-03	3.32E+00	2.09E-02	1.75E-05	3.29E-03	1.90E-04	2.86E-04	2.55E-05	4.14E-01	1.62E-02	5.07E-01	1.33E-01	1.88E-02	1.00E-02	7.03E-02	1.44E-02	7.35E-03	1.27E-02	9.07E-04	4.58E-05	4.52E-03	1.30E-02	7.40E-04
LV	4.20E-01	9.51E-03	1.83E+01	1.40E-01	2.25E+02	1.06E-04	1.02E+00	9.72E-02	1.43E-01	1.15E-03	2.01E+00	1.98E+00	1.16E+02	9.07E-01	5.12E+00	3.66E+00	3.19E+01	5.70E+00	1.09E+00	2.12E+00	8.60E-02	8.61E-03	1.91E+00	5.19E+00	9.04E-02
MC	1.76E-05	5.72E-06	4.27E-06	9.77E-06	1.31E-05	9.09E-05	1.01E-05	1.70E-05	2.53E-05	6.18E-07	2.06E-05	7.31E-06	9.40E-04	5.00E-04	1.79E-04	3.78E-04	4.20E-04	7.23E-06	5.68E-04	6.30E-05	2.16E-06	1.38E-07	8.71E-05	8.44E-05	2.02E-06
MD	1.38E+00	2.09E-03	1.69E-01	6.98E-03	3.15E-01	1.23E-04	5.55E+01	1.85E-01	5.58E-01	3.83E-03	4.86E-02	6.10E-02	1.12E+01	3.93E-01	4.47E+01	6.13E+00	5.42E+01	1.03E-01	5.84E-01	6.01E-01	1.79E-01	2.47E-02	1.13E+01	2.38E+01	2.42E-01
ME	7.71E-02	1.68E-03	1.23E-02	5.58E-03	2.61E-02	2.04E-04	9.75E-02	2.91E+01	1.02E+00	2.49E-02	2.28E-02	1.34E-02	2.70E+00	6.53E-01	1.86E+00	2.17E+01	2.58E+00	1.67E-02	3.99E-01	4.07E-01	7.76E-03	1.83E-03	8.41E-01	7.07E-01	1.28E-02
MK	2.08E-01	1.59E-03	1.73E-02	4.61E-03	4.06E-02	1.33E-04	2.73E-01	7.24E-01	4.77E+01	1.56E-02	2.10E-02	1.37E-02	2.61E+00	5.19E-01	4.24E+00	4.05E+01	6.20E+00	1.47E-02	3.88E-01	4.55E-01	2.53E-02	4.57E-03	5.47E+00	1.70E+00	3.53E-02
MT	5.19E-04	1.10E-05	8.18E-05	7.71E-05	1.38E-04	9.72E-07	6.64E-04	3.06E-03	2.49E-03	2.24E-02	2.10E-04	4.28E-05	1.33E-02	3.96E-03	7.19E-03	1.22E-02	8.82E-03	4.52E-05	2.39E-03	1.11E-03	2.17E-04	1.37E-05	5.75E-03	2.68E-03	1.87E-04
NL	2.82E-02	6.55E-03	6.21E-02	7.33E-01	2.09E-01	6.79E-05	1.73E-02	1.99E-03	2.17E-03	1.17E-04	9.11E+01	5.26E-01	5.15E+00	1.72E+00	1.23E-01	1.16E-01	1.12E+00	2.08E-01	1.03E-01	1.63E-01	1.30E-02	7.24E-04	6.07E-02	1.36E-01	1.07E-02
NO	1.53E+00	1.32E-02	1.30E+00	4.95E-01	5.50E+00	1.77E-04	2.68E-01	4.15E-02	5.74E-02	6.58E-04	8.77E+00	2.46E+02	5.17E+01	1.84E+00	1.56E+00	1.71E+00	6.74E+01	1.90E+01	6.62E-01	1.30E+00	5.95E-01	2.87E-02	1.43E+00	1.68E+00	4.81E-01
PL	2.06E+00	1.48E-01	9.25E+00	1.46E+00	1.85E+01	1.24E-03	5.55E+00	1.51E+00	1.80E+00	1.41E-02	1.30E+01	3.91E+00	4.26E+03	4.61E+00	5.48E+01	7.21E+01	6.81E+01	7.27E+00	2.01E+01	6.33E+01	5.13E-01	3.66E-02	8.37E+00	1.96E+01	5.33E-01
PT	1.34E-02	7.06E-04	7.98E-03	4.43E-02	2.31E-02	5.81E-05	3.84E-03	4.88E-03	7.57E-03	5.16E-04	4.97E-01	3.75E-02	5.94E-01	4.54E+02	4.95E-02	9.87E-02	1.93E-01	2.12E-02	7.42E-02	1.89E-02	6.72E-03	3.69E-04	4.87E-02	3.92E-02	5.65E-03
RO	4.12E+00	4.24E-02	8.18E-01	1.04E-01	1.67E+00	1.71E-03	3.48E+01	4.53E+00	8.95E+00	4.13E-02	4.87E-01	4.43E-01	9.91E+01	3.96E+00	1.03E+03	2.42E+02	1.91E+02	5.63E-01	1.50E+01	1.46E+01	7.34E-01	6.79E-02	6.80E+01	6.71E+01	8.53E-01
RS	7.53E-01	1.34E-02	2.04E-01	4.31E-02	4.59E-01	8.21E-04	1.44E+00	1.56E+01	2.67E+01	3.64E-02	2.16E-01	1.35E-01	3.97E+01	1.71E+00	6.45E+01	8.07E+02	3.01E+01	1.72E-01	4.83E+00	8.57E+00	1.81E-01	1.66E-02	1.03E+01	8.82E+00	1.97E-01
RU	2.71E+03	1.37E-01	3.61E+01	9.62E-01	1.69E+02	3.94E-03	5.58E+01	4.46E+00	1.10E+01	1.05E-01	9.98E+00	3.32E+01	8.30E+02	1.46E+01	2.85E+02	1.36E+02	2.54E+04	5.40E+01	2.20E+01	2.87E+01	3.27E+02	2.07E+01	6.64E+02	7.26E+02	3.08E+02
SE	1.96E+00	3.04E-02	6.54E+00	6.91E-01	3.33E+01	3.20E-04	1.41E+00	1.96E-01	1.87E-01	1.28E-03	1.27E+01	6.17E+01	1.66E+02	3.01E+00	7.37E+00	7.78E+00	1.52E+02	1.98E+02	2.05E+00	3.23E+00	6.68E-01	4.26E-02	2.62E+00	8.16E+00	5.91E-01
SI	4.91E-02	8.99E-03	3.63E-02	2.42E-02	9.23E-02	8.68E-04	1.09E-01	1.65E-01	9.23E-02	4.83E-03	7.25E-02	3.49E-02	1.44E+01	1.10E+00	2.51E+00	5.83E+00	1.42E+00	4.94E-02	1.06E+02	1.63E+00	1.58E-02	1.41E-03	6.20E-01	4.76E-01	1.60E-02
SK	1.35E-01	3.53E-02	2.43E-01	1.05E-01	5.64E-01	6.35E-04	5.89E-01	1.20E+00	1.11E+00	7.59E-03	3.96E-01	1.98E-01	2.63E+02	1.28E+00	2.35E+01	5.59E+01	6.19E+00	2.51E-01	1.18E+01	1.14E+02	3.10E-02	3.03E-03	1.54E+00	2.54E+00	3.29E-02
TJ	2.81E+01	3.37E-04	6.04E-03	7.51E-04	1.63E-02	2.01E-05	2.72E-02	1.28E-02	4.47E-02	4.15E-04	4.71E-03	9.88E-03	2.88E-01	1.06E-01	2.10E-01	2.11E-01	1.02E+01	8.13E-03	3.50E-02	1.55E-02	1.14E+03	1.72E+00	4.78E+00	5.33E-01	1.26E+02
TM	3.04E+01	5.07E-04	2.38E-02	1.39E-03	7.22E-02	2.94E-05	1.14E-01	2.61E-02	8.84E-02	6.68E-04	8.96E-03	2.59E-02	7.83E-01	1.17E-01	7.98E-01	5.65E-01	3.57E+01	2.94E-02	7.11E-02	4.11E-02	6.37E+01	1.68E+01	1.15E+01	1.51E+00	6.36E+01
TR	1.01E+01	1.42E-02	5.21E-01	3.99E-02	1.20E+00	1.02E-03	1.03E+01	1.60E+00	5.56E+00	1.37E-01	2.72E-01	3.38E-01	2.43E+01	4.16E+00	5.54E+01	3.44E+01	4.74E+02	3.77E-01	2.67E+00	1.83E+00	1.60E+00	4.23E-01	3.00E+03	1.02E+02	2.05E+00
UA	3.59E+01	7.01E-02	5.49E+00	2.98E-01	1.14E+01	2.06E-03	9.16E+01	3.26E+00	6.26E+00	6.03E-02	1.85E+00	1.97E+00	5.92E+02	4.58E+00	3.26E+02	1.29E+02	1.75E+03	2.99E+00	1.67E+01	3.31E+01	4.08E+00	8.28E-01	2.11E+02	1.02E+03	6.24E+00
UZ	1.11E+02	8.58E-04	4.75E-02	3.77E-03	1.20E-01	4.46E-05	2.82E-01	3.79E-02	1.28E-01	1.22E-03	3.72E-02	4.84E-02	2.56E+00	2.04E-01	1.95E+00	9.00E-01	6.79E+01	5.42E-02	1.11E-01	1.07E-01	3.97E+02	6.68E+00	1.54E+01	3.46E+00	4.86E+02

Table B4. *Source-receptor matrix of Hg deposition to EMEP countries in 2023, kg/year. 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	3.74E+00	2.06E-03	4.00E-01	1.26E-02	1.20E+00	5.63E-02	1.52E+00	3.79E-02	2.61E-01	1.68E-03	7.44E-01	8.40E-01	1.68E-02	1.07E-02	2.07E+00	1.25E-02	8.81E-01	2.05E-01	1.40E-02	4.02E+00	4.34E-01	5.93E-01	1.80E-02	4.44E-04	1.30E+01	3.50E-04
AM	7.67E-03	2.71E+00	8.01E-02	3.23E+00	7.86E-02	2.00E-02	1.32E-01	2.92E-02	6.15E-02	2.73E-02	2.00E-01	3.00E-01	1.40E-02	2.19E-02	2.01E-01	1.99E-02	1.20E-01	1.09E-01	4.02E+00	1.80E-01	3.54E-02	6.94E-02	6.69E-03	3.75E-04	5.44E-01	1.47E-03
AT	3.74E-02	1.74E-03	8.56E+01	1.40E-02	1.81E+00	7.63E-01	6.48E-01	1.39E-01	1.41E+01	2.08E-03	3.34E+01	4.32E+01	1.89E-01	5.21E-02	4.05E+00	5.76E-02	6.84E+00	2.02E+00	1.08E-02	2.90E-01	2.60E+00	5.56E+00	1.35E-01	3.12E-03	2.88E+01	9.88E-04
AZ	1.01E-02	8.91E-01	1.37E-01	2.01E+01	1.26E-01	3.99E-02	2.30E-01	7.25E-02	1.01E-01	2.84E-02	3.90E-01	6.05E-01	3.70E-02	5.95E-02	3.22E-01	6.44E-02	2.05E-01	2.54E-01	4.21E+00	2.39E-01	5.50E-02	1.25E-01	1.45E-02	1.09E-03	8.02E-01	1.32E-02
BA	4.38E-01	2.29E-03	4.32E+00	1.73E-02	8.81E+01	1.76E-01	1.38E+00	1.10E-01	9.06E-01	2.92E-03	8.10E+00	4.81E+00	7.19E-02	3.24E-02	3.62E+00	4.12E-02	2.32E+00	7.13E-01	1.40E-02	1.42E+00	7.46E+00	9.32E+00	5.33E-02	1.36E-03	2.93E+01	1.55E-03
BE	7.63E-04	1.78E-04	1.44E-01	1.31E-03	2.49E-02	5.27E+01	1.89E-02	2.54E-02	6.08E-01	4.93E-05	1.25E+00	2.28E+01	1.92E-01	2.53E-02	2.46E+00	3.52E-02	1.96E+01	1.20E+01	9.03E-04	7.98E-03	2.11E-02	5.55E-02	3.64E-01	6.30E-03	5.18E-01	2.22E-04
BG	3.20E-01	2.34E-02	2.37E+00	1.42E-01	4.13E+00	2.18E-01	8.41E+01	4.40E-01	9.58E-01	3.19E-02	5.21E+00	4.90E+00	1.28E-01	1.29E-01	3.20E+00	1.47E-01	1.86E+00	1.02E+00	1.68E-01	9.85E+00	1.12E+00	4.42E+00	6.81E-02	3.14E-03	1.24E+01	1.24E-02
BY	8.62E-02	1.62E-02	5.58E+00	1.48E-01	3.67E+00	1.73E+00	3.15E+00	4.08E+01	2.67E+00	3.96E-03	2.84E+01	4.23E+01	2.21E+00	2.92E+00	4.19E+00	1.50E+00	5.28E+00	8.75E+00	1.13E-01	1.44E+00	1.54E+00	7.13E+00	4.42E-01	1.97E-02	1.06E+01	1.92E-02
CH	5.23E-03	2.58E-04	1.52E+00	2.27E-03	1.78E-01	4.77E-01	6.97E-02	2.11E-02	4.11E+01	2.55E-04	1.74E+00	9.83E+00	4.54E-02	7.92E-03	3.96E+00	1.21E-02	1.08E+01	1.23E+00	1.97E-03	4.67E-02	2.82E-01	2.12E-01	1.01E-01	1.87E-03	1.83E+01	1.91E-04
CY	1.23E-02	9.08E-04	3.64E-02	3.32E-03	6.90E-02	6.11E-03	1.36E-01	3.96E-03	3.39E-02	4.57E-01	5.72E-02	7.14E-02	2.07E-03	1.14E-03	9.60E-02	1.67E-03	7.69E-02	2.77E-02	4.07E-03	4.55E-01	3.10E-02	2.79E-02	2.29E-03	7.98E-05	7.61E-01	1.50E-04
CZ	2.98E-02	1.70E-03	1.58E+01	1.50E-02	1.69E+00	1.66E+00	4.91E-01	2.34E-01	5.31E+00	1.38E-03	2.69E+02	9.06E+01	4.87E-01	1.49E-01	2.88E+00	1.58E-01	6.75E+00	4.22E+00	1.01E-02	1.97E-01	1.06E+00	5.29E+00	2.13E-01	5.64E-03	7.02E+00	1.28E-03
DE	1.62E-02	3.21E-03	1.54E+01	3.07E-02	6.61E-01	4.39E+01	4.12E-01	7.88E-01	3.47E+01	1.11E-03	1.10E+02	9.66E+02	6.16E+00	5.96E-01	1.65E+01	6.69E-01	7.27E+01	7.06E+01	1.88E-02	1.64E-01	5.42E-01	2.41E+00	2.57E+00	5.00E-02	1.27E+01	4.45E-03
DK	6.16E-04	4.24E-04	3.96E-01	3.98E-03	4.89E-02	2.47E+00	1.37E-02	1.18E-01	5.51E-01	7.75E-05	3.78E+00	2.72E+01	1.90E+01	2.53E-01	1.31E+00	2.61E-01	3.09E+00	1.60E+01	2.30E-03	8.49E-03	3.61E-02	1.47E-01	5.57E-01	1.39E-02	3.90E-01	7.06E-04
EE	4.31E-03	1.09E-03	5.80E-01	7.65E-03	2.26E-01	6.21E-01	1.17E-01	8.24E-01	3.64E-01	2.57E-04	3.92E+00	9.55E+00	1.25E+00	2.69E+01	8.18E-01	3.71E+00	1.19E+00	3.78E+00	9.94E-03	3.62E-02	1.12E-01	4.49E-01	1.58E-01	8.02E-03	8.99E-01	9.49E-04
ES	6.85E-02	3.73E-03	2.03E+00	2.11E-02	1.73E+00	3.24E+00	6.69E-01	1.26E-01	2.42E+00	2.23E-03	6.17E+00	1.74E+01	4.25E-01	4.16E-02	3.32E+02	6.40E-02	2.40E+01	1.08E+01	3.54E-02	9.10E-01	1.40E+00	1.45E+00	9.76E-01	1.68E-02	2.10E+01	2.48E-03
FI	1.47E-02	7.52E-03	2.14E+00	5.38E-02	7.82E-01	2.62E+00	4.40E-01	2.11E+00	1.31E+00	1.04E-03	1.31E+01	3.11E+01	4.42E+00	1.89E+01	2.80E+00	9.52E+01	4.71E+00	1.50E+01	3.92E-02	1.74E-01	4.18E-01	1.97E+00	6.28E-01	4.11E-02	3.11E+00	1.14E-02
FR	5.99E-02	3.14E-03	5.16E+00	2.11E-02	1.91E+00	2.69E+01	6.07E-01	2.97E-01	2.30E+01	2.06E-03	2.20E+01	9.78E+01	1.27E+00	1.69E-01	9.67E+01	2.40E-01	3.45E+02	5.19E+01	2.32E-02	6.35E-01	1.72E+00	1.93E+00	3.76E+00	5.32E-02	3.91E+01	2.80E-03
GB	2.33E-03	1.38E-03	3.43E-01	1.00E-02	7.22E-02	6.40E+00	3.52E-02	1.19E-01	7.69E-01	2.33E-04	2.56E+00	1.96E+01	1.98E+00	2.24E-01	8.15E+00	3.22E-01	1.59E+01	4.87E+02	6.81E-03	2.72E-02	5.41E-02	1.08E-01	1.53E+01	1.07E-01	9.40E-01	9.99E-04
GE	3.84E-02	8.29E-01	3.94E-01	2.07E+00	5.77E-01	5.53E-02	1.29E+00	9.10E-02	2.97E-01	5.50E-02	7.26E-01	9.59E-01	4.66E-02	5.15E-02	6.37E-01	5.09E-02	4.54E-01	2.99E-01	1.67E+01	1.10E+00	2.23E-01	3.11E-01	2.12E-02	1.53E-03	2.74E+00	4.63E-03
GR	7.76E-01	1.84E-02	1.35E+00	1.15E-01	2.76E+00	2.13E-01	1.27E+01	1.92E-01	8.92E-01	2.39E-02	2.70E+00	3.20E+00	7.84E-02	5.47E-02	4.31E+00	6.70E-02	2.49E+00	9.15E-01	1.22E-01	8.07E+01	1.02E+00	1.83E+00	7.22E-02	2.21E-03	2.40E+01	7.54E-03
HR	2.21E-01	1.62E-03	7.96E+00	1.20E-02	1.90E+01	1.97E-01	9.26E-01	8.76E-02	1.05E+00	1.94E-03	9.77E+00	5.66E+00	7.50E-02	2.60E-02	4.50E+00	3.42E-02	2.94E+00	7.45E-01	9.25E-03	7.60E-01	2.39E+01	1.22E+01	5.86E-02	1.45E-03	3.55E+01	1.40E-03
HU	3.10E-01	2.45E-03	1.75E+01	1.86E-02	1.48E+01	3.50E-01	3.68E+00	2.36E-01	2.27E+00	2.04E-03	2.27E+01	1.25E+01	1.60E-01	6.88E-02	4.01E+00	6.91E-02	3.24E+00	1.15E+00	1.58E-02	1.63E+00	6.00E+00	7.92E+01	7.42E-02	2.33E-03	2.30E+01	1.70E-03
IE	7.34E-04	2.66E-04	7.69E-02	2.99E-03	2.36E-02	9.14E-01	8.71E-03	3.13E-02	2.40E-01	5.21E-05	5.86E-01	3.87E+00	1.44E-01	3.28E-02	1.79E+00	4.73E-02	2.21E+00	2.30E+01	1.64E-03	7.43E-03	2.16E-02	2.43E-02	2.63E+01	3.80E-02	3.71E-01	2.11E-04
IS	7.58E-04	3.02E-04	5.41E-02	2.05E-03	3.33E-02	2.56E-01	1.18E-02	3.10E-02	7.45E-02	5.11E-05	4.17E-01	1.92E+00	2.02E-01	7.14E-02	5.14E-01	1.22E-01	5.25E-01	4.60E+00	1.60E-03	6.09E-03	2.42E-02	3.95E-02	4.37E-01	1.45E+00	2.21E-01	6.43E-04
IT	9.97E-01	1.09E-02	1.33E+01	6.98E-02	1.80E+01	8.75E-01	3.10E+00	2.66E-01	1.36E+01	7.02E-03	1.43E+01	1.71E+01	2.27E-01	7.62E-02	2.52E+01	1.14E-01	2.41E+01	3.35E+00	6.86E-02	5.83E+00	1.60E+01	7.46E+00	3.14E-01	6.23E-03	5.44E+02	6.25E-03
KY	1.78E-02	1.26E-01	2.53E-01	9.66E-01	2.33E-01	7.48E-02	2.80E-01	8.34E-02	2.37E-01	2.14E-02	6.26E-01	1.06E+00	4.54E-02	8.01E-02	7.45E-01	9.39E-02	4.33E-01	4.07E-01	4.92E-01	3.15E-01	1.02E-01	1.91E-01	2.58E-02	1.71E-03	1.56E+00	8.71E+00
KZ	3.43E-01	1.99E+00	5.15E+00	1.70E+01	6.34E+00	1.66E+00	8.53E+00	2.58E+00	4.05E+00	1.81E-01	1.50E+01	2.44E+01	1.45E+00	2.29E+00	1.09E+01	3.09E+00	7.74E+00	1.04E+01	8.64E+00	6.60E+00	1.99E+00	4.55E+00	6.56E-01	6.57E-02	2.62E+01	1.56E+01
LI	1.71E-05	1.15E-06	1.50E-02	1.01E-05	6.85E-04	2.33E-03	2.78E-04	9.78E-05	3.20E-01	9.74E-07	7.78E-03	7.23E-02	2.52E-04	4.17E-05	1.61E-02	6.79E-05	3.85E-02	6.18E-03	8.39E-06	1.74E-04	1.20E-03	8.73E-04	4.58E-04	9.45E-06	7.01E-02	1.00E-06
LT	1.61E-02	3.49E-03	1.55E+00	2.98E-02	5.95E-01	1.03E+00	4.65E-01	5.18E+00	9.01E-01	6.06E-04	1.07E+01	2.20E+01	2.02E+00	1.35E+00	1.51E+00	6.46E-01	2.22E+00	5.84E+00	2.19E-02	1.37E-01	2.83E-01	1.23E+00	2.48E-01	9.92E-03	2.15E+00	3.12E-03
LU	8.49E-05	1.30E-05	1.84E-02	9.59E-05	2.71E-03	9.59E-01	2.02E-03	2.32E-03	9.38E-02	5.35E-06	2.15E-01	2.19E+00	1.13E-02	1.63E-03	2.80E-01	2.25E-03	1.97E+00	4.64E-01	6.94E-05	9.31E-04	2.40E-03	7.56E-03	2.08E-02	3.70E-04	6.95E-02	1.59E-05
LV	1.00E-02	2.36E-03	1.11E+00	1.63E-02	4.07E-01	9.69E-01	2.94E-01	2.39E+00	6.79E-01	5.08E-04	8.19E+00	1.83E+01	1.99E+00	5.02E+00	1.41E+00	1.56E+00	1.94E+00	5.63E+00	1.54E-02	9.09E-02	2.00E-01	8.71E-01	2.41E-01	1.11E-02	1.59E+00	2.03E-03
MC	6.62E-06	1.97E-07	2.24E-04	1.53E-06	1.63E-04	3.09E-05	6.23E-05	7.80E-06	3.98E-04	2.20E-07	3.42E-04	5.06E-04	6.25E-06	2.46E-06	1.12E-03	3.50E-06	5.07E-03	1.01E-04	1.74E-06	5.93E-05	1.79E-04	1.27E-04	1.17E-05	1.86E-07	6.92E-03	1.01E-07
MD	2.93E-02	1.97E-02	5.63E-01	9.19E-02	5.96E-01	7.50E-02	1.83E+00	4.27E-01	2.35E-01	2.84E-03	1.55E+00	1.78E+00	7.05E-02	8.57E-02	6.65E-01	7.39E-02	4.49E-01	3.79E-01	9.52E-02	6.69E-01	2.12E-01	8.88E-01	2.11E-02	1.30E-03	2.07E+00	1.17E-02
ME	6.96E-01	8.05E-04	3.92E-01	5.58E-03	3.94E+00	3.66E-02	5.12E-01	2.36E-02	2.03E-01	8.50E-04	7.78E-01	6.67E-01	1.20E-02	6.31E-03	1.23E+00	7.98E-03	6.10E-01	1.39E-01	5.05E-03	9.57E-01	4.80E-01	7.77E-01	1.24E-02	3.19E-04	9.45E+00	1.81E-04
MK	6.37E-01	2.21E-03	4.07E-01	1.49E-02	8.15E-01	4.03E-02	3.90E+00	3.92E-02	2.01E-01	2.59E-03	8.49E-01	7.85E-01	1.53E-02	1.20E-02	9.68E-01	1.42E-02	4.72E-01	1.60E-01	1.61E-02	5.03E+00	2.58E-01	7.59E-01	1.22E-02	3.98E-04	4.79E+00	7.01E-04
MT	7.83E-04	1.22E-05	2.46E-03	7.29E-05	6.39E-03	5.64E-04	3.63E-03	1.52E-04	2.31E-03	3.67E-06	4.16E-03	5.26E-03	1.41E-04	5.39E-05	1.36E-02	7.31E-05	1.15E-02	2.41E-03	6.00E-05	1.06E-02	3.07E-03	1.90E-03	2.77E-04	6.11E-06	1.84E-01	1.78E-05
NL	5.96E-04	2.93E-04	1.81E-01	2.52E-03	2.41E-02	2.57E+01	1.24E-02	3.38E-02	4.46E-01	5.52E-05	1.29E+00	2.93E+01	4.48E-01	3.14E-02	1.90E+00	5.43E-02	9.59E+00	2.33E+01	1.57E-03	7.16E-03	1.89E-02	5.65E-02	5.65E-01	9.14E-03	3.87E-01	2.52E-04
NO	7.62E-03	7.73E-03	1.49E+00	5.20E-02	3.39E-01	4.51E+00	1.98E-01	7.82E-01	1.50E+00	1.19E-03	1.27E+01	4.19E+01	8.90E+00	2.20E+00	3.79E+00	5.26E+00	7.15E+00	4.29E+01	4.42E-02	1.40E-01	2.32E-01	8.85E-01	1.88E+00	1.43E-01	2.37E+00	1.31E-02
PL	1.34E-01	8.69E-03	1.75E+01	8.54E-02	6.34E+00	6.39E+00	2.80E+00	6.31E+00	7.64E+00	5.17E-03	1.97E+02	2.82E+02	5.33E+00	1.61E+00	8.42E+00	1.41E+00	1.48E+01	2.49E+01	5.89E-02	1.10E+00	3.07E+00	1.65E+01	1.09E+00	3.29E-02	1.83E+01	1.03E-02
PT	5.84E-03	4.72E-04	1.80E-01	2.46E-03	1.21E-01	4.80E-01	5.63E-02	1.24E-02	2.56E-01	1.71E-04	6.89E-01	2.40E+00	5.45E-02	5.50E-03	1.44E+01	8.04E-03	2.02E+00	1.86E+00	3.37E-03	7.32E-02	8.31E-02	9.16E-02	1.32E-01	2.68E-03	1.14E+00	3.26E-04
RO	4.96E-01	7.24E-02	9.91E+00	2.84E-01	1.36E+01	5.70E-01	1.89E+01	1.35E+00	3.03E+00	2.46E-02	1.71E+01	1.57E+01	3.41E-01	3.40E-01	6.53E+00	3.42E-01	4.72E+00	2.38E+00	3.56E-01	5.21E+00	4.10E+00	2.49E+01	1.52E-01	7.37E-03	2.85E+01	4.89E-02
RS	8.34E-01	7.49E-03	4.31E+00	4.23E-02	1.67E+01	2.19E-01	1.07E+01	2.18E-01	1.07E+00	4.37E-03	9.24E+00	6.13E+00	1.05E-01	7.03E-02	2.97E+00	8.14E-02	1.99E+00	8.43E-01	4.66E-02	3.94E+00	2.98E+00	1.51E+01	5.69E-02	1.96E-03	1.80E+01	4.33E-03
RU	8.35E-01	3.33E+00	2.55E+01	2.83E+01	1.97E+01	1.30E+01	3.17E+01	3.35E+01	1.67E+01	4.38E-01	1.02E+02	1.87E+02	1.65E+01	5.29E+01	3.99E+01	6.96E+01	3.79E+01	7.90E+01	2.05E+01	2.19E+01	7.95E+00	2.62E+01	4.26E+00	4.02E-01	8.42E+01	6.72E+00
SE	1.64E-02	1.15E-02	2.81E+00	8.16E-02	9.76E-01	5.69E+00	4.80E-01	2.13E+00	2.34E+00	1.44E-03	2.32E+01	7.86E+01	2.37E+01	9.86E+00	5.07E+00	2.75E+01	8.79E+00	4.27E+01	7.08E-02	2.38E-01	4.91E-01	1.90E+00	1.69E+00	8.44E-02	3.90E+00	1.11E-02
SI	2.32E-02	5.17E-04	7.34E+00	3.78E-03	1.21E+00	1.06E-01	2.60E-01	3.39E-02	6.63E-01	5.25E-04	3.55E+00	3.02E+00	3.22E-02	9.75E-03	1.58E+00	1.23E-02	1.18E+00	3.47E-01	2.71E-03	1.37E-01	5.85E+00	2.39E+00	2.52E-02	5.63E-04	1.63E+01	2.42E-04
SK	8.58E-02	1.48E-03	1.03E+01	1.30E-02	5.01E+00	3.69E-01	1.35E+00	1.74E-01	2.08E+00	9.92E-04	3.52E+01	1.39E+01	1.59E-01	5.95E-02	2.19E+00	6.45E-02	2.48E+00	1.12E+00	9.08E-03	5.39E-01	2.13E+00	2.07E+01	6.54E-02	2.22E-03	9.81E+00	1.03E-03
TJ	9.47E-03	6.48E-02	1.28E-01	5.11E-01	1.21E-01	3.93E-02	1.52E-01	4.69E-02	1.25E-01	1.15E-02	3.27E-01	5.56E-01	2.40E-02	4.77E-02	3.89E-01	4.94E-02	2.27E-01	2.13E-01	2.44E-01	1.71E-01	5.25E-02	9.72E-02	1.38E-02	8.67E-04	8.15E-01	2.49E-01
TM	2.16E-02	2.68E-01	3.90E-01	3.47E+00	3.22E-01	1.34E-01	4.65E-01	2.14E-01	3.25E-01	3.18E-02	1.19E+00	2.01E+00	1.25E-01	2.53E-01	9.24E-01	2.62E-01	6.34E-01	9.05E-01	1.14E+00	4.17E-01	1.40E-01	3.29E-01	5.61E-02	4.19E-03	1.90E+00	3.39E-01
TR	5.74E-01	1.93E+00	3.91E+00	4.08E+00	4.95E+00	7.57E-01	2.02E+01	1.09E+00	2.91E+00	1.57E+00	8.12E+00	1.09E+01	4.66E-01	4.08E-01	1.13E+01	4.19E-01	6.35E+00	3.56E+00	4.79E+00	2.44E+01	2.08E+00	3.96E+00	2.53E-01	1.17E-02	3.94E+01	4.24E-02
UA	4.46E-01	2.69E-01	1.29E+01	2.08E+00	1.27E+01	2.00E+00	1.82E+01	1.10E+01	5.15E+00	9.31E-02	4.46E+01	5.03E+01	1.92E+00	2.35E+00	1.10E+01	1.77E+00	9.16E+00	9.73E+00	2.05E+00	9.51E+00	4.51E+00	2.50E+01	5.50E-01	2.72E-02	3.76E+01	1.26E-01
UZ	3.92E-02	2.66E-01	4.81E-01	2.59E+00	6.12E-01	1.59E-01	7.00E-01	2.52E-01	3.89E-01	3.27E-02	1.41E+00	2.37E+00	1.32E-01	2.66E-01	1.16E+00	2.92E-01	7.74E-01	1.02E+00	1.09E+00	4.94E-01	1.89E-01	3.89E-01	6.31E-02	4.71E-03	2.54E+00	1.03E+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	1.50E-01	1.28E-04	1.53E-02	2.74E-02	4.34E-03	5.78E-04	2.99E-02	5.22E-01	5.48E+00	6.54E-03	2.63E-02	1.08E-02	1.12E+00	2.04E-01	1.92E+00	6.28E+00	2.23E+00	1.54E-02	1.73E-01	3.26E-01	3.99E-03	4.02E-03	2.81E+00	9.79E-01	1.04E-02
AM	6.56E-01	3.21E-05	1.59E-02	7.55E-03	6.53E-03	7.49E-05	1.66E-02	1.23E-02	6.05E-02	1.81E-04	1.25E-02	7.99E-03	4.64E-01	2.51E-02	3.99E-01	1.94E-01	4.43E+00	1.73E-02	3.00E-02	5.48E-02	2.60E-02	1.42E-01	1.59E+01	1.11E+00	1.31E-01
AT	1.68E-01	2.28E-02	8.27E-02	5.43E-01	2.74E-02	2.35E-03	4.28E-02	1.35E-01	2.58E-01	6.95E-04	3.72E-01	6.00E-02	1.89E+01	4.08E-01	4.08E+00	4.75E+00	3.47E+00	9.85E-02	1.12E+01	6.06E+00	8.94E-03	4.88E-03	2.99E+00	1.59E+00	1.80E-02
AZ	3.19E+00	5.27E-05	4.23E-02	1.41E-02	1.81E-02	1.15E-04	3.53E-02	1.85E-02	9.16E-02	2.72E-04	2.71E-02	2.51E-02	1.04E+00	3.93E-02	7.97E-01	3.27E-01	1.65E+01	5.35E-02	4.85E-02	1.06E-01	2.22E-01	7.58E-01	1.50E+01	2.90E+00	7.00E-01
BA	2.39E-01	5.52E-04	5.23E-02	9.82E-02	1.52E-02	1.90E-03	5.45E-02	2.70E+00	1.01E+00	5.17E-03	9.38E-02	3.13E-02	8.42E+00	3.59E-01	7.49E+00	2.57E+01	3.82E+00	5.13E-02	1.26E+00	3.81E+00	1.20E-02	5.93E-03	2.90E+00	1.82E+00	2.45E-02
BE	2.29E-02	2.02E-04	2.41E-02	8.31E+00	9.70E-03	2.86E-04	5.01E-03	2.84E-03	7.31E-03	3.96E-05	5.42E+00	6.50E-02	1.50E+00	2.43E-01	1.64E-01	6.63E-02	5.81E-01	6.58E-02	2.12E-02	6.13E-02	2.97E-03	6.54E-04	5.85E-02	1.24E-01	4.60E-03
BG	2.43E+00	5.26E-04	1.71E-01	1.02E-01	4.63E-02	1.26E-03	1.10E+00	7.55E-01	6.10E+00	4.55E-03	1.37E-01	7.80E-02	1.02E+01	3.32E-01	7.11E+01	3.65E+01	3.06E+01	1.41E-01	7.57E-01	2.42E+00	8.44E-02	4.80E-02	3.70E+01	1.56E+01	1.98E-01
BY	2.70E+00	2.04E-03	1.07E+01	6.19E-01	2.10E+00	1.42E-03	1.22E+00	3.53E-01	9.68E-01	1.58E-03	1.40E+00	8.12E-01	1.54E+02	4.64E-01	2.15E+01	1.14E+01	8.78E+01	2.31E+00	1.54E+00	7.01E+00	1.84E-01	8.22E-02	1.57E+01	4.21E+01	4.22E-01
CH	4.67E-02	4.65E-02	1.37E-02	3.61E-01	4.33E-03	2.62E-03	6.10E-03	1.80E-02	4.19E-02	1.71E-04	2.01E-01	2.15E-02	1.63E+00	3.63E-01	3.81E-01	3.52E-01	7.55E-01	2.42E-02	3.42E-01	1.86E-01	2.47E-03	9.25E-04	3.94E-01	2.20E-01	4.80E-03
CY	3.44E-02	1.87E-05	1.69E-03	2.48E-03	4.83E-04	6.21E-05	5.24E-03	1.40E-02	7.32E-02	4.57E-04	3.08E-03	1.49E-03	9.11E-02	1.00E-02	1.95E-01	1.16E-01	3.45E-01	1.95E-03	1.65E-02	1.86E-02	1.20E-03	9.31E-04	6.18E+00	1.39E-01	2.51E-03
CZ	1.72E-01	4.32E-03	1.75E-01	1.13E+00	6.52E-02	8.27E-04	6.12E-02	1.10E-01	2.20E-01	4.33E-04	8.90E-01	1.25E-01	7.62E+01	3.09E-01	4.37E+00	4.90E+00	4.01E+00	2.45E-01	1.50E+00	1.16E+01	1.36E-02	5.28E-03	2.11E+00	1.86E+00	2.49E-02
DE	6.18E-01	3.41E-02	7.88E-01	2.56E+01	2.92E-01	2.58E-03	8.88E-02	6.06E-02	1.56E-01	4.90E-04	3.29E+01	9.72E-01	7.79E+01	1.72E+00	3.56E+00	2.43E+00	1.21E+01	1.73E+00	8.76E-01	3.05E+00	5.10E-02	1.66E-02	1.49E+00	2.73E+00	9.56E-02
DK	9.73E-02	2.94E-04	2.34E-01	4.51E-01	1.13E-01	1.03E-04	5.82E-03	3.10E-03	6.33E-03	2.07E-05	2.82E+00	5.84E-01	6.95E+00	1.89E-01	1.75E-01	1.74E-01	1.90E+00	1.77E+00	5.51E-02	1.79E-01	7.65E-03	3.01E-03	9.24E-02	1.88E-01	1.60E-02
EE	1.11E-01	2.23E-04	1.98E+00	1.44E-01	2.25E+00	1.86E-04	4.55E-02	1.94E-02	4.69E-02	7.08E-05	5.53E-01	4.50E-01	1.62E+01	1.10E-01	1.00E+00	7.01E-01	1.35E+01	2.06E+00	1.36E-01	5.01E-01	9.28E-03	2.39E-03	6.75E-01	1.10E+00	1.64E-02
ES	8.82E-01	8.16E-04	7.71E-02	1.05E+00	2.49E-02	4.77E-03	3.75E-02	1.56E-01	4.51E-01	3.38E-03	1.36E+00	1.75E-01	7.79E+00	3.51E+01	2.42E+00	2.23E+00	7.44E+00	1.67E-01	1.10E+00	1.09E+00	2.98E-02	8.18E-03	2.39E+00	1.84E+00	6.18E-02
FI	2.38E+00	7.92E-04	3.09E+00	6.16E-01	2.13E+00	6.44E-04	1.55E-01	5.67E-02	1.55E-01	2.45E-04	2.22E+00	4.23E+00	4.88E+01	3.55E-01	3.69E+00	2.40E+00	8.70E+01	1.69E+01	4.82E-01	2.16E+00	1.83E-01	3.65E-02	2.04E+00	4.63E+00	3.11E-01
FR	5.83E-01	4.96E-03	2.12E-01	1.06E+01	7.56E-02	2.55E-02	6.67E-02	1.79E-01	3.81E-01	2.32E-03	7.12E+00	4.98E-01	2.26E+01	7.46E+00	3.35E+00	2.71E+00	8.84E+00	4.92E-01	1.49E+00	1.87E+00	3.66E-02	8.88E-03	2.12E+00	2.25E+00	6.24E-02
GB	1.46E-01	3.11E-04	1.51E-01	7.01E-01	7.21E-02	3.74E-04	8.84E-03	6.91E-03	1.75E-02	1.10E-04	4.59E+00	9.72E-01	3.99E+00	1.61E+00	2.40E-01	1.55E-01	3.44E+00	8.04E-01	5.34E-02	1.26E-01	1.61E-02	3.99E-03	2.27E-01	2.78E-01	2.37E-02
GE	9.39E-01	1.71E-04	4.54E-02	2.29E-02	1.88E-02	3.60E-04	1.23E-01	8.76E-02	4.91E-01	7.44E-04	3.59E-02	3.40E-02	1.65E+00	7.99E-02	3.16E+00	1.58E+00	1.76E+01	5.69E-02	1.79E-01	2.22E-01	4.78E-02	1.26E-01	7.45E+01	4.52E+00	1.52E-01
GR	1.44E+00	4.19E-04	6.79E-02	9.86E-02	1.93E-02	1.61E-03	3.41E-01	5.51E-01	1.03E+01	1.91E-02	1.09E-01	5.08E-02	4.68E+00	4.24E-01	1.29E+01	1.26E+01	1.54E+01	7.22E-02	5.53E-01	1.06E+00	5.86E-02	3.51E-02	3.73E+01	7.08E+00	1.26E-01
HR	1.45E-01	6.57E-04	4.28E-02	1.11E-01	1.31E-02	2.59E-03	3.72E-02	4.65E-01	5.61E-01	3.42E-03	1.04E-01	3.12E-02	9.24E+00	4.51E-01	5.37E+00	1.74E+01	2.27E+00	4.90E-02	5.74E+00	4.24E+00	1.07E-02	4.22E-03	1.87E+00	1.14E+00	1.94E-02
HU	2.15E-01	1.63E-03	1.14E-01	2.13E-01	3.36E-02	2.12E-03	9.68E-02	1.28E+00	2.09E+00	2.56E-03	1.94E-01	5.82E-02	2.68E+01	4.45E-01	2.90E+01	5.17E+01	5.91E+00	1.07E-01	4.86E+00	2.70E+01	1.37E-02	5.86E-03	3.58E+00	3.31E+00	2.57E-02
IE	3.78E-02	8.43E-05	2.53E-02	1.72E-01	9.36E-03	1.42E-04	2.06E-03	2.15E-03	5.13E-03	3.49E-05	5.21E-01	1.41E-01	9.91E-01	3.60E-01	5.20E-02	3.16E-02	9.97E-01	8.17E-02	1.63E-02	3.10E-02	2.97E-03	8.02E-04	5.72E-02	6.70E-02	4.65E-03
IS	7.25E-02	3.31E-05	3.63E-02	5.26E-02	1.74E-02	6.93E-05	2.63E-03	3.11E-03	5.54E-03	2.23E-05	1.76E-01	4.06E-01	8.20E-01	1.28E-01	6.22E-02	3.81E-02	1.08E+00	2.15E-01	1.67E-02	3.07E-02	4.15E-03	1.08E-03	7.25E-02	7.24E-02	9.05E-03
IT	1.48E+00	9.69E-03	1.09E-01	4.66E-01	3.18E-02	2.82E-02	1.41E-01	1.60E+00	3.34E+00	3.72E-02	3.85E-01	1.21E-01	1.74E+01	2.32E+00	1.05E+01	1.56E+01	1.54E+01	1.51E-01	1.31E+01	4.51E+00	5.69E-02	2.51E-02	1.03E+01	4.86E+00	1.15E-01
KY	5.72E+01	1.20E-04	4.90E-02	2.85E-02	2.04E-02	2.51E-04	3.03E-02	3.22E-02	1.56E-01	3.75E-04	4.52E-02	3.58E-02	1.40E+00	9.06E-02	8.94E-01	4.94E-01	2.27E+01	7.13E-02	9.53E-02	1.51E-01	8.47E+01	1.62E+00	1.10E+01	2.44E+00	1.65E+02
KZ	2.10E+03	2.11E-03	1.43E+00	5.71E-01	6.08E-01	4.04E-03	1.12E+00	6.57E-01	2.96E+00	6.33E-03	1.14E+00	1.56E+00	4.22E+01	1.30E+00	3.12E+01	1.24E+01	1.35E+03	2.62E+00	1.85E+00	3.72E+00	1.29E+02	1.92E+01	1.89E+02	9.05E+01	3.10E+02
LI	2.03E-04	2.65E-03	6.81E-05	1.83E-03	2.15E-05	1.05E-05	2.58E-05	5.99E-05	1.49E-04	6.72E-07	1.07E-03	1.06E-04	6.02E-03	1.58E-03	1.61E-03	1.40E-03	3.30E-03	1.22E-04	1.72E-03	7.20E-04	1.21E-05	4.33E-06	1.60E-03	9.28E-04	2.35E-05
LT	5.56E-01	6.35E-04	1.91E+01	2.72E-01	1.95E+00	3.18E-04	1.35E-01	6.03E-02	1.65E-01	2.28E-04	9.81E-01	3.79E-01	5.28E+01	1.83E-01	3.43E+00	1.85E+00	1.79E+01	1.60E+00	3.44E-01	1.50E+00	3.07E-02	1.68E-02	1.12E+00	3.51E+00	7.69E-02
LU	1.88E-03	3.68E-05	2.08E-03	6.15E+00	7.94E-04	3.18E-05	4.09E-04	3.12E-04	8.42E-04	4.70E-06	1.34E-01	3.55E-03	1.86E-01	2.49E-02	1.53E-02	7.94E-03	4.60E-02	4.62E-03	2.39E-03	8.00E-03	2.27E-04	4.81E-05	5.69E-03	1.15E-02	3.42E-04
LV	2.89E-01	4.40E-04	7.87E+00	2.41E-01	1.14E+01	2.70E-04	9.82E-02	3.70E-02	1.00E-01	1.50E-04	9.04E-01	5.14E-01	3.47E+01	1.90E-01	2.16E+00	1.22E+00	1.59E+01	2.49E+00	2.48E-01	1.03E+00	1.85E-02	7.43E-03	1.09E+00	2.77E+00	3.85E-02
MC	4.01E-05	2.19E-07	3.38E-06	2.00E-05	9.94E-07	7.91E-05	3.16E-06	1.75E-05	4.58E-05	1.42E-07	1.32E-05	3.45E-06	4.49E-04	1.03E-04	2.49E-04	2.56E-04	5.05E-04	4.46E-06	1.66E-04	8.25E-05	1.20E-06	5.72E-07	3.80E-04	1.52E-04	2.62E-06
MD	1.02E+00	1.34E-04	1.40E-01	3.09E-02	3.54E-02	2.62E-04	5.92E+00	9.13E-02	3.69E-01	4.85E-04	5.42E-02	3.58E-02	6.20E+00	7.38E-02	1.46E+01	2.30E+00	1.52E+01	7.93E-02	1.79E-01	6.41E-01	5.45E-02	2.91E-02	8.56E+00	1.33E+01	1.33E-01
ME	7.54E-02	1.09E-04	1.01E-02	1.98E-02	2.88E-03	4.58E-04	1.46E-02	4.01E+00	7.70E-01	3.35E-03	1.71E-02	6.91E-03	1.01E+00	1.24E-01	1.46E+00	6.33E+00	1.19E+00	1.03E-02	1.49E-01	3.73E-01	2.25E-03	1.84E-03	1.04E+00	5.51E-01	5.80E-03
MK	1.76E-01	1.09E-04	1.57E-02	2.04E-02	4.53E-03	3.47E-04	4.35E-02	1.75E-01	2.31E+01	2.02E-03	2.12E-02	9.63E-03	1.24E+00	9.83E-02	2.84E+00	9.73E+00	2.53E+00	1.50E-02	1.41E-01	4.10E-01	5.73E-03	4.63E-03	3.68E+00	1.08E+00	1.40E-02
MT	1.02E-03	1.00E-06	6.11E-05	2.68E-04	1.86E-05	5.44E-06	1.66E-04	1.02E-03	3.03E-03	9.03E-03	2.40E-04	1.06E-04	4.70E-03	1.09E-03	6.65E-03	6.69E-03	7.42E-03	1.09E-04	1.59E-03	1.14E-03	1.35E-04	2.47E-05	1.47E-02	3.24E-03	1.85E-04
NL	3.45E-02	2.10E-04	3.11E-02	1.12E+00	1.25E-02	1.40E-04	3.52E-03	2.31E-03	5.24E-03	3.07E-05	3.25E+01	1.77E-01	1.69E+00	2.46E-01	1.02E-01	6.35E-02	7.33E-01	1.18E-01	2.13E-02	7.65E-02	3.43E-03	9.44E-04	7.11E-02	1.45E-01	5.46E-03
NO	1.58E+00	7.12E-04	9.10E-01	8.31E-01	4.55E-01	6.30E-04	5.73E-02	2.53E-02	7.47E-02	2.16E-04	4.04E+00	3.43E+01	2.35E+01	4.80E-01	1.39E+00	8.37E-01	3.39E+01	1.17E+01	2.71E-01	9.50E-01	1.26E-01	2.93E-02	1.87E+00	2.69E+00	2.18E-01
PL	1.44E+00	6.35E-03	3.85E+00	2.29E+00	9.43E-01	2.24E-03	4.97E-01	5.34E-01	1.13E+00	1.82E-03	5.35E+00	9.43E-01	1.05E+03	9.42E-01	2.37E+01	2.15E+01	4.01E+01	2.88E+00	3.46E+00	2.88E+01	1.08E-01	3.79E-02	8.59E+00	1.58E+01	2.22E-01
PT	8.11E-02	8.17E-05	1.07E-02	1.41E-01	3.97E-03	3.27E-04	3.15E-03	1.26E-02	3.98E-02	2.49E-04	2.06E-01	2.39E-02	6.74E-01	5.86E+01	1.88E-01	1.69E-01	7.07E-01	2.23E-02	6.57E-02	7.33E-02	4.24E-03	1.01E-03	1.67E-01	1.68E-01	7.19E-03
RO	3.14E+00	2.00E-03	5.55E-01	3.07E-01	1.37E-01	2.87E-03	4.26E+00	1.89E+00	5.01E+00	5.16E-03	3.48E-01	1.82E-01	3.93E+01	7.23E-01	3.93E+02	7.15E+01	5.36E+01	3.62E-01	3.16E+00	1.14E+01	2.08E-01	7.93E-02	4.59E+01	3.60E+01	4.35E-01
RS	4.85E-01	7.16E-04	9.78E-02	1.21E-01	2.83E-02	1.44E-03	1.66E-01	4.51E+00	1.18E+01	4.18E-03	1.29E-01	4.87E-02	1.20E+01	2.96E-01	3.23E+01	2.16E+02	9.15E+00	8.52E-02	1.16E+00	5.96E+00	2.70E-02	1.26E-02	6.85E+00	4.48E+00	5.32E-02
RU	1.37E+03	9.81E-03	1.99E+01	3.90E+00	1.02E+01	1.33E-02	6.10E+00	2.43E+00	9.87E+00	2.26E-02	9.84E+00	1.65E+01	3.65E+02	4.90E+00	1.45E+02	5.60E+01	1.14E+04	3.51E+01	7.51E+00	2.34E+01	6.72E+01	1.64E+01	6.27E+02	5.09E+02	1.27E+02
SE	1.78E+00	1.40E-03	4.01E+00	1.19E+00	2.52E+00	9.42E-04	1.67E-01	8.18E-02	1.64E-01	2.66E-04	5.50E+00	1.12E+01	6.61E+01	6.31E-01	4.10E+00	2.88E+00	6.04E+01	7.25E+01	5.64E-01	1.99E+00	1.24E-01	4.48E-02	2.72E+00	7.22E+00	2.42E-01
SI	4.88E-02	4.45E-04	1.74E-02	6.30E-02	5.33E-03	9.95E-04	1.13E-02	7.79E-02	1.16E-01	5.69E-04	5.22E-02	1.17E-02	3.47E+00	1.51E-01	1.49E+00	2.53E+00	8.39E-01	1.91E-02	2.13E+01	1.12E+00	2.48E-03	1.38E-03	5.94E-01	4.03E-01	4.94E-03
SK	1.33E-01	1.58E-03	9.99E-02	2.20E-01	3.09E-02	9.49E-04	6.01E-02	3.69E-01	6.16E-01	9.30E-04	2.10E-01	4.91E-02	5.36E+01	2.34E-01	1.08E+01	1.63E+01	3.71E+00	9.81E-02	1.96E+00	6.50E+01	8.55E-03	3.87E-03	1.83E+00	2.08E+00	1.67E-02
TJ	1.26E+01	6.28E-05	2.82E-02	1.49E-02	1.19E-02	1.38E-04	1.72E-02	1.65E-02	8.72E-02	1.99E-04	2.40E-02	1.80E-02	7.64E-01	4.85E-02	4.81E-01	2.56E-01	1.15E+01	3.67E-02	4.84E-02	7.75E-02	2.51E+02	1.40E+00	5.84E+00	1.40E+00	5.37E+01
TM	4.46E+01	1.58E-04	1.32E-01	4.79E-02	5.99E-02	3.17E-04	8.95E-02	4.26E-02	2.15E-01	4.73E-04	9.41E-02	9.77E-02	3.31E+00	1.07E-01	1.89E+00	7.61E-01	6.85E+01	2.06E-01	1.35E-01	2.90E-01	2.75E+01	2.24E+01	1.64E+01	7.30E+00	4.93E+01
TR	8.61E+00	1.50E-03	4.73E-01	2.97E-01	1.56E-01	4.37E-03	1.82E+00	9.01E-01	5.24E+00	2.34E-02	4.45E-01	2.71E-01	1.85E+01	1.24E+00	3.83E+01	1.50E+01	1.29E+02	4.69E-01	1.57E+00	2.79E+00	3.75E-01	5.75E-01	2.52E+03	5.56E+01	9.43E-01
UA	2.44E+01	3.48E-03	3.49E+00	8.53E-01	9.61E-01	4.56E-03	9.63E+00	1.63E+00	4.77E+00	8.77E-03	1.47E+00	8.88E-01	2.13E+02	1.20E+00	1.24E+02	4.40E+01	4.17E+02	2.06E+00	3.90E+00	2.20E+01	1.13E+00	8.57E-01	1.70E+02	5.33E+02	3.01E+00
UZ	9.05E+01	1.93E-04	1.48E-01	5.51E-02	6.43E-02	3.98E-04	9.65E-02	6.09E-02	2.72E-01	5.51E-04	1.10E-01	1.17E-01	3.98E+00	1.34E-01	2.39E+00	1.06E+00	8.43E+01	2.28E-01	1.78E-01	3.22E-01	1.09E+02	6.11E+00	1.83E+01	8.47E+00	2.29E+02

Table B5. *Source-receptor matrix of B(a)P deposition to EMEP countries in 2023, kg/year. 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	5.04E+01	1.19E+00	2.99E+01	4.84E-01	1.44E+00	9.39E-01	1.00E+00	1.00E+00	1.27E+00	1.18E+00	1.19E+00	1.21E+00	2.62E-04	8.34E-06	2.25E-03	2.66E-05	2.36E-03	1.84E-04	2.58E-07	8.39E+00	1.58E-01	5.18E-01	1.67E-05	2.35E-08	2.44E+00	2.44E-11
AM	2.84E+00	1.50E+02	4.89E+00	1.28E+00	5.87E-01	5.87E-01	5.87E-01	5.87E-01	3.49E-01	3.03E-01	2.97E-01	2.96E-01	2.98E-06	3.50E-07	3.71E-07	4.12E-07	1.58E-05	3.98E-05	8.17E+00	1.37E-04	2.79E-05	1.39E-04	5.70E-06	2.64E-09	6.89E-05	1.61E-07
AT	1.03E+02	4.46E+00	7.22E+02	2.09E+00	2.70E+00	2.33E+00	2.33E+00	2.33E+00	2.66E+00	2.86E+00	2.19E+01	1.36E+01	3.24E-02	6.59E-04	4.29E-02	1.02E-03	2.06E+00	2.16E-01	8.83E-07	1.53E-03	9.44E+00	3.16E+01	2.33E-02	9.30E-06	4.08E+01	3.93E-11
AZ	2.34E+00	2.14E+01	4.38E+00	3.88E+01	3.05E+00	3.05E+00	3.05E+00	3.05E+00	1.09E+00	1.02E+00	9.94E-01	9.70E-01	4.46E-06	4.60E-07	7.17E-07	3.27E-07	1.11E-05	2.39E-05	1.44E+01	1.04E-04	2.97E-05	1.93E-04	3.51E-06	1.55E-09	5.87E-05	1.83E-05
BA	1.14E+02	4.65E+00	1.89E+02	2.24E+00	5.50E+02	3.06E+01	3.06E+01	3.06E+01	4.91E+01	2.10E+01	2.02E+01	2.01E+01	3.09E-03	1.66E-04	1.92E-02	5.55E-04	4.12E-02	6.57E-03	6.81E-07	1.56E-01	1.45E+02	2.06E+01	6.30E-04	4.18E-07	1.02E+01	6.54E-11
BE	1.06E+02	9.45E-01	1.09E+02	1.83E+00	1.83E+00	3.27E+02	2.37E+01	2.37E+01	2.45E+01	4.19E+01	1.84E+01	2.09E+01	1.32E-01	1.90E-04	5.11E-01	3.73E-04	1.05E+02	7.63E+00	3.35E-08	1.82E-06	4.83E-04	1.63E-03	2.68E-01	6.69E-05	1.59E-02	2.60E-11
BG	1.77E+02	1.52E+01	2.44E+02	3.80E+00	4.26E+00	4.15E+00	3.51E+02	3.70E+01	4.22E+01	4.36E+01	5.49E+01	2.79E+01	3.14E-03	2.77E-04	3.93E-04	2.18E-04	7.80E-03	3.71E-03	3.62E-03	3.21E+01	7.37E-01	2.92E+00	3.87E-04	2.14E-07	1.44E-01	4.01E-09
BY	9.14E+02	3.12E+01	1.73E+03	2.11E+01	2.11E+01	2.11E+01	2.11E+01	8.91E+02	1.84E+02	1.93E+02	1.97E+02	2.40E+02	8.62E-01	1.26E+00	1.10E-02	6.45E-01	2.54E-01	5.01E-01	2.58E-03	2.22E-02	1.48E-01	3.82E+00	5.45E-02	2.18E-05	3.68E-02	2.36E-08
CH	3.63E+01	5.23E-01	4.93E+01	5.76E-01	5.76E-01	5.91E-01	5.88E-01	5.88E-01	4.84E+01	8.45E+00	8.67E+00	1.07E+01	1.40E-02	5.14E-05	2.25E-01	6.97E-05	3.31E+01	1.14E-01	4.40E-08	4.69E-05	1.88E-03	6.31E-04	1.13E-02	2.76E-06	4.09E+01	5.41E-12
CY	1.00E+00	1.06E+00	1.80E+00	5.73E-02	5.73E-02	5.73E-02	5.73E-02	5.73E-02	5.73E-02	2.23E+00	3.79E-01	4.04E-01	6.33E-07	1.12E-07	7.28E-07	6.83E-08	5.77E-06	5.70E-07	4.81E-06	2.80E-02	1.86E-04	2.14E-04	5.45E-08	5.46E-11	1.00E-03	1.18E-13
CZ	7.48E+02	1.99E+01	1.50E+03	1.51E+01	1.65E+01	1.59E+01	1.59E+01	1.59E+01	1.61E+01	1.60E+01	9.07E+02	1.58E+02	1.53E-01	3.67E-03	8.04E-02	5.55E-03	3.37E+00	5.96E-01	3.33E-06	9.55E-04	2.70E+00	1.87E+01	5.84E-02	4.00E-05	7.86E-01	3.56E-10
DE	1.38E+03	1.56E+01	1.80E+03	2.24E+01	2.25E+01	6.02E+01	3.52E+01	3.52E+01	4.30E+01	4.83E+01	9.54E+01	1.20E+03	1.50E+01	1.92E-02	1.53E+00	3.29E-02	1.67E+02	2.60E+01	2.86E-06	1.45E-04	1.46E-01	6.82E-01	1.64E+00	8.38E-04	7.32E+00	7.36E-10
DK	1.23E+02	1.07E+00	1.40E+02	2.17E+00	2.17E+00	2.18E+00	2.18E+00	2.18E+00	2.19E+00	2.19E+00	2.20E+00	2.67E+00	3.36E+02	2.79E-02	4.93E-02	5.97E-02	1.10E+00	5.65E+00	4.24E-08	1.34E-06	5.89E-03	5.53E-02	4.16E-01	8.31E-04	8.70E-03	3.69E-09
EE	1.26E+02	1.94E+00	1.96E+02	2.96E+00	2.96E+00	2.96E+00	2.96E+00	2.96E+00	2.96E+00	2.96E+00	2.96E+00	2.96E+00	3.88E-01	3.04E+02	1.97E-03	2.61E+01	5.14E-02	1.25E-01	6.35E-05	2.62E-04	7.87E-03	9.25E-02	1.22E-02	2.28E-05	1.74E-03	4.14E-08
ES	9.74E+02	6.83E+00	9.03E+02	1.45E+01	1.45E+01	1.45E+01	1.45E+01	1.45E+01	1.45E+01	1.45E+01	1.45E+01	1.45E+01	6.72E-03	1.35E-05	3.15E+03	1.80E-05	2.14E+01	3.08E-01	1.31E-08	4.19E-05	1.19E-02	1.96E-03	1.97E-01	1.99E-04	2.98E-01	3.45E-11
FI	7.14E+02	9.37E+00	9.86E+02	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	1.81E+01	5.07E-01	2.94E+01	3.30E-03	2.89E+03	5.39E-02	1.81E-01	1.15E-04	3.01E-04	7.83E-03	8.06E-02	2.22E-02	1.12E-03	1.87E-03	6.05E-06
FR	1.05E+03	1.01E+01	1.05E+03	1.69E+01	1.69E+01	4.37E+01	2.23E+01	2.23E+01	3.93E+01	2.70E+01	2.55E+01	3.45E+01	3.81E-01	9.69E-04	9.44E+01	1.28E-03	3.70E+03	2.19E+01	5.29E-07	5.54E-04	3.32E-01	5.45E-02	2.26E+00	5.50E-04	2.65E+01	1.24E-10
GB	6.56E+02	4.88E+00	6.50E+02	1.09E+01	1.09E+01	1.10E+01	1.10E+01	1.10E+01	1.13E+01	1.14E+01	1.14E+01	1.15E+01	1.32E+00	1.21E-02	2.15E+00	3.47E-02	2.21E+01	2.09E+03	9.18E-08	7.02E-08	1.22E-03	6.89E-03	1.09E+02	8.31E-03	3.02E-03	7.61E-09
GE	2.67E+01	5.14E+01	4.25E+01	7.36E+00	4.61E+00	4.61E+00	4.61E+00	4.61E+00	4.00E+00	3.52E+00	3.44E+00	3.41E+00	1.08E-04	1.69E-05	8.19E-06	3.62E-05	3.21E-04	7.03E-04	3.16E+02	5.01E-03	1.17E-03	7.90E-03	9.89E-05	5.21E-08	8.81E-04	2.23E-06
GR	2.03E+02	1.35E+01	2.40E+02	4.00E+00	4.15E+00	4.11E+00	1.18E+01	6.41E+00	7.10E+00	7.23E+00	7.40E+00	6.57E+00	6.66E-04	4.50E-05	2.48E-03	5.34E-05	4.88E-03	3.39E-04	1.33E-04	1.22E+03	1.66E-01	4.96E-01	3.23E-05	3.27E-08	1.66E+00	8.80E-10
HR	1.68E+02	1.01E+01	3.85E+02	3.40E+00	1.23E+02	1.75E+01	1.75E+01	1.75E+01	2.77E+01	2.03E+01	1.96E+01	1.96E+01	3.86E-03	4.41E-04	4.84E-02	5.54E-04	1.02E-01	8.71E-03	9.62E-07	5.46E-02	1.03E+03	7.29E+01	8.17E-04	5.47E-07	2.36E+01	2.03E-10
HU	4.59E+02	1.61E+01	9.82E+02	8.46E+00	3.10E+01	1.48E+01	1.48E+01	1.48E+01	1.93E+01	1.77E+01	1.78E+01	1.81E+01	2.35E-02	1.21E-03	2.03E-02	1.63E-03	2.63E-01	7.98E-02	3.30E-06	1.43E-01	1.07E+02	1.69E+03	9.07E-03	4.61E-06	2.37E+00	5.02E-10
IE	2.14E+02	1.61E+00	2.08E+02	3.60E+00	3.60E+00	3.60E+00	3.60E+00	3.60E+00	3.60E+00	3.60E+00	3.60E+00	3.60E+00	2.43E-02	6.07E-04	1.64E-01	1.86E-03	3.94E-01	2.11E+01	1.74E-08	3.32E-09	5.38E-05	2.87E-04	1.00E+03	3.98E-03	5.89E-05	5.58E-10
IS	1.29E+00	1.07E-02	1.32E+00	2.23E-02	2.23E-02	2.23E-02	2.23E-02	2.23E-02	2.23E-02	2.23E-02	2.23E-02	2.23E-02	4.07E-03	1.41E-04	4.48E-04	1.74E-03	1.57E-03	5.33E-02	8.65E-10	9.76E-10	1.58E-06	8.90E-06	9.14E-02	4.14E+00	2.26E-06	9.14E-12
IT	6.06E+02	1.20E+01	1.28E+03	1.08E+01	1.28E+01	1.21E+01	1.21E+01	1.21E+01	1.76E+01	1.48E+01	1.49E+01	1.49E+01	8.01E-03	1.68E-04	1.52E+00	2.58E-04	1.11E+01	4.48E-02	2.97E-07	8.15E-01	2.47E+01	2.71E+00	3.48E-03	1.41E-06	4.38E+03	1.34E-10
KY	1.02E+02	1.63E+01	1.57E+02	8.88E+00	8.88E+00	8.88E+00	8.88E+00	8.88E+00	8.88E+00	8.88E+00	8.88E+00	8.88E+00	2.44E-08	2.07E-09	1.73E-06	4.06E-08	1.41E-06	7.30E-07	7.45E-05	1.24E-06	2.01E-07	3.72E-07	7.75E-08	1.97E-10	6.38E-06	8.89E+02
KZ	2.38E+03	2.24E+02	3.76E+03	1.45E+02	1.44E+02	1.44E+02	1.44E+02	1.44E+02	1.44E+02	1.44E+02	1.44E+02	1.44E+02	2.33E-03	1.04E-03	5.40E-04	1.59E-03	2.26E-03	3.76E-03	4.58E-02	3.94E-03	3.69E-03	2.76E-02	5.10E-04	1.91E-07	7.38E-03	2.30E+02
LI	9.40E-02	1.49E-03	2.20E-01	1.48E-03	1.48E-03	1.51E-03	1.51E-03	1.51E-03	2.59E-01	2.26E-02	2.31E-02	3.35E-02	6.86E-05	2.26E-07	3.65E-04	4.81E-07	1.65E-02	5.33E-04	1.89E-10	1.25E-07	5.40E-06	4.90E-06	5.14E-05	1.47E-08	7.56E-02	2.63E-14
LT	3.25E+02	5.79E+00	5.35E+02	6.38E+00	6.38E+00	6.38E+00	6.38E+00	2.52E+01	1.00E+01	1.04E+01	1.05E+01	1.07E+01	2.13E+00	1.27E+00	7.91E-03	7.34E-01	2.26E-01	5.62E-01	3.02E-05	1.78E-03	4.71E-02	6.59E-01	4.28E-02	2.02E-05	1.18E-02	1.85E-09
LU	6.79E+00	6.57E-02	6.74E+00	1.05E-01	1.05E-01	7.21E+00	1.39E+00	1.39E+00	1.39E+00	1.50E+00	7.60E-01	2.84E+00	9.69E-03	1.60E-05	4.53E-02	2.09E-05	1.17E+01	1.48E-01	8.90E-09	4.29E-07	2.37E-05	7.46E-05	1.20E-02	2.27E-06	4.23E-03	4.61E-13
LV	2.54E+02	4.48E+00	4.08E+02	5.53E+00	5.53E+00	5.53E+00	5.53E+00	5.79E+00	5.83E+00	5.89E+00	5.91E+00	5.95E+00	1.44E+00	2.04E+01	5.36E-03	3.67E+00	1.56E-01	3.68E-01	2.19E-04	1.23E-03	2.14E-02	2.68E-01	2.72E-02	2.66E-05	5.76E-03	3.18E-09
MC	8.25E-03	2.63E-04	1.23E-02	1.21E-04	1.21E-04	1.22E-04	1.22E-04	1.22E-04	1.22E-04	1.22E-04	1.22E-04	1.22E-04	1.87E-07	1.28E-09	1.02E-04	1.78E-09	3.78E-02	6.05E-07	1.35E-11	4.27E-07	5.80E-05	1.87E-05	8.09E-08	3.19E-11	3.54E-02	1.42E-14
MD	1.34E+02	6.54E+00	2.13E+02	3.32E+00	3.32E+00	3.32E+00	3.42E+00	3.42E+00	3.48E+00	3.52E+00	3.55E+00	3.57E+00	1.82E-03	7.73E-04	1.47E-04	1.17E-03	3.22E-03	2.78E-03	3.72E-04	3.38E-02	2.60E-02	4.21E-01	2.66E-04	2.25E-07	9.05E-03	6.85E-09
ME	4.21E+01	7.86E-01	2.83E+01	4.22E-01	1.23E+01	2.39E+00	2.41E+00	2.41E+00	2.79E+00	2.10E+00	2.08E+00	2.09E+00	3.56E-04	1.06E-05	3.38E-03	5.24E-05	3.31E-03	3.78E-04	2.16E-07	2.88E-01	1.69E+00	9.61E-01	3.47E-05	3.20E-08	3.34E+00	7.27E-12
MK	9.34E+01	2.60E+00	9.02E+01	1.23E+00	1.85E+00	1.69E+00	6.21E+00	2.25E+00	2.78E+00	2.90E+00	2.92E+00	2.91E+00	6.82E-04	1.57E-05	3.35E-04	3.82E-05	1.42E-03	4.08E-04	1.76E-06	2.13E+01	1.71E-01	8.09E-01	3.57E-05	4.60E-08	3.10E-01	2.60E-11
MT	1.64E-02	5.43E-04	2.21E-02	3.57E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	3.64E-04	7.76E-08	8.51E-10	6.61E-05	3.48E-09	8.29E-05	9.17E-07	3.97E-11	6.58E-04	1.39E-04	4.47E-05	1.57E-07	3.00E-11	3.24E-02	2.27E-15
NL	1.48E+02	1.19E+00	1.51E+02	2.43E+00	2.43E+00	7.61E+01	1.13E+01	1.13E+01	1.24E+01	2.00E+01	1.52E+01	2.23E+01	4.57E-01	3.23E-04	3.15E-01	1.07E-03	2.57E+01	2.03E+01	2.05E-08	1.36E-07	3.24E-03	1.21E-02	6.58E-01	2.56E-04	1.89E-02	1.32E-10
NO	1.02E+02	9.25E-01	1.10E+02	1.87E+00	1.87E+00	1.88E+00	1.88E+00	1.88E+00	1.89E+00	1.89E+00	1.89E+00	1.90E+00	7.22E+00	2.11E-01	5.09E-02	5.18E+00	6.69E-01	6.14E+00	4.97E-06	1.18E-05	2.77E-03	2.91E-02	8.22E-01	1.64E-02	3.43E-03	6.61E-07
PL	6.17E+03	1.06E+02	1.02E+04	1.12E+02	1.16E+02	1.14E+02	1.14E+02	1.37E+02	1.19E+02	1.19E+02	2.23E+02	1.66E+02	7.05E+00	3.32E-01	1.14E-01	3.80E-01	3.36E+00	3.58E+00	6.79E-05	2.70E-02	2.67E+00	5.13E+01	3.24E-01	2.06E-04	4.46E-01	1.56E-08
PT	2.45E+02	1.68E+00	2.34E+02	3.71E+00	3.71E+00	3.71E+00	3.71E+00	3.71E+00	3.71E+00	3.71E+00	3.71E+00	3.71E+00	1.23E-04	2.52E-07	4.88E+01	8.08E-07	4.12E-02	1.26E-02	1.10E-09	1.39E-06	3.52E-05	1.55E-05	9.22E-03	8.25E-05	7.37E-04	4.55E-12
RO	1.05E+03	6.50E+01	1.63E+03	2.30E+01	2.65E+01	2.49E+01	5.64E+01	3.03E+01	3.76E+01	3.71E+01	3.86E+01	3.73E+01	1.47E-02	3.93E-03	3.68E-03	3.79E-03	1.15E-01	5.97E-02	5.02E-03	1.16E+00	7.87E+00	1.24E+02	7.22E-03	3.43E-06	8.12E-01	2.22E-08
RS	5.74E+02	1.53E+01	6.49E+02	8.31E+00	8.33E+01	2.60E+01	3.97E+01	2.82E+01	5.80E+01	3.64E+01	3.68E+01	3.70E+01	9.97E-03	2.62E-04	3.41E-03	6.40E-04	4.77E-02	1.89E-02	2.06E-05	3.15E+00	4.10E+01	6.21E+01	1.99E-03	1.24E-06	1.41E+00	4.00E-10
RU	9.19E+03	4.79E+02	1.66E+04	4.71E+02	4.62E+02	4.62E+02	4.62E+02	4.72E+02	4.66E+02	4.66E+02	4.66E+02	4.71E+02	1.59E+00	4.56E+01	1.09E-02	1.17E+02	2.55E-01	6.85E-01	1.02E+01	1.20E-01	9.08E-02	1.28E+00	6.78E-02	1.24E-03	4.53E-02	3.76E-01
SE	3.81E+02	3.71E+00	4.49E+02	6.96E+00	6.96E+00	6.96E+00	6.96E+00	6.96E+00	6.97E+00	6.97E+00	6.97E+00	6.98E+00	7.55E+01	3.05E+00	4.71E-02	5.29E+01	1.08E+00	5.43E+00	1.29E-05	1.36E-04	2.64E-02	3.19E-01	4.85E-01	5.05E-03	1.43E-02	1.40E-06
SI	5.40E+01	3.01E+00	2.19E+02	1.15E+00	2.72E+00	1.61E+00	1.61E+00	1.61E+00	1.80E+00	1.73E+00	1.74E+00	1.74E+00	1.27E-03	1.02E-04	1.90E-02	1.29E-04	5.48E-02	2.72E-03	2.98E-07	1.82E-03	1.18E+02	6.59E+00	2.43E-04	1.37E-07	2.66E+01	6.22E-11
SK	5.59E+02	1.86E+01	1.05E+03	1.10E+01	1.55E+01	1.28E+01	1.28E+01	1.28E+01	1.36E+01	1.34E+01	3.68E+01	2.39E+01	4.03E-02	2.25E-03	1.21E-02	4.55E-03	3.04E-01	1.04E-01	3.04E-06	3.04E-02	4.49E+00	1.99E+02	1.14E-02	6.88E-06	4.92E-01	8.29E-10
TJ	5.58E+01	1.21E+01	9.17E+01	5.74E+00	5.74E+00	5.74E+00	5.74E+00	5.74E+00	5.74E+00	5.74E+00	5.74E+00	5.74E+00	2.21E-09	9.91E-11	2.11E-07	2.39E-10	1.36E-07	6.72E-08	9.41E-05	2.32E-07	7.75E-08	1.25E-07	8.74E-09	1.64E-11	1.91E-06	1.94E+01
TM	4.42E+01	6.30E+00	7.83E+01	3.94E+00	3.93E+00	3.93E+00	3.93E+00	3.93E+00	3.92E+00	3.92E+00	3.92E+00	3.92E+00	6.36E-06	9.32E-07	5.66E-07	3.72E-07	6.73E-06	1.24E-05	8.03E-03	2.99E-05	1.47E-05	1.29E-04	1.91E-06	1.05E-09	1.18E-05	4.54E-03
TR	1.43E+03	4.88E+02	2.20E+03	4.86E+01	4.85E+01	4.85E+01	5.24E+01	5.01E+01	5.05E+01	5.05E+01	5.07E+01	5.05E+01	9.62E-04	3.64E-04	1.86E-04	3.21E-04	2.69E-03	3.68E-03	4.82E+00	1.87E+01	6.41E-02	4.55E-01	5.22E-04	2.46E-07	6.14E-02	5.14E-08
UA	2.69E+03	1.41E+02	4.80E+03	8.29E+01	8.31E+01	8.30E+01	8.31E+01	9.11E+01	9.24E+01	9.36E+01	9.43E+01	9.56E+01	2.34E-01	7.19E-02	1.41E-02	6.93E-02	2.57E-01	2.35E-01	1.19E-01	2.87E-01	1.87E+00	6.34E+01	2.53E-02	1.40E-05	3.23E-01	2.50E-06
UZ	1.44E+02	2.19E+01	2.29E+02	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	1.17E+01	3.67E-05	5.21E-06	1.33E-06	2.72E-06	4.71E-05	9.00E-05	4.09E-03	6.72E-05	4.29E-05	3.50E-04	9.42E-06	3.99E-09	3.08E-05	1.05E+02

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	3.09E-07	8.39E-07	4.86E-04	5.13E-05	8.43E-05	1.60E-07	3.10E-03	3.86E+01	1.90E+01	1.27E-03	2.60E-04	7.95E-06	4.71E-01	5.78E-05	4.68E-01	9.10E+01	6.67E-04	7.35E-05	4.51E-03	2.18E-01	1.08E-12	1.88E-10	8.80E-02	1.06E-02	4.83E-11
AM	4.30E-04	7.04E-09	1.81E-05	1.61E-06	4.47E-06	1.98E-10	3.03E-03	4.88E-06	3.20E-05	6.93E-08	1.41E-05	1.00E-07	1.83E-03	2.61E-07	6.09E-03	4.54E-04	5.27E-02	8.25E-07	7.22E-06	1.74E-04	3.31E-09	1.21E-04	1.70E+01	1.38E-02	7.29E-06
AT	7.43E-07	1.04E-01	1.94E-02	1.12E-01	7.19E-03	5.07E-06	6.51E-03	5.91E-03	1.79E-03	1.03E-05	2.08E-01	1.02E-03	3.40E+01	1.86E-03	1.16E-01	3.70E-01	3.05E-02	1.15E-02	5.25E+01	3.15E+01	6.21E-12	1.02E-09	1.05E-03	1.61E-01	4.20E-10
AZ	2.26E-01	5.41E-09	2.63E-05	9.97E-07	6.19E-06	2.25E-10	2.76E-03	3.63E-06	2.27E-05	6.48E-08	9.22E-06	1.47E-07	3.32E-03	2.31E-07	4.61E-03	3.32E-04	1.93E+01	1.25E-06	7.81E-06	2.51E-04	1.64E-06	6.67E-02	1.93E+00	5.97E-02	6.12E-03
BA	1.43E-06	3.86E-05	8.45E-03	2.58E-03	1.81E-03	2.35E-06	2.85E-03	1.85E+01	1.59E-01	1.21E-03	6.33E-03	1.15E-04	1.18E+01	1.06E-03	1.71E+00	7.71E+01	1.54E-02	1.51E-03	1.31E+00	6.05E+00	4.47E-12	7.66E-10	2.28E-02	7.53E-02	9.35E-11
BE	5.67E-08	6.73E-05	1.87E-03	4.70E+00	6.16E-04	5.45E-07	2.31E-05	4.45E-08	2.74E-07	1.37E-09	4.04E+01	4.20E-03	2.08E-01	2.24E-02	5.68E-05	4.91E-05	4.32E-03	1.62E-02	2.52E-04	2.67E-03	1.31E-11	6.16E-11	4.92E-06	1.93E-03	7.66E-11
BG	3.79E-04	6.82E-06	4.41E-03	7.86E-04	1.62E-03	1.10E-07	4.10E+00	3.24E-01	8.42E+00	1.06E-04	3.31E-03	3.22E-05	2.41E+00	1.18E-05	1.52E+02	8.21E+01	3.50E-01	1.01E-03	4.47E-02	1.32E+00	6.85E-11	1.46E-07	3.52E+01	3.67E+00	1.32E-08
BY	6.17E-03	1.18E-04	9.18E+01	2.03E-02	2.64E+01	4.47E-08	4.74E+00	1.12E-02	1.34E-02	7.33E-06	3.66E-01	2.08E-02	8.45E+02	1.25E-03	7.05E+00	6.35E-01	8.61E+01	7.58E-01	4.74E-02	9.94E+00	3.83E-09	6.36E-06	7.38E-01	1.60E+03	2.46E-06
CH	4.15E-08	4.07E-01	8.73E-04	7.16E-02	3.86E-04	2.34E-05	4.98E-05	2.69E-05	9.37E-06	1.22E-06	8.45E-02	1.44E-04	2.35E-01	8.04E-03	1.77E-04	1.14E-04	1.36E-03	3.37E-03	3.09E-03	1.51E-03	1.23E-12	3.63E-11	2.04E-05	1.75E-03	1.65E-11
CY	2.57E-07	2.80E-09	6.91E-07	1.03E-07	4.59E-07	3.76E-10	5.45E-04	1.70E-04	3.42E-04	5.09E-06	5.16E-07	1.51E-08	3.54E-04	1.73E-08	1.60E-03	1.07E-03	1.45E-03	1.49E-07	1.41E-05	1.28E-04	5.92E-14	1.61E-10	2.87E+00	6.36E-03	5.70E-11
CZ	3.24E-06	4.93E-03	1.14E-01	3.50E-01	3.59E-02	7.43E-07	2.16E-02	1.53E-02	5.66E-03	9.35E-07	6.47E-01	4.00E-03	6.99E+02	4.06E-03	2.48E-01	1.22E+00	2.11E-01	5.57E-02	1.38E+00	1.22E+02	7.76E-11	2.22E-09	1.60E-03	6.22E-01	1.01E-09
DE	3.74E-06	1.95E-01	3.06E-01	3.74E+01	1.21E-01	7.68E-06	5.22E-03	2.56E-04	1.54E-04	3.69E-07	1.41E+02	1.24E-01	2.50E+02	7.12E-02	3.24E-02	5.34E-02	5.26E-01	1.45E+00	1.14E-01	1.53E+00	2.38E-10	2.98E-09	5.94E-04	2.54E-01	1.94E-09
DK	1.51E-06	7.97E-05	1.91E-01	5.35E-02	1.57E-01	2.45E-08	1.89E-03	3.52E-05	2.67E-05	1.28E-09	3.36E+00	1.02E+00	1.75E+01	5.40E-03	8.14E-03	4.83E-03	2.24E-01	6.77E+00	3.23E-03	1.47E-01	1.56E-09	2.81E-09	1.13E-06	7.10E-02	6.33E-09
EE	5.76E-04	1.33E-05	8.25E+00	3.11E-03	5.03E+01	2.48E-09	5.17E-02	2.90E-04	3.29E-04	9.74E-08	8.34E-02	3.97E-02	2.35E+01	3.15E-04	1.04E-01	1.21E-02	3.60E+01	2.24E+00	3.78E-03	3.13E-01	7.86E-08	1.23E-06	9.81E-03	1.88E+00	1.28E-06
ES	2.77E-08	9.60E-06	2.53E-04	9.65E-03	9.06E-05	7.50E-06	1.01E-05	1.74E-04	2.72E-05	2.62E-06	4.32E-02	1.23E-03	2.13E-02	9.50E+01	4.52E-04	8.36E-04	4.09E-04	1.44E-03	3.61E-03	1.36E-03	1.79E-11	8.54E-11	2.21E-05	3.47E-04	1.10E-10
FI	1.69E-03	1.13E-05	3.61E+00	2.96E-03	8.19E+00	3.45E-09	6.07E-02	4.49E-04	4.49E-04	1.21E-07	1.05E-01	1.16E+00	2.04E+01	7.22E-04	1.26E-01	1.50E-02	1.28E+02	2.03E+01	3.56E-03	2.53E-01	2.00E-06	3.47E-06	1.28E-02	2.06E+00	6.78E-06
FR	5.93E-07	2.87E-03	1.12E-02	2.47E+01	4.77E-03	1.93E-02	5.07E-04	1.49E-03	3.57E-04	1.17E-05	7.97E+00	1.08E-02	1.66E+00	1.18E+00	9.28E-03	1.80E-02	1.71E-02	6.07E-02	1.65E-01	4.28E-02	5.36E-11	6.18E-10	2.73E-04	1.91E-02	4.40E-10
GB	2.23E-06	2.60E-05	2.31E-02	3.93E-02	2.22E-02	1.36E-07	9.28E-05	2.42E-06	1.13E-06	1.22E-10	3.06E+00	3.36E-01	7.64E-01	3.56E-01	7.29E-04	6.26E-04	2.45E-02	3.66E-01	6.18E-04	1.88E-02	3.21E-09	5.33E-09	1.18E-06	6.57E-03	1.25E-08
GE	3.90E-03	1.45E-07	5.68E-04	3.35E-05	1.32E-04	1.11E-09	7.22E-02	3.13E-04	8.38E-04	3.58E-07	2.72E-04	3.79E-06	8.58E-02	1.66E-06	1.71E-01	1.89E-02	2.03E+01	3.24E-05	2.54E-04	8.52E-03	2.83E-08	8.08E-05	2.16E+01	9.01E-01	2.06E-05
GR	3.99E-05	1.13E-06	9.16E-04	9.67E-05	2.99E-04	1.76E-07	2.28E-01	2.03E-01	2.13E+01	3.34E-03	4.84E-04	1.05E-05	4.78E-01	3.47E-05	2.45E+00	1.05E+01	1.93E-02	1.84E-04	8.28E-03	2.33E-01	1.33E-11	1.66E-08	8.30E+01	3.08E-01	2.46E-09
HR	1.29E-06	1.09E-04	2.25E-02	4.31E-03	5.59E-03	7.80E-06	1.09E-02	4.63E+00	7.06E-02	3.48E-04	9.68E-03	1.33E-04	2.10E+01	1.91E-03	2.01E+00	4.21E+01	3.42E-02	2.13E-03	8.85E+01	1.06E+01	4.73E-12	7.70E-10	1.53E-02	2.27E-01	1.50E-10
HU	1.18E-06	3.16E-04	6.31E-02	2.32E-02	1.23E-02	1.32E-06	1.17E-01	7.70E-01	5.11E-01	1.52E-04	6.88E-02	4.20E-04	1.16E+02	9.69E-04	9.96E+01	1.13E+02	6.36E-02	8.52E-03	2.27E+01	3.25E+02	6.29E-11	7.75E-10	1.82E-02	7.48E+00	4.25E-10
IE	7.05E-08	3.61E-07	1.21E-03	1.09E-03	1.22E-03	5.14E-09	1.45E-06	1.14E-07	5.62E-08	5.00E-12	6.12E-02	1.46E-02	2.10E-02	6.87E-02	3.85E-05	3.31E-05	1.06E-03	8.45E-03	2.45E-05	6.63E-04	2.10E-10	1.58E-10	1.39E-07	2.05E-04	5.80E-10
IS	3.74E-08	8.85E-09	8.25E-05	1.14E-05	1.70E-04	2.31E-11	2.76E-07	1.47E-08	6.88E-09	2.00E-12	1.03E-03	5.04E-02	9.38E-04	1.57E-03	7.42E-07	7.94E-07	3.02E-04	6.08E-03	8.81E-07	2.37E-05	3.21E-12	2.46E-11	1.08E-08	1.00E-05	2.26E-11
IT	3.82E-07	2.22E-02	7.61E-03	4.00E-02	1.95E-03	7.97E-03	2.98E-03	1.85E+00	3.20E-01	1.24E-01	6.10E-02	1.17E-04	5.40E+00	1.60E-02	3.81E-01	2.90E+00	1.11E-02	2.37E-03	2.18E+01	1.55E+00	5.90E-12	4.87E-10	5.57E-02	5.57E-02	1.72E-10
KY	1.91E+02	1.79E-10	1.88E-07	3.24E-08	2.04E-08	7.49E-11	1.79E-06	9.95E-08	3.45E-07	1.24E-10	3.49E-07	9.80E-09	1.62E-05	4.98E-07	4.97E-06	1.49E-06	1.79E-03	2.59E-08	6.51E-08	8.20E-07	5.41E+01	2.68E-02	3.02E-04	1.08E-04	3.68E+01
KZ	1.47E+04	6.38E-07	1.70E-02	1.37E-04	4.94E-03	9.41E-08	1.52E-01	3.53E-04	4.60E-04	1.12E-07	2.01E-03	7.76E-05	1.08E+00	9.94E-05	2.54E-01	1.40E-02	3.51E+02	1.18E-03	1.50E-03	4.47E-02	7.01E+00	3.90E+00	4.50E-01	3.35E+01	6.95E+01
LI	1.64E-10	2.44E-02	3.83E-06	3.23E-04	1.74E-06	6.95E-08	2.15E-07	1.85E-08	1.15E-08	4.81E-09	5.43E-04	7.65E-07	1.38E-03	1.76E-05	9.97E-07	5.71E-07	6.69E-06	1.84E-05	8.60E-06	9.24E-06	8.45E-15	2.23E-13	1.03E-07	7.71E-06	1.12E-13
LT	5.65E-05	6.46E-05	6.42E+02	1.29E-02	4.71E+01	1.56E-08	4.20E-01	2.92E-03	3.57E-03	1.38E-06	4.72E-01	3.50E-02	3.13E+02	9.09E-04	8.67E-01	1.16E-01	5.50E+01	1.91E+00	2.15E-02	2.18E+00	3.73E-10	2.75E-08	2.36E-02	1.49E+01	1.24E-08
LU	9.95E-09	2.07E-05	1.91E-04	1.45E+01	7.08E-05	8.71E-08	6.08E-06	9.72E-09	6.47E-08	3.03E-10	4.00E-01	2.01E-04	2.69E-02	1.72E-03	1.29E-05	2.69E-06	3.62E-04	1.49E-03	1.45E-05	1.36E-04	1.97E-13	6.63E-12	1.28E-06	2.79E-04	3.10E-12
LV	2.24E-04	3.55E-05	1.02E+02	8.93E-03	6.98E+02	8.15E-09	1.99E-01	1.19E-03	1.44E-03	5.27E-07	3.08E-01	4.48E-02	8.90E+01	7.64E-04	3.70E-01	4.30E-02	2.24E+01	3.62E+00	1.01E-02	8.75E-01	4.41E-09	2.29E-07	3.37E-02	7.67E+00	1.62E-07
MC	1.43E-11	1.65E-07	3.22E-08	1.64E-06	1.19E-08	2.34E-04	6.17E-08	6.75E-07	2.27E-07	3.96E-10	8.95E-07	5.98E-09	3.26E-05	7.27E-07	6.70E-06	1.00E-05	3.79E-08	4.61E-08	4.38E-05	1.39E-05	2.20E-16	7.87E-14	2.53E-07	9.13E-07	3.23E-14
MD	6.55E-04	2.54E-06	2.69E-02	3.00E-04	5.76E-03	1.97E-08	6.02E+02	3.26E-03	6.05E-03	1.60E-06	2.29E-03	4.69E-05	4.46E+00	8.26E-06	1.23E+02	1.74E-01	4.25E-01	1.48E-03	6.06E-03	4.52E-01	2.12E-10	2.45E-07	9.57E-01	4.51E+01	2.81E-08
ME	1.51E-07	1.81E-06	5.20E-04	1.28E-04	1.05E-04	3.60E-07	1.33E-03	1.93E+02	7.01E-01	1.28E-03	4.66E-04	1.20E-05	7.57E-01	1.56E-04	2.10E-01	4.31E+01	9.05E-04	1.32E-04	1.53E-02	3.80E-01	5.82E-13	1.03E-10	7.30E-03	6.90E-03	2.44E-11
MK	6.19E-07	9.81E-07	6.77E-04	1.20E-04	1.49E-04	4.81E-08	6.37E-03	2.40E-01	2.31E+02	2.00E-04	6.05E-04	1.41E-05	6.03E-01	7.09E-06	1.18E+00	1.02E+02	9.66E-04	1.87E-04	7.71E-03	3.41E-01	1.68E-12	3.60E-10	2.37E-01	1.98E-02	6.39E-11
MT	6.35E-11	4.08E-09	5.76E-08	1.44E-07	4.36E-09	2.16E-09	2.81E-06	9.96E-05	2.92E-05	6.11E-02	1.28E-07	6.65E-10	8.28E-05	1.39E-07	2.83E-05	2.05E-04	2.49E-07	1.64E-08	1.30E-05	2.21E-05	3.80E-16	1.27E-12	9.07E-04	3.19E-06	6.05E-13
NL	8.27E-08	1.20E-04	3.91E-03	5.81E-01	1.08E-03	1.79E-07	6.07E-06	2.01E-06	8.31E-07	2.39E-10	4.25E+02	2.37E-02	7.65E-01	1.72E-02	3.12E-04	9.48E-04	8.13E-03	4.32E-02	1.51E-03	1.93E-02	6.41E-11	1.53E-10	7.25E-07	2.45E-03	2.95E-10
NO	1.23E-04	2.03E-05	2.47E-01	2.51E-02	3.04E-01	1.90E-08	6.46E-03	1.20E-04	1.12E-04	4.64E-09	1.40E+00	3.30E+02	7.68E+00	1.11E-02	1.69E-02	6.30E-03	4.06E+00	1.67E+01	1.19E-03	1.15E-01	1.02E-07	2.09E-07	1.13E-04	1.55E-01	3.60E-07
PL	6.23E-05	1.85E-03	2.17E+01	3.24E-01	3.11E+00	4.71E-07	1.49E+00	9.48E-02	9.59E-02	2.25E-05	4.16E+00	9.92E-02	2.63E+04	7.91E-03	1.68E+01	6.10E+00	7.25E+01	2.88E+00	1.14E+00	3.95E+02	3.66E-09	4.65E-08	4.22E-02	7.76E+01	3.35E-08
PT	1.45E-09	2.94E-08	5.85E-06	3.87E-05	2.23E-06	1.13E-08	2.28E-07	1.51E-06	4.08E-07	1.83E-08	3.47E-04	1.26E-04	5.79E-04	1.26E+03	5.71E-06	9.49E-06	9.71E-06	4.67E-05	1.20E-05	1.89E-05	1.97E-12	5.13E-12	3.01E-07	8.28E-06	8.48E-12
RO	9.24E-04	1.29E-04	8.47E-02	1.01E-02	2.39E-02	4.66E-07	1.04E+02	5.76E-01	1.31E+00	1.31E-04	3.44E-02	2.70E-04	4.66E+01	1.92E-04	4.81E+03	1.67E+02	1.09E+00	6.94E-03	1.01E+00	2.33E+01	6.94E-10	3.60E-07	8.03E+00	6.05E+01	3.68E-08
RS	1.04E-05	4.32E-05	1.06E-02	4.67E-03	2.28E-03	5.89E-07	9.99E-02	3.22E+01	6.62E+01	4.24E-04	1.81E-02	1.84E-04	1.95E+01	1.61E-04	6.63E+01	2.83E+03	1.73E-02	3.07E-03	4.71E-01	1.25E+01	3.41E-11	5.52E-09	2.58E-01	4.21E-01	6.16E-10
RU	1.09E+03	6.64E-05	3.68E+01	1.43E-02	5.07E+01	2.13E-07	4.75E+00	8.77E-03	1.38E-02	6.96E-06	4.97E-01	5.54E-01	3.25E+02	2.81E-03	7.69E+00	4.61E-01	4.37E+04	3.11E+00	3.00E-02	3.16E+00	3.85E-02	1.22E-01	1.81E+01	1.30E+03	1.36E-01
SE	3.50E-04	1.00E-04	4.08E+00	5.10E-02	5.23E+00	3.49E-08	7.69E-02	1.25E-03	1.18E-03	6.63E-08	2.77E+00	2.00E+01	9.65E+01	8.55E-03	1.98E-01	6.22E-02	6.75E+00	9.25E+02	1.14E-02	1.03E+00	5.03E-07	8.52E-07	5.56E-04	1.82E+00	1.78E-06
SI	2.89E-07	8.88E-05	3.76E-03	2.14E-03	1.21E-03	4.11E-06	4.54E-03	4.15E-03	9.79E-04	1.29E-05	4.30E-03	3.82E-05	5.38E+00	4.88E-04	2.03E-01	2.14E-01	5.17E-03	8.15E-04	3.72E+02	1.62E+00	6.63E-13	2.34E-10	1.85E-03	8.68E-02	7.64E-11
SK	2.04E-06	3.90E-04	1.18E-01	2.81E-02	2.16E-02	3.74E-07	1.69E-01	1.50E-01	1.13E-01	2.86E-05	9.24E-02	6.98E-04	7.65E+02	6.24E-04	1.28E+01	1.04E+01	1.31E-01	1.75E-02	1.41E+00	1.44E+03	1.71E-10	1.10E-09	5.40E-03	9.07E+00	8.83E-10
TJ	3.60E+00	2.69E-11	1.20E-08	1.92E-09	1.43E-09	1.07E-11	1.70E-06	4.90E-08	6.52E-08	1.40E-10	2.51E-08	4.53E-10	2.09E-06	9.04E-08	3.15E-06	3.43E-07	1.93E-03	1.09E-09	9.83E-09	1.73E-07	6.42E+02	6.46E-01	2.25E-04	2.71E-05	2.19E+01
TM	5.87E+00	3.15E-09	2.73E-05	5.23E-07	6.43E-06	6.22E-11	1.04E-03	1.33E-06	8.45E-06	9.27E-09	5.98E-06	1.56E-07	3.88E-03	4.58E-07	1.34E-03	9.65E-05	6.67E-01	1.98E-06	4.55E-06	1.89E-04	1.88E+00	2.49E+02	3.84E-02	1.26E-01	3.31E+01
TR	5.39E-03	1.48E-06	3.69E-03	2.31E-04	1.80E-03	4.58E-08	4.32E+00	1.41E-02	1.30E-01	1.65E-04	1.59E-03	1.10E-05	8.79E-01	7.03E-06	1.35E+01	1.43E+00	4.46E+00	3.48E-04	4.88E-03	2.88E-01	7.04E-10	4.37E-06	1.04E+04	1.27E+01	6.86E-07
UA	6.12E-01	1.87E-04	2.93E+00	2.42E-02	6.02E-01	4.57E-07	2.15E+02	1.20E-01	1.10E-01	3.53E-05	1.93E-01	5.00E-03	8.24E+02	8.46E-04	2.83E+02	9.15E+00	3.81E+02	1.10E-01	4.54E-01	8.17E+01	1.22E-07	8.19E-04	1.97E+01	1.78E+04	2.29E-04
UZ	2.14E+02	7.67E-09	1.98E-04	3.01E-06	4.93E-05	9.59E-11	1.87E-03	9.70E-06	1.84E-05	2.86E-09	4.56E-05	1.57E-06	1.83E-02	9.47E-07	4.64E-03	4.02E-04	1.22E+00	1.63E-05	1.42E-05	6.35E-04	8.88E+01	6.56E+01	2.57E-02	5.24E-01	4.34E+02

Table B6. *Source-receptor matrix of B(b)F deposition to EMEP countries in 2023, kg/year. 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	4.02E+01	3.41E-05	1.60E-01	4.42E-05	1.58E+00	8.52E-03	1.52E+00	7.86E-02	9.88E-03	9.42E-05	7.12E-01	3.30E-01	6.61E-03	1.62E-03	1.60E-01	3.12E-03	1.03E-01	7.23E-03	3.56E-04	1.44E+01	7.41E-01	2.18E+00	1.59E-03	1.63E-06	1.01E+01	9.15E-06
AM	1.89E-04	1.26E+02	1.61E-03	1.75E+00	4.48E-03	4.77E-04	2.64E-02	1.93E-02	2.19E-04	3.30E-03	8.78E-03	1.03E-02	2.87E-04	1.11E-04	1.71E-04	1.52E-04	1.11E-03	8.18E-04	1.72E+01	1.06E-02	3.47E-03	9.87E-03	2.20E-04	1.41E-07	1.02E-02	1.35E-04
AT	9.42E-03	3.95E-05	4.82E+02	2.68E-05	2.78E+00	1.54E+00	9.58E-02	1.08E+00	1.33E+01	2.00E-05	1.74E+02	3.00E+02	2.33E-01	2.55E-02	6.80E-01	4.90E-02	9.15E+00	9.78E-01	4.70E-04	5.20E-02	2.24E+01	4.43E+01	2.07E-01	9.46E-05	1.02E+02	1.07E-05
AZ	2.12E-04	2.13E+01	3.03E-03	5.89E+01	7.25E-03	7.63E-04	3.46E-02	5.42E-02	3.83E-04	3.05E-03	2.00E-02	1.99E-02	7.67E-04	3.46E-04	3.74E-04	4.05E-04	1.86E-03	1.35E-03	2.39E+01	1.30E-02	6.38E-03	2.04E-02	3.42E-04	1.85E-07	1.43E-02	1.78E-03
BA	7.57E-01	5.39E-05	5.35E+00	7.82E-05	1.05E+03	1.25E-01	1.86E+00	5.44E-01	1.26E-01	9.77E-05	2.33E+01	8.15E+00	4.44E-02	1.74E-02	4.24E-01	3.65E-02	6.84E-01	1.05E-01	7.37E-04	1.15E+00	1.74E+02	5.21E+01	2.07E-02	1.31E-05	4.13E+01	1.53E-05
BE	1.57E-05	1.60E-06	9.52E-02	3.09E-06	1.70E-03	5.17E+02	7.12E-04	9.70E-02	4.51E-01	3.54E-07	5.82E-01	6.94E+01	5.85E-01	1.04E-02	2.58E+00	1.41E-02	1.50E+02	1.40E+01	4.43E-05	3.99E-04	1.61E-02	3.90E-02	1.10E+00	3.87E-04	2.76E-01	2.38E-06
BG	4.19E-01	7.01E-03	1.13E+00	1.57E-03	6.60E+00	8.90E-02	8.27E+02	2.36E+00	5.75E-02	9.17E-03	5.49E+00	3.18E+00	7.45E-02	1.89E-02	5.59E-02	2.94E-02	2.60E-01	7.87E-02	1.01E-01	5.56E+01	3.92E+00	1.46E+01	1.57E-02	7.20E-06	3.53E+00	1.67E-04
BY	2.42E-02	5.43E-03	4.36E+00	4.90E-03	2.64E+00	2.44E+00	1.80E+00	6.47E+03	5.23E-01	1.59E-04	6.37E+01	6.94E+01	4.07E+00	5.14E+00	2.89E-01	3.45E+00	3.37E+00	3.26E+00	7.81E-02	6.77E-01	3.13E+00	2.67E+01	5.88E-01	2.85E-04	1.92E+00	5.03E-04
CH	3.32E-04	2.59E-06	5.35E+00	1.81E-06	1.36E-02	8.18E-01	2.43E-03	6.41E-02	1.63E+02	1.65E-06	1.61E+00	7.79E+01	1.11E-01	2.51E-03	1.44E+00	4.16E-03	5.10E+01	5.14E-01	3.30E-05	4.67E-03	6.27E-02	2.91E-02	7.74E-02	4.45E-05	8.69E+01	1.34E-06
CY	1.65E-03	1.34E-04	2.02E-03	1.01E-05	1.43E-02	2.70E-04	2.82E-02	6.70E-03	3.19E-04	7.59E+01	8.53E-03	7.89E-03	2.12E-04	7.99E-05	4.53E-04	8.41E-05	2.07E-03	3.29E-04	4.80E-04	2.78E-01	1.09E-02	1.38E-02	6.73E-05	3.84E-08	7.09E-02	1.26E-07
CZ	8.94E-03	4.73E-05	6.83E+01	6.06E-05	4.83E+00	3.80E+00	1.14E-01	3.45E+00	4.24E+00	1.83E-05	2.67E+03	5.14E+02	7.87E-01	8.83E-02	7.84E-01	1.54E-01	1.44E+01	2.24E+00	1.02E-03	4.02E-02	1.16E+01	4.91E+01	4.36E-01	2.50E-04	8.64E+00	3.09E-05
DE	2.13E-03	8.04E-05	6.97E+01	9.79E-05	6.43E-01	1.96E+02	4.60E-02	6.13E+00	8.28E+01	1.55E-05	3.60E+02	9.40E+03	2.82E+01	3.91E-01	1.06E+01	6.47E-01	3.39E+02	6.07E+01	1.44E-03	1.98E-02	1.91E+00	6.39E+00	7.91E+00	3.44E-03	3.34E+01	7.27E-05
DK	1.29E-04	1.13E-05	5.03E-01	5.97E-06	6.65E-02	4.77E+00	3.28E-03	9.12E-01	2.34E-01	3.34E-07	6.93E+00	1.11E+02	3.21E+02	2.09E-01	4.87E-01	4.14E-01	5.26E+00	1.12E+01	4.35E-05	4.76E-04	1.53E-01	7.45E-01	1.63E+00	3.90E-03	2.12E-01	1.68E-05
EE	1.24E-03	3.66E-04	3.65E-01	3.53E-04	1.55E-01	5.47E-01	5.80E-02	2.99E+01	7.04E-02	1.52E-05	5.15E+00	1.12E+01	1.85E+00	2.66E+02	7.37E-02	3.70E+01	7.45E-01	8.28E-01	4.70E-03	1.71E-02	2.19E-01	1.17E+00	1.48E-01	2.69E-04	1.40E-01	7.07E-05
ES	9.99E-04	4.71E-05	1.05E-01	1.19E-05	1.70E-01	1.75E+00	1.04E-02	1.49E-01	1.13E-01	5.84E-06	4.56E-01	5.14E+00	2.71E-01	4.93E-03	3.92E+03	3.86E-03	5.07E+01	2.83E+00	1.67E-04	8.68E-03	4.23E-01	1.88E-01	1.25E+00	1.24E-03	4.05E+00	5.60E-06
FI	3.24E-03	1.81E-03	5.17E-01	1.64E-03	2.85E-01	9.64E-01	1.51E-01	3.00E+01	9.74E-02	5.88E-05	7.17E+00	1.70E+01	3.51E+00	5.07E+01	1.37E-01	2.47E+03	1.17E+00	1.59E+00	1.58E-02	3.05E-02	4.07E-01	1.93E+00	2.97E-01	6.71E-03	2.94E-01	5.43E-03
FR	5.77E-03	3.13E-05	1.73E+00	3.56E-05	5.59E-01	1.17E+02	4.90E-02	9.03E-01	4.17E+01	1.53E-05	7.78E+00	2.90E+02	2.60E+00	5.74E-02	2.29E+02	6.65E-02	4.31E+03	4.73E+01	5.89E-04	4.30E-02	2.03E+00	9.95E-01	9.88E+00	3.67E-03	6.64E+01	2.26E-05
GB	2.19E-05	2.76E-05	1.54E-01	1.20E-05	3.37E-02	9.99E+00	1.40E-03	4.68E-01	2.09E-01	1.25E-06	1.33E+00	2.16E+01	4.47E+00	1.37E-01	1.04E+01	3.10E-01	5.40E+01	1.92E+03	7.28E-05	1.71E-04	6.88E-02	2.89E-01	2.29E+02	3.55E-02	2.01E-01	5.11E-05
GE	3.36E-03	1.25E+01	3.85E-02	1.05E+00	1.07E-01	1.14E-02	6.20E-01	3.49E-01	3.98E-03	7.60E-03	2.16E-01	2.40E-01	5.27E-03	2.76E-03	2.03E-03	6.56E-03	2.23E-02	1.87E-02	3.15E+02	2.22E-01	8.29E-02	2.74E-01	4.75E-03	3.06E-06	1.75E-01	9.07E-04
GR	2.72E+00	1.17E-03	3.09E-01	7.66E-04	1.78E+00	2.62E-02	4.11E+01	6.31E-01	1.82E-02	1.59E-02	1.41E+00	8.64E-01	2.44E-02	7.02E-03	1.64E-01	1.17E-02	1.84E-01	2.20E-02	1.18E-02	1.37E+03	1.16E+00	3.48E+00	4.95E-03	3.08E-06	1.06E+01	1.18E-04
HR	2.59E-01	3.74E-05	1.79E+01	6.71E-05	2.00E+02	1.54E-01	1.11E+00	1.10E+00	2.32E-01	7.60E-05	3.37E+01	1.22E+01	4.83E-02	2.10E-02	8.58E-01	3.46E-02	1.22E+00	1.10E-01	7.80E-04	5.56E-01	9.03E+02	1.14E+02	2.08E-02	1.22E-05	9.01E+01	1.57E-05
HU	4.01E-01	2.48E-05	5.42E+01	6.36E-05	6.34E+01	5.71E-01	3.31E+00	3.01E+00	5.99E-01	3.10E-05	9.20E+01	3.22E+01	1.90E-01	4.34E-02	4.98E-01	6.17E-02	2.08E+00	4.72E-01	6.45E-04	1.68E+00	1.55E+02	1.71E+03	1.12E-01	5.10E-05	2.65E+01	1.75E-05
IE	1.87E-06	6.47E-06	1.23E-02	1.87E-06	2.98E-03	4.52E-01	1.26E-04	3.92E-02	2.10E-02	2.68E-07	8.78E-02	1.36E+00	1.72E-01	1.20E-02	1.34E+00	3.03E-02	2.72E+00	3.09E+01	1.27E-05	2.23E-05	5.64E-03	2.25E-02	1.61E+03	1.74E-02	3.07E-02	1.04E-05
IS	1.73E-06	7.04E-07	8.95E-04	6.50E-07	2.91E-04	2.48E-02	3.78E-05	6.59E-03	3.53E-04	3.11E-08	9.65E-03	1.26E-01	5.64E-02	9.75E-03	5.62E-02	5.99E-02	5.37E-02	4.09E-01	3.51E-06	7.43E-06	6.44E-04	2.36E-03	7.80E-01	1.31E+01	1.90E-03	1.70E-06
IT	1.12E+00	7.61E-05	3.00E+01	8.09E-05	2.91E+01	5.99E-01	1.43E+00	7.45E-01	1.56E+01	8.60E-05	1.85E+01	5.11E+01	9.48E-02	1.73E-02	1.16E+01	2.99E-02	3.02E+01	3.20E-01	7.18E-04	4.16E+00	6.35E+01	1.66E+01	6.06E-02	3.99E-05	5.37E+03	2.00E-05
KY	2.04E-05	1.20E-02	8.59E-05	8.24E-03	3.14E-04	4.92E-05	1.45E-03	1.08E-03	4.71E-05	4.33E-05	5.08E-04	1.18E-03	1.82E-05	7.20E-06	3.72E-04	1.90E-05	2.98E-04	6.52E-05	1.02E-02	1.30E-03	2.63E-04	3.89E-04	1.39E-05	3.41E-08	2.63E-03	1.31E+03
KZ	6.37E-03	7.98E-01	2.37E-01	2.12E+00	3.26E-01	1.29E-01	1.24E+00	1.07E+01	2.51E-02	2.72E-03	2.35E+00	2.73E+00	1.38E-01	9.95E-02	3.79E-02	1.34E-01	2.16E-01	2.09E-01	1.41E+00	4.20E-01	3.66E-01	1.57E+00	4.88E-02	3.41E-05	6.69E-01	4.27E+02
LI	9.54E-07	3.02E-08	1.06E-01	1.08E-08	6.91E-05	4.22E-03	1.12E-05	3.69E-04	5.96E-01	6.40E-09	1.18E-02	4.15E-01	5.57E-04	1.27E-05	3.57E-03	2.74E-05	5.39E-02	2.50E-03	1.79E-07	1.47E-05	2.69E-04	1.74E-04	3.69E-04	2.80E-07	2.97E-01	6.98E-09
LT	7.19E-03	1.90E-04	1.32E+00	1.48E-04	5.59E-01	1.88E+00	3.26E-01	3.03E+02	2.28E-01	5.89E-06	1.99E+01	4.04E+01	5.95E+00	3.84E+00	1.95E-01	2.85E+00	2.27E+00	2.73E+00	2.53E-03	7.89E-02	8.12E-01	5.15E+00	3.75E-01	1.85E-04	5.54E-01	3.07E-05
LU	1.83E-06	1.59E-07	1.59E-02	4.69E-07	1.41E-04	1.07E+01	1.34E-04	1.04E-02	1.17E-01	6.38E-08	1.04E-01	1.43E+01	4.70E-02	7.79E-04	2.52E-01	9.79E-04	1.58E+01	3.96E-01	7.72E-06	7.67E-05	1.16E-03	2.87E-03	6.11E-02	1.58E-05	5.21E-02	3.06E-07
LV	3.74E-03	3.96E-04	8.10E-01	2.52E-04	3.29E-01	1.50E+00	1.80E-01	1.42E+02	1.58E-01	1.39E-05	1.19E+01	2.92E+01	4.97E+00	2.82E+01	1.70E-01	9.54E+00	1.86E+00	2.12E+00	7.29E-03	5.58E-02	4.87E-01	2.86E+00	3.10E-01	3.13E-04	3.37E-01	4.17E-05
MC	1.70E-06	7.33E-09	2.08E-04	2.63E-09	8.57E-05	2.48E-05	2.75E-05	9.63E-06	2.83E-04	4.18E-09	2.72E-04	1.21E-03	5.45E-06	3.11E-07	6.86E-04	5.01E-07	3.91E-02	7.41E-06	3.22E-08	1.73E-05	3.55E-04	1.97E-04	1.79E-06	1.10E-09	5.45E-02	4.62E-10
MD	1.03E-02	1.73E-03	2.31E-01	8.80E-04	4.03E-01	3.42E-02	3.25E+00	4.96E+00	1.74E-02	3.84E-04	1.32E+00	1.10E+00	2.94E-02	2.46E-02	7.39E-03	4.49E-02	7.78E-02	3.91E-02	1.41E-02	4.05E-01	3.65E-01	2.35E+00	6.98E-03	4.06E-06	3.64E-01	8.98E-05
ME	3.71E+00	1.55E-05	2.59E-01	1.55E-05	1.63E+01	1.10E-02	8.33E-01	6.67E-02	1.34E-02	3.05E-05	1.38E+00	5.34E-01	6.47E-03	1.82E-03	1.31E-01	4.10E-03	9.77E-02	8.90E-03	1.75E-04	1.20E+00	3.12E+00	3.38E+00	1.86E-03	1.50E-06	1.14E+01	2.99E-06
MK	5.94E+00	4.97E-05	2.74E-01	5.69E-05	1.37E+00	1.61E-02	1.13E+01	1.03E-01	9.47E-03	5.30E-05	1.20E+00	5.73E-01	1.42E-02	2.11E-03	3.73E-02	4.45E-03	5.62E-02	1.28E-02	7.23E-04	3.58E+01	7.51E-01	3.51E+00	2.53E-03	2.62E-06	2.24E+00	8.27E-06
MT	3.35E-04	9.61E-08	3.85E-04	3.08E-08	2.96E-03	8.54E-05	7.81E-04	1.89E-04	1.61E-04	1.88E-08	2.03E-03	1.72E-03	7.54E-06	1.77E-06	1.82E-03	3.74E-06	2.83E-03	6.97E-05	3.15E-07	7.14E-03	2.87E-03	1.79E-03	2.28E-05	8.42E-09	9.33E-02	3.87E-09
NL	1.09E-05	3.60E-06	1.86E-01	2.20E-06	1.62E-02	1.74E+02	3.83E-04	1.46E-01	3.27E-01	2.42E-07	1.30E+00	1.49E+02	1.33E+00	1.56E-02	1.78E+00	2.99E-02	5.11E+01	3.13E+01	1.75E-05	8.30E-05	6.52E-02	1.74E-01	2.24E+00	9.94E-04	3.01E-01	3.91E-06
NO	8.10E-04	2.92E-04	3.15E-01	1.92E-04	1.20E-01	4.29E+00	2.83E-02	3.64E+00	1.64E-01	1.28E-05	4.74E+00	3.79E+01	2.03E+01	1.49E+00	6.45E-01	1.21E+01	5.59E+00	1.63E+01	1.23E-03	2.97E-03	1.48E-01	6.62E-01	3.83E+00	9.14E-02	2.26E-01	1.27E-03
PL	9.11E-02	3.65E-04	3.25E+01	4.75E-04	1.26E+01	1.50E+01	1.53E+00	2.93E+02	3.38E+00	8.02E-05	1.04E+03	7.11E+02	1.78E+01	2.31E+00	1.58E+00	3.15E+00	2.26E+01	1.44E+01	8.83E-03	5.48E-01	1.88E+01	1.50E+02	2.39E+00	1.04E-03	1.09E+01	3.03E-04
PT	6.06E-05	6.97E-06	2.93E-03	1.35E-06	5.27E-03	5.63E-02	6.20E-04	7.96E-03	2.15E-03	6.44E-07	1.72E-02	1.39E-01	1.30E-02	2.24E-04	7.67E+01	2.35E-04	7.39E-01	2.41E-01	1.73E-05	6.59E-04	1.08E-02	6.37E-03	1.20E-01	2.84E-04	9.86E-02	1.05E-06
RO	5.49E-01	7.21E-03	1.01E+01	2.45E-03	3.89E+01	5.33E-01	1.05E+02	1.29E+01	5.22E-01	4.35E-03	3.00E+01	2.21E+01	2.62E-01	1.31E-01	2.10E-01	1.97E-01	1.77E+00	5.82E-01	1.37E-01	9.02E+00	3.29E+01	2.28E+02	1.32E-01	5.46E-05	1.79E+01	3.47E-04
RS	3.67E+00	2.90E-04	5.05E+00	3.52E-04	1.13E+02	2.67E-01	3.80E+01	1.18E+00	1.63E-01	1.66E-04	2.54E+01	1.07E+01	1.39E-01	2.74E-02	1.74E-01	5.12E-02	7.32E-01	2.22E-01	4.47E-03	1.16E+01	5.51E+01	1.18E+02	4.85E-02	2.98E-05	1.42E+01	5.21E-05
RU	6.31E-02	2.68E+00	4.50E+00	3.83E+00	4.45E+00	4.40E+00	1.26E+01	1.37E+03	5.83E-01	3.72E-02	5.37E+01	8.55E+01	9.56E+00	9.65E+01	6.08E-01	2.06E+02	5.70E+00	6.85E+00	2.61E+01	4.37E+00	4.76E+00	2.72E+01	1.19E+00	1.07E-02	5.10E+00	1.31E+01
SE	4.24E-03	6.69E-04	1.35E+00	4.86E-04	5.46E-01	8.15E+00	1.36E-01	2.56E+01	4.29E-01	2.02E-05	2.20E+01	1.48E+02	1.24E+02	1.14E+01	8.65E-01	1.03E+02	9.39E+00	1.77E+01	3.35E-03	1.18E-02	7.54E-01	3.94E+00	2.96E+00	2.75E-02	8.45E-01	1.83E-03
SI	1.08E-02	1.15E-05	3.73E+01	1.63E-05	2.85E+00	5.63E-02	1.15E-01	3.74E-01	1.38E-01	2.01E-05	1.10E+01	6.83E+00	1.66E-02	5.14E-03	3.94E-01	8.90E-03	5.56E-01	2.96E-02	2.45E-04	5.42E-02	1.25E+02	1.49E+01	5.05E-03	2.59E-06	6.52E+01	5.86E-06
SK	9.22E-02	2.28E-05	3.05E+01	4.80E-05	1.62E+01	6.43E-01	9.29E-01	4.18E+00	6.53E-01	2.29E-05	2.38E+02	3.93E+01	2.72E-01	5.30E-02	2.53E-01	1.09E-01	2.23E+00	5.34E-01	6.10E-04	4.21E-01	2.00E+01	2.98E+02	1.15E-01	6.00E-05	8.20E+00	2.04E-05
TJ	9.11E-06	1.21E-02	4.43E-05	8.20E-03	1.17E-04	1.13E-05	8.39E-04	4.89E-04	1.46E-05	3.45E-05	2.69E-04	3.10E-04	9.62E-06	2.86E-06	7.65E-05	5.05E-06	5.85E-05	1.80E-05	9.00E-03	4.71E-04	1.21E-04	2.82E-04	4.53E-06	1.01E-08	1.03E-03	2.88E+01
TM	1.78E-04	3.47E-01	3.43E-03	1.10E+00	6.30E-03	1.18E-03	3.00E-02	8.63E-02	4.34E-04	1.42E-03	2.79E-02	2.93E-02	1.28E-03	7.68E-04	5.46E-04	7.78E-04	2.56E-03	2.00E-03	2.87E-01	9.99E-03	6.56E-03	2.38E-02	5.13E-04	3.43E-07	1.12E-02	2.54E-01
TR	1.18E-01	2.03E+01	4.83E-01	1.58E-01	1.47E+00	6.78E-02	3.74E+01	5.61E+00	3.84E-02	4.49E+00	2.63E+00	1.99E+00	6.63E-02	4.07E-02	5.72E-02	5.02E-02	2.14E-01	8.88E-02	7.81E+00	4.34E+01	1.14E+00	4.86E+00	2.04E-02	1.31E-05	2.94E+00	3.69E-04
UA	1.45E-01	1.24E-01	1.15E+01	9.03E-02	1.56E+01	1.81E+00	1.69E+01	4.65E+02	7.42E-01	1.20E-02	9.33E+01	6.25E+01	1.71E+00	1.01E+00	3.78E-01	1.11E+00	3.67E+00	1.92E+00	1.16E+00	4.52E+00	1.69E+01	1.76E+02	3.73E-01	2.09E-04	1.04E+01	5.77E-03
UZ	3.50E-04	1.90E-01	5.33E-03	3.69E-01	1.16E-02	4.11E-03	4.76E-02	2.73E-01	7.16E-04	7.13E-04	6.12E-02	7.60E-02	3.43E-03	1.86E-03	7.63E-04	2.03E-03	6.74E-03	6.48E-03	1.77E-01	1.65E-02	1.07E-02	3.56E-02	1.41E-03	1.02E-06	2.32E-02	1.62E+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	3.54E-03	2.96E-05	2.46E-02	1.65E-03	6.93E-03	6.62E-06	8.43E-02	3.47E+01	2.70E+01	1.36E-02	7.21E-03	4.76E-04	3.35E+00	3.93E-03	2.39E+00	1.26E+02	7.57E-02	2.36E-03	6.44E-02	1.16E+00	4.61E-07	1.77E-05	1.57E+00	6.13E-01	7.14E-06
AM	3.65E-02	6.86E-07	1.19E-03	6.69E-05	4.96E-04	3.93E-08	4.30E-02	7.45E-04	2.30E-03	6.63E-06	3.48E-04	3.31E-05	7.78E-02	1.19E-05	1.27E-01	3.30E-02	6.43E-01	1.39E-04	1.03E-03	8.52E-03	1.22E-05	4.04E-03	4.04E+01	4.11E-01	8.42E-04
AT	4.47E-03	1.33E-01	2.35E-01	4.77E-01	1.12E-01	9.47E-05	1.78E-01	7.48E-02	4.70E-02	6.44E-04	7.95E-01	2.42E-02	1.13E+02	2.62E-02	1.50E+00	3.01E+00	4.00E-01	1.33E-01	7.06E+01	5.42E+01	1.40E-06	5.92E-05	1.91E-01	3.78E+00	2.39E-05
AZ	3.93E+00	1.29E-06	3.43E-03	9.98E-05	1.49E-03	5.42E-08	7.09E-02	8.99E-04	2.80E-03	1.10E-05	6.44E-04	9.47E-05	2.07E-01	2.65E-05	1.89E-01	4.60E-02	3.34E+01	4.39E-04	1.96E-03	1.87E-02	6.32E-04	6.50E-01	1.33E+01	1.92E+00	1.31E-01
BA	6.14E-03	4.73E-04	1.76E-01	3.21E-02	6.19E-02	4.88E-05	1.46E-01	2.31E+01	1.01E+00	1.29E-02	8.16E-02	4.77E-03	6.14E+01	1.85E-02	1.03E+01	1.45E+02	3.21E-01	3.87E-02	3.48E+00	2.21E+01	9.62E-07	2.42E-05	9.10E-01	2.58E+00	9.28E-06
BE	8.12E-04	5.32E-04	4.08E-02	8.63E+00	2.16E-02	8.76E-06	2.65E-03	4.26E-05	7.42E-05	4.73E-07	4.20E+01	7.26E-02	1.84E+00	1.49E-01	8.21E-03	2.94E-03	8.02E-02	1.20E-01	9.31E-03	5.71E-02	5.20E-07	9.99E-06	4.51E-03	1.69E-01	5.10E-06
BG	1.75E-01	2.13E-04	1.86E-01	1.64E-02	7.63E-02	8.36E-06	1.60E+01	1.66E+00	1.56E+01	3.77E-03	6.52E-02	4.10E-03	2.05E+01	1.38E-03	2.63E+02	1.74E+02	6.49E+00	3.30E-02	5.53E-01	7.89E+00	7.37E-06	4.27E-04	9.69E+01	5.71E+01	1.48E-04
BY	1.31E+00	2.17E-03	1.72E+02	2.48E-01	4.79E+01	4.79E-06	2.63E+01	1.69E-01	2.57E-01	5.70E-04	2.38E+00	3.40E-01	1.79E+03	3.45E-02	5.15E+01	9.85E+00	2.38E+02	3.45E+00	1.18E+00	4.23E+01	7.52E-05	1.09E-02	1.42E+01	3.45E+03	3.87E-03
CH	3.88E-04	4.06E-01	1.86E-02	2.73E-01	9.77E-03	2.01E-04	4.55E-03	1.08E-03	1.05E-03	1.46E-04	3.57E-01	5.90E-03	1.89E+00	5.47E-02	1.55E-02	1.30E-02	3.32E-02	4.22E-02	7.79E-02	5.24E-02	2.97E-07	5.41E-06	6.92E-03	1.33E-01	2.67E-06
CY	4.07E-04	9.95E-07	3.55E-04	4.79E-05	2.17E-04	1.40E-07	1.39E-02	6.27E-03	1.19E-02	2.44E-04	2.19E-04	1.46E-05	4.39E-02	3.46E-06	5.83E-02	4.98E-02	5.08E-02	8.19E-05	1.88E-03	9.48E-03	5.13E-08	4.04E-06	1.24E+01	2.85E-01	1.31E-06
CZ	1.15E-02	1.85E-02	8.91E-01	1.32E+00	3.69E-01	2.06E-05	3.05E-01	1.16E-01	7.76E-02	1.23E-04	2.10E+00	7.19E-02	9.81E+02	4.60E-02	2.58E+00	7.69E+00	1.46E+00	3.97E-01	6.20E+00	1.65E+02	4.51E-06	1.47E-04	2.12E-01	8.60E+00	6.34E-05
DE	2.67E-02	2.88E-01	2.80E+00	6.85E+01	1.25E+00	1.23E-04	2.01E-01	1.40E-02	1.58E-02	1.05E-04	1.85E+02	1.19E+00	5.31E+02	6.27E-01	1.01E+00	1.31E+00	4.22E+00	4.92E+00	1.36E+00	1.10E+01	1.49E-05	2.95E-04	1.89E-01	8.50E+00	1.52E-04
DK	3.14E-03	7.19E-04	1.00E+00	2.90E-01	7.58E-01	1.24E-06	5.99E-02	1.87E-03	1.82E-03	2.76E-06	7.62E+00	3.86E+00	5.17E+01	5.15E-02	3.30E-01	2.09E-01	1.45E+00	1.00E+01	8.20E-02	1.03E+00	5.19E-06	1.56E-05	1.23E-03	1.57E+00	2.35E-05
EE	8.90E-02	2.46E-04	2.16E+01	4.37E-02	7.40E+01	4.00E-07	5.90E-01	9.90E-03	1.49E-02	1.92E-05	5.87E-01	3.48E-01	1.01E+02	9.15E-03	1.47E+00	4.36E-01	7.90E+01	6.15E+00	1.05E-01	2.22E+00	4.46E-05	8.42E-04	4.43E-01	2.02E+01	4.67E-04
ES	1.18E-03	2.11E-04	4.76E-02	1.34E-01	2.08E-02	6.03E-05	9.01E-03	1.32E-02	4.12E-03	1.89E-04	7.77E-01	6.48E-02	2.19E+00	1.57E+02	6.51E-02	8.73E-02	8.11E-02	8.61E-02	1.43E-01	1.52E-01	1.85E-06	2.32E-05	2.83E-02	2.87E-01	1.41E-05
FI	6.05E-01	3.48E-04	1.50E+01	6.64E-02	2.36E+01	1.01E-06	1.16E+00	2.46E-02	3.30E-02	3.23E-05	1.08E+00	5.05E+00	1.30E+02	1.35E-02	3.08E+00	8.95E-01	3.08E+02	4.65E+01	1.79E-01	3.29E+00	1.63E-03	5.59E-03	1.09E+00	3.93E+01	7.13E-03
FR	7.39E-03	1.20E-02	2.89E-01	3.11E+01	1.60E-01	2.48E-02	6.08E-02	3.10E-02	1.93E-02	6.82E-04	2.13E+01	2.66E-01	1.91E+01	5.70E+00	3.99E-01	4.92E-01	5.30E-01	6.90E-01	1.04E+00	9.65E-01	4.65E-06	1.08E-04	1.22E-01	1.91E+00	5.10E-05
GB	4.78E-03	4.58E-04	3.15E-01	2.61E-01	2.84E-01	6.22E-06	1.08E-02	4.67E-04	4.48E-04	6.56E-07	9.21E+00	2.11E+00	9.39E+00	2.34E+00	8.77E-02	8.76E-02	5.61E-01	1.65E+00	3.59E-02	4.25E-01	1.98E-05	4.36E-05	1.76E-03	6.56E-01	8.28E-05
GE	2.03E-01	1.46E-05	1.96E-02	1.57E-03	8.46E-03	3.99E-07	6.92E-01	1.83E-02	4.86E-02	4.37E-05	8.26E-03	7.57E-04	1.72E+00	1.49E-04	2.33E+00	7.16E-01	4.42E+01	3.33E-03	2.26E-02	2.27E-01	1.07E-04	8.19E-03	6.16E+01	1.44E+01	2.49E-03
GR	6.43E-02	5.83E-05	6.72E-02	4.68E-03	2.80E-02	8.32E-06	2.26E+00	9.34E-01	3.70E+01	3.77E-02	2.15E-02	1.26E-03	5.82E+00	3.50E-03	1.47E+01	3.67E+01	1.26E+00	9.06E-03	1.44E-01	1.98E+00	4.48E-06	2.72E-04	1.82E+02	1.19E+01	1.01E-04
HR	6.52E-03	9.49E-04	2.55E-01	4.42E-02	9.80E-02	1.07E-04	3.13E-01	5.90E+00	5.49E-01	5.04E-03	9.98E-02	5.81E-03	8.49E+01	3.24E-02	1.04E+01	7.60E+01	3.94E-01	4.68E-02	9.60E+01	3.11E+01	1.21E-06	4.77E-05	8.56E-01	5.31E+00	1.82E-05
HU	5.02E-03	2.38E-03	6.06E-01	1.34E-01	1.96E-01	4.62E-05	1.01E+00	3.70E+00	3.33E+00	4.23E-03	3.51E-01	1.61E-02	2.87E+02	2.15E-02	1.48E+02	2.41E+02	7.78E-01	9.93E-02	4.08E+01	4.46E+02	2.00E-06	4.74E-05	6.85E-01	3.42E+01	2.26E-05
IE	5.66E-04	4.07E-05	2.57E-02	1.93E-02	2.38E-02	1.43E-06	4.73E-04	4.12E-05	4.18E-05	6.31E-08	4.43E-01	1.80E-01	5.75E-01	3.87E-01	6.60E-03	7.82E-03	4.16E-02	7.60E-02	2.74E-03	3.20E-02	4.04E-06	6.11E-06	2.70E-04	4.37E-02	1.58E-05
IS	4.95E-04	1.13E-06	6.79E-03	1.04E-03	1.08E-02	2.54E-08	3.12E-04	1.47E-05	1.58E-05	4.44E-08	2.97E-02	5.16E-01	7.80E-02	5.42E-02	7.87E-04	6.85E-04	2.42E-02	6.99E-02	3.09E-04	3.31E-03	4.16E-07	2.75E-06	1.51E-04	6.28E-03	2.08E-06
IT	6.26E-03	4.31E-02	1.96E-01	1.96E-01	7.88E-02	1.30E-02	2.18E-01	5.16E+00	1.93E+00	3.16E-01	2.89E-01	8.84E-03	4.89E+01	2.04E-01	5.66E+00	2.13E+01	3.27E-01	5.93E-02	4.07E+01	1.09E+01	1.70E-06	5.92E-05	1.68E+00	3.25E+00	2.29E-05
KY	2.05E+02	1.31E-07	6.49E-05	6.51E-06	2.07E-05	2.77E-08	1.09E-03	8.76E-05	2.85E-04	6.75E-07	3.47E-05	1.05E-05	4.72E-03	1.71E-05	3.99E-03	2.01E-03	1.64E-01	1.85E-05	7.09E-05	3.66E-04	6.20E+01	9.79E-01	7.42E-02	3.40E-02	1.11E+02
KZ	2.87E+04	9.29E-05	6.70E-01	1.24E-02	3.13E-01	3.38E-06	3.95E+00	4.12E-02	8.02E-02	8.94E-05	1.13E-01	1.42E-02	3.10E+01	2.64E-03	9.57E+00	1.59E+00	1.04E+03	1.01E-01	1.33E-01	1.74E+00	2.59E+01	4.91E+01	1.97E+01	3.58E+02	2.56E+02
LI	1.87E-06	2.34E-02	1.05E-04	1.21E-03	5.07E-05	8.27E-07	2.59E-05	2.60E-06	3.60E-06	6.64E-07	1.85E-03	2.97E-05	1.15E-02	1.42E-04	1.02E-04	6.46E-05	1.89E-04	2.30E-04	3.79E-04	2.66E-04	1.83E-09	2.63E-08	3.36E-05	7.26E-04	1.43E-08
LT	3.98E-02	8.45E-04	6.89E+02	1.24E-01	6.35E+01	1.44E-06	2.68E+00	4.72E-02	7.75E-02	1.18E-04	2.09E+00	3.60E-01	6.58E+02	2.27E-02	7.04E+00	1.94E+00	8.59E+01	4.97E+00	3.90E-01	9.84E+00	7.07E-06	2.12E-04	9.06E-01	9.01E+01	1.00E-04
LU	1.07E-04	1.18E-04	3.60E-03	1.68E+01	1.83E-03	1.58E-06	4.92E-04	5.07E-06	1.30E-05	8.57E-08	7.20E-01	4.19E-03	2.20E-01	1.27E-02	1.28E-03	2.86E-04	7.61E-03	1.09E-02	7.97E-04	5.05E-03	5.27E-08	1.57E-06	8.30E-04	2.04E-02	7.02E-07
LV	9.95E-02	5.46E-04	1.56E+02	1.02E-01	6.55E+02	9.57E-07	1.71E+00	2.57E-02	4.09E-02	6.85E-05	1.65E+00	4.41E-01	2.91E+02	2.20E-02	4.14E+00	1.05E+00	6.04E+01	8.93E+00	2.35E-01	5.31E+00	1.18E-05	6.18E-04	1.06E+00	6.18E+01	2.53E-04
MC	1.65E-07	7.39E-07	2.35E-06	1.10E-05	1.27E-06	2.56E-04	5.34E-06	8.73E-06	7.52E-06	4.74E-08	1.09E-05	7.67E-07	5.84E-04	6.05E-06	1.46E-04	1.55E-04	4.11E-06	2.48E-06	2.87E-04	1.42E-04	5.50E-11	2.72E-09	4.10E-05	6.00E-05	9.70E-10
MD	1.07E-01	7.48E-05	2.97E-01	5.68E-03	8.98E-02	1.01E-06	5.72E+02	4.59E-02	1.27E-01	1.18E-04	2.78E-02	2.91E-03	2.04E+01	3.19E-04	1.56E+02	1.90E+00	5.21E+00	3.28E-02	1.17E-01	2.18E+00	8.50E-06	4.50E-04	7.62E+00	1.84E+02	1.88E-04
ME	1.32E-03	4.28E-05	2.43E-02	2.41E-03	7.28E-03	8.46E-06	4.33E-02	1.68E+02	1.97E+00	1.16E-02	8.42E-03	5.34E-04	4.97E+00	5.11E-03	1.59E+00	6.55E+01	5.71E-02	3.54E-03	1.17E-01	1.73E+00	1.86E-07	5.79E-06	2.55E-01	3.73E-01	2.22E-06
MK	4.72E-03	3.18E-05	2.88E-02	2.80E-03	9.46E-03	2.88E-06	1.16E-01	7.34E-01	2.40E+02	3.56E-03	1.38E-02	7.67E-04	4.14E+00	8.70E-04	4.64E+00	1.41E+02	1.05E-01	4.89E-03	8.49E-02	1.86E+00	4.18E-07	1.84E-05	3.60E+00	8.86E-01	6.82E-06
MT	2.57E-06	3.44E-07	3.40E-05	2.97E-05	6.65E-06	7.40E-08	4.40E-04	1.40E-03	6.79E-04	8.92E-02	2.37E-05	7.73E-07	7.19E-03	1.69E-05	2.07E-03	4.99E-03	2.90E-04	3.73E-06	4.65E-04	1.20E-03	4.26E-10	1.04E-07	1.54E-02	2.05E-03	3.23E-08
NL	9.17E-04	7.01E-04	6.88E-02	1.50E+00	3.27E-02	4.08E-06	1.01E-03	1.77E-04	1.11E-04	2.75E-07	3.46E+02	2.23E-01	5.04E+00	1.17E-01	1.35E-02	3.29E-02	1.13E-01	2.28E-01	3.21E-02	2.26E-01	1.18E-06	5.93E-06	1.11E-03	1.61E-01	5.81E-06
NO	1.06E-01	4.34E-04	2.13E+00	2.49E-01	2.06E+00	2.20E-06	2.05E-01	9.72E-03	1.23E-02	2.76E-06	5.50E+00	7.86E+02	4.64E+01	1.08E-01	6.75E-01	4.40E-01	1.28E+01	3.66E+01	5.75E-02	1.22E+00	2.54E-04	8.05E-04	5.23E-02	4.99E+00	1.00E-03
PL	9.98E-02	1.34E-02	4.90E+01	1.93E+00	1.20E+01	2.59E-05	8.93E+00	7.69E-01	1.00E+00	1.15E-03	1.43E+01	9.35E-01	2.74E+04	1.28E-01	6.68E+01	4.22E+01	1.02E+02	8.85E+00	8.52E+00	5.12E+02	5.87E-05	1.16E-03	2.15E+00	3.65E+02	5.89E-04
PT	1.06E-04	4.50E-06	2.48E-03	2.77E-03	9.97E-04	1.08E-06	6.22E-04	5.96E-04	2.64E-04	1.23E-05	2.76E-02	5.64E-03	1.24E-01	1.37E+03	3.68E-03	4.42E-03	4.80E-03	4.87E-03	3.56E-03	5.67E-03	4.06E-07	2.19E-06	1.80E-03	1.74E-02	2.12E-06
RO	2.68E-01	2.09E-03	1.35E+00	1.12E-01	4.95E-01	2.98E-05	1.55E+02	3.25E+00	7.63E+00	4.56E-03	3.25E-01	2.45E-02	1.87E+02	8.58E-03	4.79E+03	3.51E+02	1.71E+01	1.80E-01	7.28E+00	6.90E+01	3.00E-05	8.29E-04	5.50E+01	3.20E+02	3.62E-04
RS	2.96E-02	6.44E-04	3.26E-01	4.93E-02	1.07E-01	2.57E-05	1.16E+00	4.02E+01	8.58E+01	7.68E-03	1.87E-01	8.85E-03	8.49E+01	6.23E-03	1.19E+02	2.99E+03	7.59E-01	6.05E-02	2.43E+00	3.94E+01	3.33E-06	9.48E-05	5.11E+00	9.95E+00	3.58E-05
RU	6.64E+03	2.22E-03	1.14E+02	3.22E-01	1.26E+02	1.70E-05	5.05E+01	4.17E-01	8.30E-01	1.40E-03	4.60E+00	3.53E+00	1.15E+03	8.64E-02	1.13E+02	1.96E+01	5.66E+04	1.79E+01	1.67E+00	3.68E+01	1.77E+00	7.38E+00	2.22E+02	5.30E+03	8.10E+00
SE	2.25E-01	1.47E-03	1.75E+01	4.85E-01	1.79E+01	3.72E-06	1.41E+00	4.58E-02	5.52E-02	1.79E-05	1.06E+01	6.64E+01	3.37E+02	1.24E-01	4.20E+00	2.12E+00	4.23E+01	1.01E+03	3.44E-01	6.62E+00	5.65E-04	1.68E-03	1.35E-01	3.30E+01	2.44E-03
SI	2.16E-03	5.94E-04	5.43E-02	1.89E-02	2.35E-02	5.71E-05	1.36E-01	7.64E-02	3.13E-02	6.11E-04	3.43E-02	2.23E-03	2.42E+01	1.11E-02	1.73E+00	1.73E+00	9.57E-02	1.69E-02	3.34E+02	6.06E+00	4.93E-07	2.36E-05	2.15E-01	2.16E+00	9.12E-06
SK	5.62E-03	2.78E-03	8.60E-01	1.56E-01	2.56E-01	1.62E-05	1.16E+00	9.50E-01	8.90E-01	1.12E-03	4.11E-01	2.30E-02	1.07E+03	1.35E-02	3.66E+01	5.05E+01	1.02E+00	1.68E-01	6.89E+00	1.43E+03	3.36E-06	4.66E-05	2.98E-01	3.85E+01	2.56E-05
TJ	2.54E+01	3.83E-08	3.06E-05	1.45E-06	1.08E-05	6.98E-09	9.29E-04	3.14E-05	1.65E-04	2.48E-07	9.45E-06	3.56E-06	2.61E-03	4.30E-06	3.01E-03	1.06E-03	1.13E-01	6.18E-06	3.45E-05	2.44E-04	5.79E+02	6.10E+00	4.92E-02	2.14E-02	6.82E+01
TM	6.69E+01	1.54E-06	5.43E-03	1.39E-04	2.78E-03	4.30E-08	6.84E-02	7.95E-04	2.58E-03	1.06E-05	1.04E-03	1.86E-04	3.19E-01	4.16E-05	1.65E-01	3.85E-02	8.00E+00	8.22E-04	2.13E-03	2.26E-02	1.09E+01	5.06E+02	1.90E+00	4.09E+00	9.94E+01
TR	9.43E-01	1.41E-04	2.72E-01	1.09E-02	1.46E-01	7.83E-06	2.14E+01	2.91E-01	1.63E+00	7.95E-03	5.05E-02	5.47E-03	1.66E+01	1.02E-03	6.13E+01	1.43E+01	4.21E+01	3.63E-02	2.28E-01	3.33E+00	2.17E-05	3.22E-03	1.47E+04	1.87E+02	1.23E-03
UA	2.08E+01	3.08E-03	1.66E+01	2.88E-01	4.93E+00	2.58E-05	3.54E+02	1.13E+00	1.57E+00	2.32E-03	1.41E+00	1.42E-01	1.75E+03	2.67E-02	5.89E+02	6.48E+01	8.28E+02	1.11E+00	5.35E+00	1.77E+02	9.99E-04	1.63E-01	1.48E+02	2.91E+04	6.03E-02
UZ	9.54E+02	2.60E-06	1.50E-02	3.84E-04	7.05E-03	5.98E-08	8.24E-02	2.23E-03	4.55E-03	6.16E-06	3.48E-03	3.95E-04	7.73E-01	5.32E-05	2.41E-01	6.32E-02	1.16E+01	2.20E-03	3.39E-03	4.03E-02	1.07E+02	1.88E+02	1.49E+00	1.05E+01	1.01E+03

Table B7. *Source-receptor matrix of B(k)F deposition to EMEP countries in 2023, kg/year. 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	1.00E-05	5.12E-02	2.65E-05	4.60E-01	2.21E-03	4.73E-01	1.90E-02	2.67E-03	4.30E-06	4.15E-01	1.04E-01	3.12E-03	7.61E-04	7.74E-03	2.06E-03	1.77E-02	2.50E-03	1.04E-04	5.08E+00	2.17E-01	8.92E-01	3.68E-04	1.93E-06	2.68E+00	2.73E-06
AM	0.00E+00	5.63E+01	4.60E-04	4.79E-01	1.12E-03	1.56E-04	9.71E-03	4.35E-03	5.65E-05	4.80E-04	4.51E-03	3.54E-03	1.35E-04	4.20E-05	1.72E-05	7.52E-05	3.82E-04	4.68E-04	4.69E+00	1.90E-03	8.55E-04	3.47E-03	9.72E-05	2.69E-07	1.36E-03	8.02E-05
AT	0.00E+00	1.21E-05	2.31E+02	1.83E-05	7.14E-01	4.72E-01	1.98E-02	2.38E-01	7.23E+00	1.09E-06	1.11E+02	1.26E+02	1.07E-01	9.28E-03	8.53E-02	2.45E-02	3.80E+00	4.13E-01	1.18E-04	1.40E-02	6.58E+00	1.86E+01	5.93E-02	1.21E-04	3.54E+01	3.33E-06
AZ	0.00E+00	8.64E+00	7.59E-04	3.66E+01	1.61E-03	2.08E-04	1.03E-02	1.09E-02	9.67E-05	5.66E-04	9.06E-03	5.81E-03	3.09E-04	1.35E-04	4.33E-05	2.09E-04	5.64E-04	5.99E-04	8.28E+00	2.20E-03	1.46E-03	6.54E-03	1.23E-04	2.93E-07	1.67E-03	1.19E-03
BA	0.00E+00	1.44E-05	1.75E+00	4.57E-05	4.31E+02	3.38E-02	5.96E-01	1.22E-01	4.35E-02	3.01E-06	1.34E+01	2.80E+00	1.98E-02	6.05E-03	3.49E-02	2.00E-02	1.92E-01	3.94E-02	1.87E-04	3.20E-01	7.10E+01	2.11E+01	5.67E-03	1.81E-05	1.22E+01	7.20E-06
BE	0.00E+00	5.49E-07	2.63E-02	2.90E-06	5.03E-04	2.76E+02	2.62E-04	1.92E-02	2.12E-01	2.75E-08	2.92E-01	2.94E+01	2.75E-01	3.90E-03	5.46E-01	7.96E-03	9.36E+01	6.78E+00	1.30E-05	1.62E-04	5.81E-03	1.52E-02	3.56E-01	3.28E-04	7.57E-02	1.04E-06
BG	0.00E+00	1.95E-03	3.43E-01	1.04E-03	2.09E+00	2.57E-02	3.99E+02	5.63E-01	2.01E-02	1.58E-03	2.87E+00	1.03E+00	3.23E-02	9.84E-03	3.43E-03	1.81E-02	8.74E-02	3.04E-02	2.91E-02	2.01E+01	1.30E+00	5.50E+00	4.29E-03	1.09E-05	7.15E-01	6.30E-05
BY	0.00E+00	1.63E-03	1.24E+00	3.01E-03	6.70E-01	6.71E-01	5.11E-01	1.99E+03	1.92E-01	2.76E-05	3.31E+01	2.30E+01	1.90E+00	2.35E+00	4.61E-02	2.03E+00	1.27E+00	1.37E+00	2.27E-02	1.52E-01	8.01E-01	9.77E+00	1.87E-01	3.46E-04	3.92E-01	1.49E-04
CH	0.00E+00	7.71E-07	2.31E+00	1.56E-06	1.54E-03	2.64E-01	6.25E-04	1.37E-02	1.17E+02	6.99E-08	9.73E-01	3.46E+01	5.25E-02	1.15E-03	2.57E-01	2.48E-03	2.93E+01	2.19E-01	9.85E-06	1.35E-03	9.41E-03	7.94E-03	2.41E-02	3.57E-05	3.30E+01	4.83E-07
CY	0.00E+00	2.67E-05	2.98E-04	3.95E-06	1.74E-03	3.87E-05	5.95E-03	8.75E-04	3.50E-05	3.24E+01	2.23E-03	1.38E-03	4.65E-05	2.11E-05	6.70E-06	2.46E-05	1.66E-04	7.10E-05	1.18E-04	4.87E-02	1.35E-03	2.61E-03	1.03E-05	2.95E-08	5.02E-03	1.02E-08
CZ	0.00E+00	1.54E-05	2.81E+01	4.32E-05	1.51E+00	1.15E+00	2.79E-02	7.77E-01	1.97E+00	1.11E-06	2.01E+03	2.20E+02	3.82E-01	3.32E-02	1.36E-01	7.98E-02	6.11E+00	9.44E-01	2.66E-04	1.11E-02	3.66E+00	2.04E+01	1.30E-01	3.48E-04	2.30E+00	9.95E-06
DE	0.00E+00	2.77E-05	2.90E+01	8.06E-05	1.55E-01	7.33E+01	1.12E-02	1.13E+00	4.81E+01	1.21E-06	2.28E+02	4.85E+03	1.55E+01	1.70E-01	2.05E+00	3.77E-01	1.76E+02	2.81E+01	4.09E-04	5.46E-03	5.20E-01	2.07E+00	2.57E+00	4.45E-03	1.08E+01	2.83E-05
DK	0.00E+00	4.46E-06	1.55E-01	6.08E-06	1.91E-02	1.56E+00	9.90E-04	2.04E-01	9.44E-02	1.30E-07	3.90E+00	4.76E+01	2.18E+02	1.01E-01	9.55E-02	2.74E-01	2.26E+00	5.81E+00	1.79E-05	9.79E-05	4.57E-02	2.96E-01	5.95E-01	2.74E-03	5.46E-02	1.01E-05
EE	0.00E+00	1.09E-04	9.23E-02	2.56E-04	3.66E-02	1.53E-01	1.91E-02	6.94E+00	2.37E-02	4.35E-06	2.45E+00	3.58E+00	8.02E-01	2.11E+02	1.14E-02	2.69E+01	2.65E-01	3.57E-01	1.48E-03	4.67E-03	4.90E-02	3.94E-01	4.81E-02	2.36E-04	2.60E-02	2.12E-05
ES	0.00E+00	6.89E-06	2.48E-02	6.04E-06	2.97E-02	5.04E-01	3.37E-03	2.68E-02	4.79E-02	5.17E-07	2.11E-01	1.67E+00	8.11E-02	2.18E-03	1.69E+03	2.28E-03	2.34E+01	8.71E-01	3.19E-05	2.63E-03	8.80E-02	5.00E-02	3.13E-01	1.30E-03	9.89E-01	1.43E-06
FI	0.00E+00	5.81E-04	1.34E-01	1.37E-03	7.62E-02	2.84E-01	5.30E-02	6.83E+00	3.45E-02	1.68E-05	3.54E+00	5.67E+00	1.52E+00	3.01E+01	2.42E-02	2.09E+03	4.42E-01	7.11E-01	5.18E-03	8.52E-03	9.88E-02	6.59E-01	1.10E-01	5.25E-03	6.59E-02	2.31E-03
FR	0.00E+00	9.28E-06	5.12E-01	3.34E-05	1.45E-01	4.80E+01	1.57E-02	2.14E-01	2.55E+01	8.76E-07	4.23E+00	1.22E+02	1.22E+00	2.49E-02	6.11E+01	3.83E-02	2.84E+03	2.20E+01	1.75E-04	1.29E-02	6.11E-01	3.43E-01	2.97E+00	2.54E-03	2.53E+01	8.85E-06
GB	0.00E+00	1.05E-05	4.04E-02	1.53E-05	7.43E-03	3.25E+00	3.18E-04	1.13E-01	8.78E-02	6.28E-07	6.88E-01	7.44E+00	2.46E+00	6.46E-02	2.51E+00	1.92E-01	2.71E+01	1.26E+03	3.20E-05	6.62E-05	1.71E-02	1.07E-01	8.81E+01	2.54E-02	3.74E-02	3.36E-05
GE	0.00E+00	4.76E+00	1.07E-02	3.22E-01	2.51E-02	3.28E-03	1.92E-01	7.47E-02	1.08E-03	9.54E-04	1.11E-01	7.59E-02	2.37E-03	1.07E-03	2.66E-04	3.57E-03	7.49E-03	8.49E-03	1.34E+02	3.41E-02	2.06E-02	1.01E-01	1.66E-03	5.12E-06	2.51E-02	4.03E-04
GR	0.00E+00	3.48E-04	8.69E-02	4.39E-04	4.57E-01	6.83E-03	1.61E+01	1.44E-01	4.91E-03	2.06E-03	6.90E-01	2.58E-01	1.01E-02	3.42E-03	8.07E-03	6.73E-03	3.62E-02	7.56E-03	3.51E-03	7.30E+02	3.27E-01	1.23E+00	1.15E-03	3.61E-06	2.14E+00	3.25E-05
HR	0.00E+00	9.84E-06	6.41E+00	4.13E-05	7.62E+01	4.18E-02	3.69E-01	2.57E-01	8.44E-02	2.49E-06	2.01E+01	4.31E+00	2.14E-02	8.13E-03	7.83E-02	1.87E-02	3.36E-01	4.32E-02	1.81E-04	1.67E-01	4.13E+02	5.05E+01	5.89E-03	1.83E-05	2.78E+01	6.89E-06
HU	0.00E+00	5.76E-06	2.15E+01	2.42E-05	1.96E+01	1.81E-01	9.39E-01	6.84E-01	2.38E-01	1.74E-06	5.68E+01	1.18E+01	1.01E-01	1.74E-02	5.14E-02	3.68E-02	7.81E-01	2.02E-01	1.35E-04	4.28E-01	5.86E+01	8.19E+02	3.43E-02	7.84E-05	6.11E+00	7.70E-06
IE	0.00E+00	2.72E-06	2.17E-03	2.12E-06	6.52E-04	1.01E-01	2.42E-05	8.54E-03	3.43E-03	1.42E-07	3.61E-02	3.00E-01	6.96E-02	4.90E-03	2.54E-01	1.85E-02	9.28E-01	1.48E+01	6.03E-06	8.20E-06	1.33E-03	8.95E-03	7.35E+02	1.20E-02	1.26E-03	7.10E-06
IS	0.00E+00	2.91E-07	1.60E-04	1.13E-06	5.42E-05	7.73E-03	1.06E-05	2.17E-03	1.15E-04	1.07E-08	4.30E-03	3.79E-02	2.41E-02	7.79E-03	7.72E-03	5.67E-02	2.04E-02	1.41E-01	2.11E-06	1.46E-06	9.81E-05	5.53E-04	1.67E-01	7.79E+00	1.71E-04	1.90E-06
IT	0.00E+00	1.98E-05	1.13E+01	4.45E-05	8.37E+00	1.77E-01	4.04E-01	1.66E-01	8.71E+00	2.96E-06	1.01E+01	1.86E+01	3.82E-02	5.94E-03	1.40E+00	1.49E-02	1.19E+01	1.22E-01	1.71E-04	1.25E+00	2.14E+01	6.31E+00	1.39E-02	3.34E-05	2.64E+03	7.11E-06
KY	0.00E+00	2.71E-03	1.70E-05	5.25E-03	4.66E-05	1.46E-05	2.69E-04	2.60E-04	9.21E-06	3.97E-06	2.18E-04	3.01E-04	6.91E-06	2.87E-06	4.66E-05	7.88E-06	6.03E-05	3.28E-05	2.27E-03	1.30E-04	3.94E-05	1.14E-04	6.12E-06	4.55E-08	3.37E-04	5.15E+02
KZ	0.00E+00	1.73E-01	5.75E-02	1.58E+00	7.46E-02	3.52E-02	3.45E-01	2.49E+00	6.75E-03	3.12E-04	1.07E+00	8.17E-01	7.01E-02	5.15E-02	5.40E-03	9.19E-02	7.29E-02	9.04E-02	3.24E-01	6.95E-02	8.21E-02	5.14E-01	1.71E-02	4.12E-05	1.31E-01	1.72E+02
LI	0.00E+00	8.50E-09	4.96E-02	7.76E-09	1.11E-05	1.41E-03	2.55E-06	6.44E-05	4.19E-01	4.82E-10	7.12E-03	1.70E-01	2.49E-04	5.65E-06	5.20E-04	1.64E-05	2.38E-02	1.08E-03	5.22E-08	4.27E-06	4.45E-05	4.94E-05	1.19E-04	2.29E-07	1.01E-01	2.56E-09
LT	0.00E+00	5.54E-05	3.59E-01	6.33E-05	1.41E-01	5.61E-01	1.04E-01	8.18E+01	8.47E-02	1.05E-06	1.01E+01	1.42E+01	2.90E+00	1.99E+00	3.32E-02	1.85E+00	9.10E-01	1.22E+00	8.21E-04	1.93E-02	2.00E-01	1.80E+00	1.19E-01	2.01E-04	1.09E-01	9.96E-06
LU	0.00E+00	5.05E-08	3.91E-03	4.25E-07	3.29E-05	4.72E+00	4.79E-05	2.19E-03	5.72E-02	3.44E-09	5.10E-02	6.54E+00	2.15E-02	2.89E-04	4.84E-02	5.09E-04	9.75E+00	1.68E-01	2.19E-06	3.05E-05	3.52E-04	9.02E-04	1.83E-02	1.35E-05	1.33E-02	1.12E-07
LV	0.00E+00	1.15E-04	2.09E-01	1.44E-04	8.08E-02	4.40E-01	5.73E-02	3.55E+01	5.46E-02	3.15E-06	5.76E+00	9.88E+00	2.27E+00	1.77E+01	2.72E-02	6.14E+00	7.00E-01	9.27E-01	2.40E-03	1.45E-02	1.15E-01	9.70E-01	9.50E-02	2.85E-04	6.38E-02	1.38E-05
MC	0.00E+00	2.63E-09	6.21E-05	2.01E-09	2.00E-05	7.35E-06	9.19E-06	2.06E-06	1.34E-04	3.07E-10	1.35E-04	4.14E-04	1.80E-06	9.90E-08	1.07E-04	2.03E-07	2.77E-02	2.37E-06	9.87E-09	5.54E-06	1.04E-04	7.88E-05	3.83E-07	7.65E-10	2.59E-02	2.38E-10
MD	0.00E+00	4.16E-04	6.57E-02	4.82E-04	1.07E-01	9.30E-03	1.11E+00	1.07E+00	5.75E-03	7.37E-05	6.71E-01	3.45E-01	1.29E-02	1.28E-02	5.08E-04	3.39E-02	2.59E-02	1.51E-02	3.95E-03	8.96E-02	1.01E-01	8.98E-01	2.02E-03	8.19E-06	7.04E-02	3.29E-05
ME	0.00E+00	4.75E-06	8.50E-02	9.13E-06	5.88E+00	2.98E-03	2.73E-01	1.57E-02	4.02E-03	1.46E-06	8.25E-01	1.83E-01	3.09E-03	7.52E-04	8.63E-03	2.59E-03	2.09E-02	3.30E-03	5.14E-05	3.28E-01	1.12E+00	1.38E+00	4.76E-04	1.91E-06	3.34E+00	1.15E-06
MK	0.00E+00	1.31E-05	8.64E-02	2.95E-05	4.24E-01	4.71E-03	4.48E+00	2.38E-02	3.05E-03	4.15E-06	6.54E-01	1.93E-01	7.08E-03	1.05E-03	1.75E-03	2.89E-03	1.58E-02	4.86E-03	1.98E-04	1.32E+01	2.47E-01	1.34E+00	6.69E-04	3.35E-06	5.10E-01	2.30E-06
MT	0.00E+00	1.94E-08	6.51E-05	1.34E-08	5.46E-04	1.60E-05	1.32E-04	1.92E-05	4.24E-05	1.95E-09	5.71E-04	3.51E-04	1.03E-06	3.31E-07	1.45E-04	9.63E-07	6.11E-04	8.88E-06	6.37E-08	1.27E-03	6.06E-04	3.79E-04	2.30E-06	2.31E-09	3.14E-02	1.06E-09
NL	0.00E+00	1.21E-06	5.69E-02	1.97E-06	4.57E-03	8.19E+01	8.57E-05	2.71E-02	1.58E-01	6.17E-08	6.80E-01	7.22E+01	7.27E-01	6.09E-03	3.66E-01	1.92E-02	2.82E+01	1.68E+01	6.56E-06	3.51E-05	2.22E-02	6.88E-02	8.17E-01	1.09E-03	8.97E-02	2.21E-06
NO	0.00E+00	9.86E-05	8.43E-02	1.91E-04	2.45E-02	1.35E+00	1.07E-02	8.19E-01	6.13E-02	4.12E-06	2.28E+00	1.27E+01	9.70E+00	7.48E-01	1.56E-01	8.58E+00	2.28E+00	7.53E+00	4.48E-04	7.87E-04	2.94E-02	2.03E-01	1.32E+00	5.97E-02	5.24E-02	6.96E-04
PL	0.00E+00	1.08E-04	1.08E+01	3.19E-04	3.61E+00	4.38E+00	4.17E-01	7.49E+01	1.36E+00	4.25E-06	6.60E+02	2.78E+02	8.90E+00	1.13E+00	2.71E-01	2.00E+00	8.96E+00	6.00E+00	2.16E-03	1.32E-01	5.50E+00	6.21E+01	7.38E-01	1.60E-03	2.47E+00	1.00E-04
PT	0.00E+00	8.20E-07	5.22E-04	4.20E-07	5.55E-04	1.17E-02	1.65E-04	1.19E-03	6.01E-04	4.91E-08	7.13E-03	3.43E-02	3.23E-03	8.63E-05	2.59E+01	1.67E-04	2.25E-01	5.63E-02	2.28E-06	1.79E-04	1.28E-03	1.38E-03	1.81E-02	3.55E-04	1.32E-02	1.70E-07
RO	0.00E+00	1.89E-03	3.10E+00	1.53E-03	1.24E+01	1.54E-01	4.35E+01	2.83E+00	1.82E-01	6.29E-04	1.62E+01	7.11E+00	1.09E-01	6.13E-02	1.60E-02	1.22E-01	6.10E-01	2.37E-01	4.01E-02	2.53E+00	1.08E+01	9.52E+01	3.89E-02	8.32E-05	3.95E+00	1.43E-04
RS	0.00E+00	8.06E-05	1.67E+00	2.01E-04	4.08E+01	7.70E-02	1.42E+01	2.35E-01	5.91E-02	1.66E-05	1.46E+01	3.67E+00	6.68E-02	1.08E-02	1.37E-02	2.91E-02	2.50E-01	8.67E-02	1.23E-03	3.64E+00	2.29E+01	4.89E+01	1.37E-02	4.08E-05	3.37E+00	1.93E-05
RU	0.00E+00	7.08E-01	1.18E+00	1.89E+00	1.07E+00	1.23E+00	3.58E+00	3.39E+02	1.95E-01	4.87E-03	2.57E+01	2.72E+01	4.33E+00	4.94E+01	9.38E-02	1.28E+02	2.09E+00	3.00E+00	8.51E+00	8.64E-01	1.15E+00	9.36E+00	3.97E-01	9.19E-03	9.79E-01	3.97E+00
SE	0.00E+00	2.13E-04	3.80E-01	4.24E-04	1.40E-01	2.47E+00	4.55E-02	5.85E+00	1.65E-01	6.53E-06	1.15E+01	5.40E+01	6.50E+01	5.86E+00	1.52E-01	6.77E+01	3.67E+00	8.19E+00	1.14E-03	2.90E-03	1.94E-01	1.44E+00	1.02E+00	1.87E-02	2.20E-01	8.64E-04
SI	0.00E+00	3.37E-06	1.61E+01	1.02E-05	7.02E-01	1.40E-02	3.18E-02	8.10E-02	5.14E-02	7.17E-07	6.21E+00	2.37E+00	6.42E-03	1.85E-03	3.61E-02	4.30E-03	1.55E-01	1.10E-02	5.34E-05	1.43E-02	5.11E+01	6.42E+00	1.34E-03	3.75E-06	2.49E+01	2.23E-06
SK	0.00E+00	5.78E-06	1.19E+01	2.38E-05	4.89E+00	1.95E-01	2.54E-01	9.70E-01	2.56E-01	1.21E-06	1.52E+02	1.40E+01	1.28E-01	2.21E-02	3.44E-02	6.33E-02	8.44E-01	2.25E-01	1.24E-04	1.07E-01	6.05E+00	1.30E+02	3.57E-02	9.05E-05	1.86E+00	7.24E-06
TJ	0.00E+00	3.10E-03	8.83E-06	5.64E-03	1.77E-05	2.59E-06	1.76E-04	8.43E-05	2.81E-06	3.11E-06	1.06E-04	7.25E-05	3.30E-06	9.69E-07	6.10E-06	3.02E-06	1.07E-05	7.18E-06	2.22E-03	5.00E-05	1.96E-05	7.32E-05	1.66E-06	9.63E-09	1.19E-04	1.16E+01
TM	0.00E+00	8.84E-02	9.05E-04	7.80E-01	1.45E-03	3.20E-04	8.33E-03	1.93E-02	1.31E-04	1.60E-04	1.36E-02	9.13E-03	6.05E-04	4.47E-04	5.80E-05	5.61E-04	8.20E-04	8.77E-04	7.18E-02	1.47E-03	1.61E-03	8.04E-03	1.91E-04	4.67E-07	1.37E-03	1.02E-01
TR	0.00E+00	6.34E+00	1.20E-01	2.68E-02	3.51E-01	1.68E-02	1.38E+01	1.16E+00	1.01E-02	7.54E-01	1.11E+00	5.40E-01	2.23E-02	1.68E-02	1.97E-03	2.52E-02	5.09E-02	3.45E-02	2.27E+00	1.29E+01	2.87E-01	1.53E+00	5.96E-03	1.79E-05	3.66E-01	1.45E-04
UA	0.00E+00	3.34E-02	3.39E+00	6.03E-02	4.22E+00	4.95E-01	5.29E+00	1.15E+02	2.52E-01	1.95E-03	5.07E+01	2.05E+01	7.97E-01	4.48E-01	4.84E-02	6.76E-01	1.29E+00	7.64E-01	3.42E-01	9.38E-01	4.69E+00	7.18E+01	1.13E-01	3.30E-04	2.01E+00	2.33E-03
UZ	0.00E+00	4.63E-02	1.25E-03	3.05E-01	2.46E-03	1.14E-03	1.35E-02	7.07E-02	1.70E-04	8.04E-05	2.85E-02	2.35E-02	1.76E-03	1.15E-03	7.08E-05	1.54E-03	2.22E-03	2.89E-03	4.32E-02	2.57E-03	2.23E-03	1.15E-02	5.18E-04	1.24E-06	2.73E-03	6.00E+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	7.46E-04	2.34E-05	1.02E-02	5.06E-04	2.12E-03	1.47E-06	2.83E-02	1.48E+01	1.01E+01	4.62E-03	2.50E-03	1.45E-04	1.51E+00	1.48E-04	9.07E-01	4.96E+01	3.61E-02	6.99E-04	1.66E-02	6.67E-01	2.10E-07	8.86E-06	3.55E-01	1.60E-01	3.75E-06
AM	9.20E-03	4.78E-07	4.74E-04	2.63E-05	1.41E-04	5.66E-09	1.89E-02	1.26E-04	4.02E-04	1.13E-06	1.63E-04	1.11E-05	3.06E-02	2.71E-06	4.92E-02	8.89E-03	1.69E-01	3.79E-05	2.67E-04	4.53E-03	6.48E-06	2.46E-03	1.43E+01	1.14E-01	3.77E-04
AT	1.08E-03	1.92E-01	9.07E-02	1.88E-01	3.09E-02	2.73E-05	7.03E-02	1.32E-02	6.71E-03	8.15E-05	3.22E-01	7.00E-03	4.74E+01	2.99E-03	3.96E-01	8.00E-01	1.75E-01	3.97E-02	2.78E+01	3.27E+01	6.02E-07	2.22E-05	3.80E-02	1.03E+00	1.24E-05
AZ	1.14E+00	8.50E-07	1.14E-03	3.25E-05	3.73E-04	7.28E-09	2.59E-02	1.39E-04	4.28E-04	1.71E-06	2.33E-04	2.79E-05	7.30E-02	3.94E-06	6.02E-02	1.09E-02	1.61E+01	1.04E-04	4.62E-04	8.84E-03	3.81E-04	5.23E-01	3.46E+00	5.25E-01	8.62E-02
BA	1.16E-03	4.28E-04	6.80E-02	1.09E-02	1.58E-02	1.19E-05	4.41E-02	8.63E+00	2.70E-01	4.40E-03	2.88E-02	1.31E-03	2.60E+01	1.19E-03	3.46E+00	5.24E+01	1.36E-01	1.12E-02	1.11E+00	1.19E+01	5.43E-07	1.10E-05	1.83E-01	5.72E-01	4.78E-06
BE	3.09E-04	5.40E-04	1.38E-02	5.18E+00	4.97E-03	4.12E-06	1.28E-03	5.20E-06	1.95E-05	2.38E-07	2.32E+01	1.93E-02	7.12E-01	2.43E-02	2.84E-03	9.07E-04	3.46E-02	3.45E-02	3.11E-03	2.70E-02	2.83E-07	4.73E-06	1.13E-03	4.93E-02	3.73E-06
BG	4.14E-02	1.83E-04	7.33E-02	5.93E-03	2.46E-02	1.54E-06	6.31E+00	4.61E-01	5.24E+00	8.98E-04	2.40E-02	9.50E-04	7.82E+00	8.14E-05	1.06E+02	6.33E+01	2.70E+00	8.93E-03	1.61E-01	4.10E+00	4.56E-06	2.50E-04	3.09E+01	1.67E+01	7.70E-05
BY	3.09E-01	2.00E-03	7.70E+01	8.12E-02	1.62E+01	9.10E-07	9.50E+00	3.78E-02	5.85E-02	1.57E-04	8.84E-01	8.81E-02	7.82E+02	5.13E-03	1.62E+01	2.73E+00	1.09E+02	1.03E+00	2.97E-01	2.16E+01	2.88E-05	3.82E-03	3.33E+00	1.28E+03	1.70E-03
CH	1.16E-04	7.13E-01	6.86E-03	1.10E-01	2.99E-03	7.65E-05	1.88E-03	1.81E-04	1.82E-04	7.42E-06	1.42E-01	1.66E-03	8.10E-01	7.56E-03	4.32E-03	2.00E-03	1.48E-02	1.27E-02	1.32E-02	2.26E-02	1.28E-07	2.39E-06	1.64E-03	3.99E-02	1.65E-06
CY	6.99E-05	3.43E-07	6.69E-05	8.39E-06	3.47E-05	1.02E-08	3.51E-03	7.08E-04	1.66E-03	2.49E-05	4.41E-05	1.94E-06	8.95E-03	1.14E-07	1.36E-02	7.45E-03	1.98E-02	9.92E-06	2.27E-04	2.53E-03	7.04E-09	1.60E-06	3.16E+00	7.09E-02	6.13E-07
CZ	3.13E-03	2.12E-02	3.63E-01	5.11E-01	1.04E-01	6.11E-06	1.32E-01	2.55E-02	1.57E-02	1.96E-05	8.63E-01	2.07E-02	4.59E+02	7.56E-03	7.68E-01	2.42E+00	6.42E-01	1.23E-01	1.97E+00	1.00E+02	1.99E-06	5.64E-05	4.83E-02	2.32E+00	3.49E-05
DE	9.00E-03	4.23E-01	1.03E+00	3.81E+01	3.36E-01	4.16E-05	7.63E-02	1.80E-03	2.28E-03	8.18E-06	9.42E+01	3.51E-01	2.24E+02	1.01E-01	2.70E-01	3.36E-01	1.77E+00	1.63E+00	3.44E-01	4.74E+00	7.08E-06	1.26E-04	4.33E-02	2.11E+00	9.44E-05
DK	2.16E-03	7.01E-04	4.25E-01	9.70E-02	2.21E-01	3.43E-07	2.53E-02	4.31E-04	5.13E-04	1.02E-07	3.38E+00	1.29E+00	2.27E+01	8.90E-03	1.24E-01	7.20E-02	6.68E-01	3.82E+00	2.38E-02	5.77E-01	3.23E-06	1.21E-05	4.80E-04	4.76E-01	2.50E-05
EE	3.19E-02	2.05E-04	9.37E+00	1.29E-02	2.67E+01	1.07E-07	2.15E-01	2.45E-03	3.61E-03	5.88E-06	2.17E-01	8.01E-02	3.87E+01	1.27E-03	4.79E-01	1.17E-01	4.18E+01	1.81E+00	2.30E-02	1.05E+00	1.61E-05	3.34E-04	1.29E-01	5.61E+00	2.84E-04
ES	3.06E-04	2.29E-04	1.48E-02	4.79E-02	5.86E-03	2.87E-05	3.81E-03	2.25E-03	8.72E-04	4.87E-05	2.61E-01	1.44E-02	7.07E-01	4.65E+01	2.22E-02	2.13E-02	2.95E-02	1.86E-02	2.98E-02	5.98E-02	5.47E-07	8.17E-06	5.71E-03	7.38E-02	6.87E-06
FI	3.81E-01	3.06E-04	6.19E+00	2.04E-02	7.59E+00	3.07E-07	4.56E-01	6.64E-03	8.97E-03	1.08E-05	4.18E-01	1.58E+00	5.06E+01	2.19E-03	1.08E+00	2.69E-01	1.55E+02	1.55E+01	4.17E-02	1.57E+00	7.38E-04	3.04E-03	3.48E-01	1.18E+01	5.21E-03
FR	2.31E-03	1.28E-02	1.11E-01	1.87E+01	4.56E-02	2.39E-02	2.85E-02	6.87E-03	4.26E-03	1.20E-04	9.40E+00	7.31E-02	7.98E+00	8.81E-01	1.35E-01	1.36E-01	2.49E-01	2.05E-01	3.02E-01	4.64E-01	2.33E-06	5.06E-05	2.94E-02	6.17E-01	3.45E-05
GB	4.76E-03	4.74E-04	1.39E-01	8.97E-02	8.58E-02	2.54E-06	4.77E-03	7.82E-05	9.64E-05	7.45E-08	3.76E+00	7.57E-01	3.97E+00	4.11E-01	3.02E-02	2.11E-02	2.58E-01	5.27E-01	9.33E-03	2.28E-01	1.34E-05	4.02E-05	8.98E-04	2.07E-01	9.90E-05
GE	6.33E-02	9.87E-06	7.05E-03	5.49E-04	2.29E-03	6.08E-08	2.73E-01	3.45E-03	7.65E-03	4.63E-06	3.20E-03	2.42E-04	6.47E-01	1.73E-05	8.34E-01	1.84E-01	1.90E+01	9.28E-04	5.64E-03	1.22E-01	5.48E-05	4.56E-03	2.05E+01	4.31E+00	1.43E-03
GR	1.30E-02	4.18E-05	2.59E-02	1.50E-03	8.60E-03	1.56E-06	7.99E-01	2.08E-01	1.37E+01	1.00E-02	7.29E-03	3.19E-04	2.22E+00	1.25E-04	5.24E+00	1.15E+01	5.07E-01	2.31E-03	3.70E-02	9.89E-01	2.21E-06	1.33E-04	6.27E+01	3.28E+00	4.94E-05
HR	1.21E-03	9.11E-04	1.04E-01	1.52E-02	2.84E-02	3.08E-05	1.06E-01	2.19E+00	1.50E-01	1.36E-03	3.59E-02	1.45E-03	3.70E+01	2.29E-03	3.61E+00	2.86E+01	1.75E-01	1.37E-02	4.12E+01	1.74E+01	6.59E-07	1.70E-05	1.80E-01	1.29E+00	8.20E-06
HU	1.11E-03	2.30E-03	2.54E-01	5.09E-02	5.78E-02	1.01E-05	3.46E-01	9.35E-01	8.96E-01	1.30E-03	1.47E-01	4.60E-03	1.22E+02	1.90E-03	5.87E+01	8.86E+01	2.98E-01	3.31E-02	1.50E+01	2.60E+02	9.33E-07	1.32E-05	1.54E-01	6.69E+00	9.45E-06
IE	8.65E-04	1.52E-05	1.10E-02	4.07E-03	7.22E-03	9.85E-08	2.35E-04	6.43E-06	7.69E-06	9.91E-09	1.33E-01	7.06E-02	2.26E-01	6.36E-02	2.21E-03	1.96E-03	1.88E-02	2.00E-02	6.61E-04	1.70E-02	2.85E-06	6.45E-06	1.42E-04	1.42E-02	1.95E-05
IS	9.68E-04	7.31E-07	4.16E-03	2.73E-04	5.28E-03	3.96E-09	1.89E-04	1.91E-06	2.21E-06	2.22E-09	1.26E-02	1.59E-01	3.86E-02	9.26E-03	3.67E-04	1.28E-04	1.70E-02	2.32E-02	4.82E-05	1.40E-03	4.59E-07	4.17E-06	9.91E-05	2.78E-03	4.10E-06
IT	1.19E-03	5.30E-02	7.22E-02	7.45E-02	2.02E-02	1.02E-02	6.91E-02	1.51E+00	5.14E-01	1.48E-01	1.07E-01	1.86E-03	1.99E+01	1.37E-02	1.84E+00	6.29E+00	1.33E-01	1.56E-02	1.40E+01	5.57E+00	7.92E-07	2.32E-05	3.48E-01	7.83E-01	1.11E-05
KY	1.84E+02	5.64E-08	2.46E-05	1.80E-06	5.38E-06	8.15E-09	3.60E-04	9.76E-06	2.78E-05	1.45E-07	1.35E-05	3.12E-06	1.73E-03	4.68E-06	1.02E-03	2.82E-04	5.96E-02	3.36E-06	1.25E-05	1.74E-04	3.94E+01	3.51E-01	1.24E-02	8.41E-03	6.68E+01
KZ	1.74E+04	5.88E-05	2.78E-01	3.73E-03	1.10E-01	1.33E-06	1.39E+00	7.58E-03	1.25E-02	1.37E-05	4.08E-02	5.90E-03	1.15E+01	4.82E-04	2.90E+00	3.72E-01	4.93E+02	3.64E-02	3.10E-02	8.36E-01	1.37E+01	2.05E+01	4.29E+00	1.10E+02	1.72E+02
LI	5.64E-07	4.18E-02	3.50E-05	4.97E-04	1.49E-05	2.77E-07	7.95E-06	2.92E-07	4.87E-07	3.29E-08	7.60E-04	8.47E-06	4.74E-03	1.86E-05	2.15E-05	1.01E-05	7.64E-05	6.61E-05	5.86E-05	1.09E-04	7.35E-10	1.08E-08	7.86E-06	1.77E-04	8.18E-09
LT	1.20E-02	7.81E-04	3.66E+02	4.05E-02	2.42E+01	3.26E-07	9.64E-01	1.13E-02	1.88E-02	2.99E-05	8.30E-01	9.42E-02	2.88E+02	3.18E-03	2.23E+00	5.34E-01	4.54E+01	1.56E+00	9.64E-02	4.82E+00	2.40E-06	5.81E-05	2.27E-01	2.62E+01	3.71E-05
LU	3.28E-05	1.22E-04	1.22E-03	1.13E+01	4.41E-04	6.19E-07	2.37E-04	7.89E-07	3.59E-06	4.19E-08	3.07E-01	1.05E-03	8.34E-02	1.93E-03	4.57E-04	7.95E-05	3.23E-03	3.01E-03	2.04E-04	1.73E-03	2.59E-08	6.79E-07	1.99E-04	6.37E-03	4.39E-07
LV	3.13E-02	4.69E-04	7.35E+01	3.13E-02	2.79E+02	2.30E-07	6.05E-01	6.50E-03	1.04E-02	1.95E-05	6.36E-01	1.02E-01	1.17E+02	3.05E-03	1.31E+00	2.91E-01	2.95E+01	2.70E+00	5.45E-02	2.52E+00	4.59E-06	1.93E-04	2.92E-01	1.72E+01	1.16E-04
MC	4.90E-08	8.67E-07	7.48E-07	4.54E-06	2.98E-07	2.76E-04	1.87E-06	2.39E-06	1.85E-06	1.40E-08	3.49E-06	1.43E-07	2.27E-04	6.15E-07	5.06E-05	4.86E-05	1.54E-06	5.42E-07	8.62E-05	8.09E-05	3.89E-11	1.41E-09	9.13E-06	1.47E-05	6.51E-10
MD	2.92E-02	6.12E-05	1.09E-01	1.84E-03	2.75E-02	1.82E-07	2.83E+02	9.32E-03	2.62E-02	2.19E-05	9.95E-03	7.12E-04	8.57E+00	2.25E-05	6.80E+01	5.30E-01	2.14E+00	1.01E-02	3.09E-02	1.12E+00	3.62E-06	1.49E-04	1.88E+00	6.39E+01	5.95E-05
ME	2.77E-04	3.62E-05	9.90E-03	8.03E-04	2.05E-03	2.16E-06	1.32E-02	7.43E+01	6.05E-01	4.33E-03	3.01E-03	1.63E-04	2.22E+00	2.52E-04	5.22E-01	2.45E+01	2.73E-02	1.09E-03	3.30E-02	9.81E-01	9.12E-08	2.98E-06	5.11E-02	8.82E-02	1.24E-06
MK	8.62E-04	2.67E-05	1.17E-02	1.01E-03	3.01E-03	5.47E-07	3.66E-02	2.12E-01	1.03E+02	9.83E-04	5.26E-03	2.39E-04	1.72E+00	3.61E-05	1.68E+00	5.45E+01	4.51E-02	1.48E-03	2.52E-02	1.00E+00	1.82E-07	8.31E-06	7.03E-01	2.21E-01	3.12E-06
MT	4.91E-07	1.92E-07	6.50E-06	8.16E-06	8.00E-07	2.07E-08	9.08E-05	2.55E-04	1.13E-04	6.43E-02	4.94E-06	4.69E-08	1.51E-03	4.14E-07	3.97E-04	9.40E-04	6.87E-05	4.08E-07	9.00E-05	3.56E-04	1.48E-10	4.09E-08	3.19E-03	3.03E-04	1.78E-08
NL	6.46E-04	8.72E-04	2.45E-02	6.47E-01	7.73E-03	1.77E-06	4.49E-04	2.39E-05	1.81E-05	6.39E-08	2.23E+02	7.50E-02	1.97E+00	1.96E-02	3.71E-03	9.25E-03	5.18E-02	7.54E-02	1.06E-02	1.18E-01	6.77E-07	4.25E-06	3.72E-04	4.22E-02	5.99E-06
NO	1.08E-01	3.93E-04	8.92E-01	7.83E-02	6.64E-01	5.48E-07	8.81E-02	2.44E-03	3.79E-03	6.96E-07	2.31E+00	3.12E+02	1.81E+01	2.22E-02	2.40E-01	1.19E-01	6.39E+00	1.15E+01	1.29E-02	5.81E-01	1.58E-04	5.68E-04	1.90E-02	1.55E+00	9.02E-04
PL	3.17E-02	1.35E-02	2.18E+01	6.82E-01	3.85E+00	6.79E-06	3.24E+00	1.84E-01	2.52E-01	3.17E-04	5.62E+00	2.66E-01	1.46E+04	1.89E-02	2.21E+01	1.30E+01	5.52E+01	2.87E+00	2.52E+00	3.03E+02	2.46E-05	4.43E-04	4.61E-01	9.23E+01	3.24E-04
PT	2.47E-05	3.54E-06	6.71E-04	6.74E-04	2.47E-04	3.08E-07	2.17E-04	6.76E-05	4.28E-05	2.15E-06	7.02E-03	1.39E-03	3.81E-02	5.37E+02	1.02E-03	8.23E-04	1.55E-03	9.78E-04	4.47E-04	2.06E-03	7.52E-08	5.60E-07	2.59E-04	3.86E-03	7.01E-07
RO	6.94E-02	1.76E-03	5.22E-01	3.99E-02	1.50E-01	5.41E-06	6.70E+01	7.81E-01	2.00E+00	1.25E-03	1.22E-01	5.67E-03	7.38E+01	5.60E-04	2.14E+03	1.32E+02	7.06E+00	4.99E-02	2.15E+00	3.71E+01	1.47E-05	3.62E-04	1.50E+01	8.53E+01	1.55E-04
RS	5.68E-03	6.00E-04	1.22E-01	1.74E-02	2.88E-02	5.50E-06	3.69E-01	1.56E+01	3.26E+01	2.37E-03	7.09E-02	2.49E-03	3.54E+01	4.60E-04	4.63E+01	1.35E+03	3.01E-01	1.80E-02	7.51E-01	2.15E+01	1.58E-06	4.44E-05	1.20E+00	2.16E+00	1.67E-05
RU	4.52E+03	1.85E-03	4.68E+01	9.77E-02	3.91E+01	4.16E-06	1.82E+01	8.51E-02	1.57E-01	2.63E-04	1.70E+00	1.04E+00	4.63E+02	1.39E-02	3.50E+01	5.04E+00	3.31E+04	5.03E+00	3.97E-01	1.77E+01	7.96E-01	3.13E+00	5.31E+01	1.76E+03	4.77E+00
SE	1.78E-01	1.40E-03	7.53E+00	1.52E-01	5.76E+00	1.07E-06	5.32E-01	1.11E-02	1.55E-02	3.47E-06	4.33E+00	1.96E+01	1.42E+02	2.12E-02	1.39E+00	6.23E-01	1.96E+01	4.19E+02	9.23E-02	3.47E+00	2.80E-04	9.91E-04	4.55E-02	9.64E+00	2.01E-03
SI	4.06E-04	5.69E-04	2.01E-02	6.13E-03	6.30E-03	1.72E-05	4.76E-02	1.06E-02	4.66E-03	7.18E-05	1.19E-02	4.56E-04	1.01E+01	8.28E-04	5.68E-01	4.15E-01	3.88E-02	4.73E-03	1.58E+02	3.26E+00	2.37E-07	7.72E-06	4.19E-02	5.50E-01	4.02E-06
SK	1.61E-03	2.62E-03	3.56E-01	5.76E-02	7.57E-02	4.07E-06	4.45E-01	2.41E-01	2.41E-01	3.42E-04	1.67E-01	6.12E-03	4.96E+02	1.60E-03	1.27E+01	1.61E+01	4.06E-01	5.02E-02	2.06E+00	9.24E+02	1.38E-06	1.58E-05	6.40E-02	8.52E+00	1.39E-05
TJ	5.18E+00	1.87E-08	8.75E-06	3.55E-07	2.36E-06	1.11E-09	2.83E-04	3.43E-06	1.62E-05	2.73E-08	2.91E-06	1.37E-06	8.04E-04	1.71E-06	7.63E-04	1.51E-04	4.77E-02	1.38E-06	6.11E-06	9.96E-05	4.07E+02	1.88E+00	9.72E-03	4.56E-03	3.72E+01
TM	1.94E+01	1.17E-06	1.90E-03	4.48E-05	9.27E-04	5.26E-09	2.33E-02	1.25E-04	3.58E-04	7.58E-07	3.73E-04	8.50E-05	1.22E-01	8.51E-06	4.98E-02	9.04E-03	3.23E+00	2.60E-04	5.43E-04	1.11E-02	4.81E+00	4.61E+02	4.01E-01	1.13E+00	6.48E+01
TR	2.26E-01	9.96E-05	8.60E-02	3.26E-03	3.94E-02	9.46E-07	8.19E+00	5.24E-02	3.23E-01	9.00E-04	1.66E-02	1.01E-03	5.25E+00	4.99E-05	2.19E+01	3.65E+00	1.75E+01	7.47E-03	5.38E-02	1.47E+00	1.14E-05	1.40E-03	5.71E+03	5.65E+01	5.55E-04
UA	5.56E+00	2.57E-03	6.46E+00	9.50E-02	1.43E+00	4.74E-06	1.60E+02	2.39E-01	3.30E-01	4.89E-04	5.20E-01	3.73E-02	7.80E+02	3.02E-03	2.21E+02	1.93E+01	4.14E+02	3.21E-01	1.43E+00	9.88E+01	5.44E-04	7.12E-02	3.76E+01	1.19E+04	3.04E-02
UZ	2.26E+02	1.50E-06	6.39E-03	1.18E-04	2.73E-03	7.13E-09	2.90E-02	3.63E-04	6.42E-04	5.24E-07	1.28E-03	2.04E-04	2.93E-01	1.17E-05	7.59E-02	1.41E-02	5.15E+00	8.56E-04	7.39E-04	1.88E-02	7.00E+01	9.57E+01	3.11E-01	2.96E+00	6.70E+02

Table B8. *Source-receptor matrix of IP deposition to EMEP countries in 2023, kg/year. 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	4.23E+00	1.33E-05	7.35E-02	6.51E-06	8.33E-01	4.60E-03	8.01E-01	2.08E-02	4.84E-03	1.70E-05	4.81E-01	2.07E-01	3.46E-03	1.27E-03	4.44E-02	2.53E-03	4.63E-02	6.97E-03	1.52E-04	6.52E+00	3.47E-01	9.88E-01	5.69E-04	1.75E-07	4.65E+00	1.48E-06
AM	2.56E-05	4.39E+01	7.31E-04	6.89E-01	2.46E-03	2.69E-04	1.15E-02	4.60E-03	1.03E-04	8.68E-04	5.87E-03	6.79E-03	1.59E-04	8.10E-05	3.53E-05	1.41E-04	6.34E-04	7.62E-04	5.59E+00	3.52E-03	1.65E-03	4.49E-03	8.08E-05	2.57E-08	2.87E-03	2.20E-05
AT	1.73E-03	1.92E-05	1.72E+02	4.17E-06	1.79E+00	8.38E-01	6.14E-02	3.19E-01	6.45E+00	4.58E-06	1.12E+02	1.72E+02	1.34E-01	2.19E-02	2.08E-01	4.71E-02	5.58E+00	1.04E+00	2.42E-04	2.24E-02	1.20E+01	1.70E+01	8.51E-02	1.43E-05	4.82E+01	2.58E-06
AZ	2.74E-05	7.63E+00	1.49E-03	1.01E+01	4.38E-03	4.57E-04	1.61E-02	1.39E-02	2.00E-04	8.21E-04	1.45E-02	1.40E-02	4.60E-04	2.52E-04	9.91E-05	3.54E-04	1.12E-03	1.33E-03	7.54E+00	4.01E-03	3.32E-03	9.91E-03	1.29E-04	3.36E-08	3.91E-03	3.31E-04
BA	1.45E-01	2.65E-05	2.67E+00	1.20E-05	5.17E+02	7.19E-02	1.18E+00	1.68E-01	7.78E-02	2.24E-05	1.75E+01	5.64E+00	2.60E-02	1.53E-02	1.26E-01	3.56E-02	4.08E-01	1.12E-01	4.05E-04	5.62E-01	8.21E+01	2.58E+01	8.68E-03	2.02E-06	1.98E+01	2.79E-06
BE	2.78E-06	7.11E-07	4.59E-02	4.42E-07	1.09E-03	1.70E+02	4.51E-04	2.85E-02	2.41E-01	7.73E-08	3.71E-01	3.74E+01	3.21E-01	8.90E-03	8.41E-01	1.30E-02	7.10E+01	1.13E+01	2.46E-05	1.68E-04	9.07E-03	1.97E-02	3.84E-01	2.89E-05	1.61E-01	5.24E-07
BG	6.51E-02	3.53E-03	5.36E-01	2.98E-04	3.86E+00	4.92E-02	3.34E+02	6.33E-01	3.21E-02	2.43E-03	3.96E+00	2.13E+00	4.40E-02	1.44E-02	1.51E-02	2.60E-02	1.50E-01	7.83E-02	5.61E-02	2.05E+01	2.06E+00	6.95E+00	6.10E-03	9.57E-07	1.51E+00	2.99E-05
BY	5.10E-03	2.44E-03	2.41E+00	8.04E-04	1.78E+00	1.56E+00	1.10E+00	1.40E+03	3.43E-01	4.93E-05	4.99E+01	5.06E+01	2.25E+00	3.90E+00	8.72E-02	3.01E+00	2.39E+00	3.39E+00	4.28E-02	3.15E-01	1.91E+00	1.42E+01	2.38E-01	3.07E-05	9.93E-01	1.25E-04
CH	4.59E-05	1.38E-06	2.05E+00	2.78E-07	8.84E-03	4.12E-01	1.41E-03	1.87E-02	6.05E+01	2.95E-07	1.10E+00	4.17E+01	6.46E-02	2.28E-03	4.48E-01	3.87E-03	2.35E+01	5.18E-01	1.74E-05	1.49E-03	3.75E-02	1.54E-02	2.56E-02	5.27E-06	3.90E+01	2.92E-07
CY	1.98E-04	4.46E-05	7.74E-04	1.64E-06	6.85E-03	1.27E-04	1.22E-02	1.67E-03	1.08E-04	1.44E+01	5.11E-03	4.31E-03	1.07E-04	6.41E-05	7.24E-05	7.67E-05	6.36E-04	2.80E-04	1.86E-04	7.37E-02	4.34E-03	5.40E-03	2.23E-05	4.72E-09	2.02E-02	1.92E-08
CZ	2.10E-03	2.38E-05	2.99E+01	8.47E-06	3.21E+00	2.14E+00	7.07E-02	9.95E-01	2.44E+00	4.08E-06	1.45E+03	3.09E+02	4.52E-01	6.93E-02	2.23E-01	1.37E-01	9.16E+00	2.43E+00	5.16E-04	1.84E-02	6.84E+00	2.39E+01	1.93E-01	3.48E-05	4.61E+00	7.75E-06
DE	3.79E-04	3.93E-05	2.75E+01	1.41E-05	4.35E-01	9.04E+01	2.78E-02	1.95E+00	3.88E+01	3.50E-06	2.21E+02	4.50E+03	1.33E+01	3.02E-01	3.37E+00	5.46E-01	1.83E+02	5.42E+01	7.70E-04	8.04E-03	1.17E+00	3.27E+00	2.98E+00	3.19E-04	1.72E+01	1.73E-05
DK	2.49E-05	4.72E-06	2.69E-01	7.33E-07	4.39E-02	2.53E+00	1.78E-03	2.49E-01	1.53E-01	8.56E-08	4.96E+00	6.39E+01	1.17E+02	1.45E-01	1.55E-01	3.12E-01	3.28E+00	8.16E+00	2.03E-05	1.72E-04	8.81E-02	3.80E-01	5.10E-01	3.46E-04	1.19E-01	2.94E-06
EE	2.56E-04	1.66E-04	2.18E-01	5.60E-05	1.08E-01	3.30E-01	3.56E-02	8.89E+00	5.00E-02	4.44E-06	4.32E+00	8.27E+00	1.09E+00	2.10E+02	2.66E-02	2.85E+01	5.36E-01	8.11E-01	2.67E-03	8.59E-03	1.45E-01	6.80E-01	5.87E-02	2.94E-05	7.16E-02	1.85E-05
ES	1.30E-04	1.81E-05	3.94E-02	1.70E-06	8.66E-02	6.38E-01	4.64E-03	2.74E-02	4.68E-02	1.09E-06	2.30E-01	2.38E+00	1.06E-01	2.79E-03	1.25E+03	2.28E-03	2.03E+01	1.94E+00	6.03E-05	2.57E-03	1.83E-01	7.11E-02	2.61E-01	7.12E-05	1.69E+00	6.79E-07
FI	6.71E-04	8.99E-04	3.07E-01	2.61E-04	2.06E-01	5.87E-01	9.29E-02	9.21E+00	6.90E-02	1.74E-05	5.98E+00	1.27E+01	2.16E+00	4.33E+01	4.35E-02	1.72E+03	8.43E-01	1.51E+00	9.39E-03	1.51E-02	2.66E-01	1.12E+00	1.12E-01	7.17E-04	1.49E-01	1.18E-03
FR	9.98E-04	1.33E-05	7.68E-01	4.58E-06	3.67E-01	4.18E+01	2.84E-02	2.29E-01	1.66E+01	2.99E-06	4.70E+00	1.52E+02	1.35E+00	4.58E-02	7.67E+01	5.74E-02	1.63E+03	3.65E+01	2.77E-04	1.65E-02	1.10E+00	4.88E-01	2.81E+00	1.84E-04	3.10E+01	4.39E-06
GB	3.32E-06	1.03E-05	7.67E-02	1.27E-06	1.93E-02	4.80E+00	6.83E-04	1.20E-01	1.24E-01	2.28E-07	9.17E-01	1.32E+01	2.05E+00	9.88E-02	3.28E+00	2.39E-01	2.73E+01	1.14E+03	2.92E-05	5.79E-05	3.75E-02	1.34E-01	6.67E+01	3.70E-03	1.11E-01	7.05E-06
GE	5.48E-04	4.77E+00	1.96E-02	3.33E-01	6.74E-02	6.91E-03	3.37E-01	8.96E-02	2.42E-03	2.34E-03	1.57E-01	1.71E-01	3.06E-03	2.13E-03	5.49E-04	6.39E-03	1.48E-02	1.90E-02	1.12E+02	7.59E-02	4.62E-02	1.35E-01	1.90E-03	5.13E-07	6.55E-02	1.77E-04
GR	3.74E-01	4.70E-04	1.45E-01	1.15E-04	9.68E-01	1.34E-02	1.94E+01	1.59E-01	8.42E-03	3.09E-03	9.63E-01	5.32E-01	1.27E-02	4.97E-03	3.98E-02	9.43E-03	7.63E-02	2.07E-02	5.33E-03	3.61E+02	5.45E-01	1.63E+00	1.68E-03	3.45E-07	3.98E+00	1.98E-05
HR	4.66E-02	1.79E-05	8.25E+00	9.20E-06	1.00E+02	8.16E-02	6.89E-01	3.23E-01	1.33E-01	1.73E-05	2.37E+01	7.76E+00	2.60E-02	1.66E-02	2.75E-01	3.19E-02	6.76E-01	1.09E-01	4.27E-04	2.55E-01	3.59E+02	4.88E+01	8.16E-03	1.77E-06	4.20E+01	3.12E-06
HU	9.09E-02	1.10E-05	2.25E+01	7.14E-06	3.80E+01	3.20E-01	2.10E+00	8.09E-01	3.58E-01	7.35E-06	6.19E+01	2.07E+01	9.88E-02	2.98E-02	1.50E-01	4.93E-02	1.32E+00	5.02E-01	3.20E-04	1.02E+00	7.17E+01	6.17E+02	4.71E-02	7.89E-06	1.36E+01	3.67E-06
IE	1.94E-07	2.08E-06	5.98E-03	1.67E-07	1.59E-03	2.45E-01	5.39E-05	8.24E-03	1.16E-02	4.10E-08	6.07E-02	9.05E-01	7.14E-02	6.64E-03	2.84E-01	2.01E-02	1.19E+00	2.10E+01	4.20E-06	5.16E-06	2.80E-03	9.18E-03	3.90E+02	1.30E-03	1.40E-02	9.06E-07
IS	1.82E-07	2.35E-07	3.57E-04	4.06E-08	1.12E-04	9.71E-03	8.93E-06	1.15E-03	1.46E-04	5.27E-09	5.32E-03	6.61E-02	2.26E-02	5.36E-03	1.05E-02	3.18E-02	2.14E-02	2.38E-01	8.16E-07	1.19E-06	2.40E-04	8.78E-04	1.44E-01	2.88E+00	5.26E-04	1.17E-07
IT	1.57E-01	3.24E-05	1.28E+01	1.25E-05	1.59E+01	2.78E-01	8.47E-01	2.03E-01	6.65E+00	1.80E-05	1.27E+01	3.24E+01	5.19E-02	1.39E-02	3.31E+00	2.64E-02	1.33E+01	2.76E-01	3.53E-04	1.77E+00	2.91E+01	7.52E+00	1.75E-02	4.49E-06	1.99E+03	3.48E-06
KY	2.60E-06	5.70E-03	4.03E-05	1.49E-03	1.39E-04	2.73E-05	6.73E-04	3.19E-04	1.84E-05	1.02E-05	4.00E-04	7.84E-04	1.16E-05	5.46E-06	1.04E-04	1.22E-05	1.35E-04	6.07E-05	5.06E-03	3.43E-04	1.08E-04	2.04E-04	4.46E-06	5.81E-09	8.42E-04	3.00E+02
KZ	1.11E-03	3.71E-01	1.36E-01	2.45E-01	2.31E-01	7.63E-02	6.87E-01	2.61E+00	1.81E-02	6.97E-04	1.81E+00	1.95E+00	7.19E-02	5.59E-02	1.04E-02	9.83E-02	1.49E-01	1.97E-01	7.43E-01	1.18E-01	2.32E-01	8.57E-01	1.75E-02	3.09E-06	3.07E-01	9.81E+01
LI	1.43E-07	1.80E-08	4.02E-02	2.19E-09	4.56E-05	2.18E-03	6.97E-06	1.20E-04	2.46E-01	1.43E-09	8.40E-03	2.42E-01	3.36E-04	1.18E-05	1.13E-03	2.60E-05	3.08E-02	2.58E-03	1.03E-07	5.13E-06	1.69E-04	9.97E-05	1.24E-04	3.43E-08	1.47E-01	1.48E-09
LT	1.42E-03	8.18E-05	7.35E-01	2.19E-05	3.72E-01	1.10E+00	2.00E-01	7.46E+01	1.49E-01	1.62E-06	1.55E+01	2.77E+01	2.96E+00	2.78E+00	6.30E-02	2.23E+00	1.52E+00	2.60E+00	1.31E-03	4.08E-02	5.10E-01	2.78E+00	1.49E-01	1.48E-05	2.90E-01	7.97E-06
LU	3.33E-07	7.32E-08	7.63E-03	6.73E-08	8.87E-05	3.80E+00	8.36E-05	3.12E-03	6.35E-02	1.40E-08	5.99E-02	7.45E+00	2.84E-02	7.25E-04	8.41E-02	9.67E-04	7.39E+00	4.05E-01	4.28E-06	3.19E-05	6.83E-04	1.41E-03	2.38E-02	1.54E-06	3.08E-02	7.47E-08
LV	7.57E-04	1.76E-04	4.74E-01	4.37E-05	2.28E-01	8.79E-01	1.11E-01	3.91E+01	1.09E-01	4.20E-06	9.68E+00	2.07E+01	2.74E+00	2.24E+01	6.14E-02	7.88E+00	1.28E+00	2.04E+00	4.18E-03	2.83E-02	3.17E-01	1.61E+00	1.24E-01	2.83E-05	1.78E-01	1.06E-05
MC	2.85E-07	3.05E-09	1.02E-04	4.09E-10	5.51E-05	1.08E-05	1.68E-05	2.78E-06	1.36E-04	9.43E-10	2.03E-04	7.40E-04	3.30E-06	2.93E-07	2.45E-04	5.38E-07	1.37E-02	6.45E-06	1.48E-08	7.17E-06	1.93E-04	9.99E-05	5.45E-07	1.15E-10	2.23E-02	6.64E-11
MD	1.80E-03	8.09E-04	1.12E-01	1.52E-04	2.42E-01	2.04E-02	1.54E+00	1.26E+00	1.08E-02	1.27E-04	9.07E-01	7.40E-01	1.46E-02	1.75E-02	1.63E-03	3.58E-02	5.26E-02	3.94E-02	6.96E-03	1.50E-01	1.95E-01	1.06E+00	2.75E-03	4.88E-07	1.59E-01	1.82E-05
ME	6.86E-01	6.83E-06	1.29E-01	2.49E-06	9.17E+00	6.43E-03	4.75E-01	1.89E-02	7.51E-03	6.16E-06	1.03E+00	3.70E-01	3.64E-03	1.56E-03	3.90E-02	3.73E-03	5.08E-02	9.42E-03	8.49E-05	6.31E-01	1.55E+00	1.64E+00	7.55E-04	1.85E-07	5.93E+00	5.42E-07
MK	7.67E-01	2.22E-05	1.33E-01	8.87E-06	8.15E-01	8.78E-03	5.28E+00	2.84E-02	5.04E-03	1.09E-05	8.53E-01	3.71E-01	7.53E-03	1.71E-03	9.50E-03	3.85E-03	2.92E-02	1.27E-02	3.50E-04	1.40E+01	3.95E-01	1.67E+00	9.62E-04	2.84E-07	9.68E-01	1.62E-06
MT	5.52E-05	3.85E-08	2.11E-04	5.14E-09	2.14E-03	4.13E-05	4.01E-04	4.83E-05	8.76E-05	4.88E-09	1.68E-03	1.23E-03	2.90E-06	1.46E-06	5.85E-04	3.32E-06	1.39E-03	6.20E-05	1.33E-07	2.85E-03	1.69E-03	1.01E-03	7.22E-06	9.80E-10	4.20E-02	5.79E-10
NL	1.82E-06	1.83E-06	9.48E-02	2.95E-07	1.01E-02	6.54E+01	2.08E-04	4.37E-02	1.84E-01	5.91E-08	9.21E-01	7.33E+01	5.99E-01	1.13E-02	5.57E-01	2.36E-02	2.64E+01	2.29E+01	8.72E-06	2.82E-05	3.69E-02	8.73E-02	7.49E-01	7.50E-05	1.83E-01	6.95E-07
NO	1.49E-04	1.42E-04	1.73E-01	2.80E-05	7.99E-02	2.26E+00	1.60E-02	1.01E+00	1.03E-01	3.47E-06	3.54E+00	2.58E+01	1.10E+01	1.10E+00	2.15E-01	9.17E+00	3.39E+00	1.28E+01	6.31E-04	1.10E-03	9.25E-02	3.56E-01	1.32E+00	8.98E-03	1.12E-01	2.30E-04
PL	1.92E-02	1.70E-04	1.64E+01	6.46E-05	8.15E+00	8.96E+00	9.53E-01	7.32E+01	2.12E+00	1.90E-05	6.72E+02	4.51E+02	8.76E+00	1.75E+00	4.87E-01	2.46E+00	1.53E+01	1.44E+01	4.50E-03	3.06E-01	1.09E+01	7.28E+01	9.64E-01	1.13E-04	5.60E+00	7.57E-05
PT	5.68E-06	2.56E-06	8.34E-04	2.03E-07	2.08E-03	1.67E-02	1.79E-04	1.12E-03	7.15E-04	1.07E-07	5.78E-03	4.79E-02	3.82E-03	9.07E-05	2.75E+01	8.76E-05	2.35E-01	1.28E-01	5.80E-06	1.29E-04	3.75E-03	1.71E-03	1.64E-02	8.16E-06	3.42E-02	6.81E-08
RO	1.06E-01	3.56E-03	5.15E+00	4.18E-04	2.40E+01	3.14E-01	4.53E+01	3.49E+00	3.32E-01	1.12E-03	2.23E+01	1.56E+01	1.58E-01	1.02E-01	5.56E-02	1.76E-01	1.17E+00	6.18E-01	7.41E-02	4.12E+00	1.85E+01	1.06E+02	5.51E-02	8.19E-06	8.54E+00	6.72E-05
RS	6.11E-01	1.39E-04	2.46E+00	5.54E-05	5.94E+01	1.56E-01	1.97E+01	3.62E-01	1.00E-01	4.01E-05	1.87E+01	7.39E+00	8.31E-02	2.39E-02	4.77E-02	4.86E-02	4.67E-01	2.43E-01	2.39E-03	5.49E+00	2.52E+01	5.17E+01	2.08E-02	4.31E-06	6.97E+00	1.10E-05
RU	1.17E-02	1.27E+00	2.58E+00	7.72E-01	3.08E+00	2.72E+00	7.21E+00	3.67E+02	3.99E-01	1.20E-02	4.42E+01	6.37E+01	5.53E+00	7.71E+01	1.89E-01	1.76E+02	4.01E+00	6.78E+00	1.29E+01	1.46E+00	2.98E+00	1.49E+01	4.53E-01	8.37E-04	2.42E+00	4.92E+00
SE	8.32E-04	3.18E-04	7.28E-01	7.51E-05	3.70E-01	4.77E+00	7.90E-02	7.39E+00	2.79E-01	5.52E-06	1.64E+01	1.01E+02	6.34E+01	9.33E+00	2.85E-01	8.44E+01	6.34E+00	1.57E+01	1.80E-03	5.31E-03	4.60E-01	2.10E+00	1.08E+00	2.65E-03	4.38E-01	3.66E-04
SI	1.87E-03	5.35E-06	1.51E+01	2.28E-06	1.72E+00	2.93E-02	7.22E-02	1.09E-01	7.56E-02	4.55E-06	7.84E+00	4.29E+00	9.41E-03	4.29E-03	1.27E-01	8.64E-03	3.00E-01	2.83E-02	1.33E-04	2.15E-02	5.58E+01	6.43E+00	1.87E-03	3.71E-07	2.93E+01	1.28E-06
SK	2.09E-02	1.06E-05	1.34E+01	5.97E-06	1.08E+01	3.91E-01	6.02E-01	1.18E+00	4.22E-01	5.21E-06	1.59E+02	2.75E+01	1.62E-01	4.04E-02	7.41E-02	9.74E-02	1.55E+00	5.98E-01	3.05E-04	2.54E-01	1.17E+01	1.33E+02	5.07E-02	8.81E-06	4.23E+00	5.12E-06
TJ	9.25E-07	5.49E-03	2.09E-05	1.39E-03	5.58E-05	6.75E-06	3.69E-04	1.43E-04	5.80E-06	8.00E-06	1.97E-04	2.20E-04	6.61E-06	2.44E-06	1.73E-05	4.43E-06	2.74E-05	1.77E-05	4.23E-03	1.22E-04	5.43E-05	1.39E-04	1.58E-06	2.17E-09	3.34E-04	6.25E+00
TM	2.00E-05	1.54E-01	1.37E-03	9.40E-02	3.23E-03	5.02E-04	1.20E-02	1.42E-02	2.01E-04	3.86E-04	1.46E-02	1.46E-02	4.76E-04	3.14E-04	1.04E-04	4.06E-04	1.18E-03	1.42E-03	1.26E-01	2.49E-03	2.80E-03	9.03E-03	1.39E-04	3.76E-08	2.85E-03	3.67E-02
TR	1.92E-02	8.19E+00	2.55E-01	7.10E-02	9.77E-01	4.02E-02	1.93E+01	1.44E+00	2.23E-02	1.11E+00	2.09E+00	1.44E+00	4.12E-02	3.07E-02	1.28E-02	4.53E-02	1.24E-01	9.13E-02	3.84E+00	1.55E+01	6.59E-01	2.56E+00	8.59E-03	2.20E-06	1.21E+00	6.85E-05
UA	3.02E-02	5.97E-02	6.05E+00	1.16E-02	1.04E+01	1.14E+00	8.74E+00	1.16E+02	5.00E-01	3.47E-03	6.99E+01	4.50E+01	9.45E-01	7.25E-01	1.04E-01	9.23E-01	2.59E+00	2.03E+00	6.02E-01	1.67E+00	1.01E+01	8.46E+01	1.48E-01	2.47E-05	5.06E+00	1.19E-03
UZ	5.00E-05	8.76E-02	2.44E-03	4.03E-02	6.13E-03	2.07E-03	2.04E-02	4.75E-02	3.87E-04	1.85E-04	3.71E-02	4.45E-02	1.37E-03	7.40E-04	1.27E-04	1.05E-03	3.82E-03	5.31E-03	8.75E-02	4.37E-03	5.16E-03	1.54E-02	4.37E-04	8.58E-08	7.58E-03	3.55E+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	8.10E-04	4.02E-05	9.90E-03	6.60E-04	3.51E-03	3.82E-06	3.95E-02	1.42E+01	1.08E+01	3.47E-03	3.80E-03	1.96E-04	1.18E+00	1.23E-03	1.23E+00	5.13E+01	4.05E-02	1.18E-03	3.41E-02	5.66E-01	8.35E-08	1.86E-06	9.04E-01	1.67E-01	9.48E-07
AM	8.02E-03	9.65E-07	5.01E-04	2.89E-05	2.51E-04	1.21E-08	1.77E-02	3.66E-04	7.78E-04	1.07E-06	1.83E-04	1.23E-05	2.74E-02	1.91E-06	5.62E-02	1.39E-02	3.96E-01	7.63E-05	5.19E-04	4.06E-03	3.11E-06	7.53E-04	1.83E+01	1.23E-01	2.21E-04
AT	1.19E-03	1.50E-01	1.10E-01	2.02E-01	6.61E-02	6.78E-05	9.27E-02	5.35E-02	2.33E-02	1.97E-04	4.31E-01	9.27E-03	4.51E+01	9.36E-03	9.02E-01	1.69E+00	2.71E-01	7.50E-02	3.33E+01	1.96E+01	3.92E-07	6.71E-06	1.12E-01	1.37E+00	5.13E-06
AZ	6.32E-01	1.95E-06	1.53E-03	4.54E-05	8.09E-04	1.75E-08	3.17E-02	4.28E-04	9.19E-04	1.85E-06	3.67E-04	3.75E-05	7.84E-02	5.88E-06	9.30E-02	2.10E-02	1.57E+01	2.43E-04	1.10E-03	9.57E-03	1.41E-04	8.63E-02	6.64E+00	6.24E-01	2.80E-02
BA	1.67E-03	7.61E-04	8.04E-02	1.45E-02	3.62E-02	3.07E-05	7.74E-02	1.19E+01	5.52E-01	3.65E-03	4.48E-02	2.06E-03	2.50E+01	6.12E-03	6.01E+00	6.86E+01	2.14E-01	2.24E-02	1.99E+00	1.19E+01	2.03E-07	3.26E-06	6.01E-01	8.76E-01	1.61E-06
BE	2.02E-04	7.43E-04	1.73E-02	2.58E+00	1.17E-02	8.23E-06	1.46E-03	3.06E-05	3.95E-05	1.35E-07	1.53E+01	2.25E-02	7.12E-01	5.84E-02	5.32E-03	1.66E-03	5.17E-02	6.40E-02	5.44E-03	3.08E-02	1.09E-07	1.12E-06	2.80E-03	6.83E-02	9.79E-07
BG	3.77E-02	3.20E-04	7.64E-02	6.81E-03	3.78E-02	4.55E-06	7.81E+00	8.81E-01	6.06E+00	8.41E-04	3.56E-02	1.70E-03	8.04E+00	4.02E-04	1.23E+02	7.51E+01	3.93E+00	1.90E-02	3.08E-01	4.07E+00	1.42E-06	4.79E-05	5.20E+01	1.80E+01	2.08E-05
BY	3.01E-01	3.75E-03	6.59E+01	1.19E-01	2.29E+01	3.22E-06	1.32E+01	1.19E-01	1.34E-01	1.55E-04	1.42E+00	1.40E-01	6.69E+02	1.02E-02	3.07E+01	5.34E+00	1.42E+02	1.76E+00	7.53E-01	2.43E+01	2.28E-05	1.35E-03	8.40E+00	1.18E+03	9.33E-04
CH	9.74E-05	3.90E-01	8.46E-03	1.06E-01	5.75E-03	1.54E-04	2.29E-03	6.67E-04	4.79E-04	2.92E-05	1.90E-01	2.50E-03	7.23E-01	2.13E-02	9.87E-03	8.20E-03	2.14E-02	2.35E-02	5.33E-02	2.87E-02	7.03E-08	5.95E-07	4.04E-03	5.06E-02	5.11E-07
CY	5.66E-05	9.55E-07	1.36E-04	1.60E-05	1.10E-04	5.15E-08	6.12E-03	2.63E-03	4.09E-03	2.98E-05	1.05E-04	4.71E-06	1.40E-02	3.92E-07	2.46E-02	2.00E-02	2.53E-02	3.93E-05	8.28E-04	4.00E-03	8.30E-09	3.62E-07	4.57E+00	8.08E-02	1.43E-07
CZ	3.01E-03	2.79E-02	3.95E-01	5.65E-01	2.02E-01	1.49E-05	1.54E-01	9.06E-02	3.95E-02	3.14E-05	1.18E+00	2.91E-02	3.40E+02	1.58E-02	1.54E+00	4.16E+00	9.44E-01	2.19E-01	3.78E+00	7.44E+01	1.25E-06	1.61E-05	1.20E-01	3.11E+00	1.33E-05
DE	6.48E-03	3.28E-01	1.20E+00	2.15E+01	6.51E-01	9.91E-05	1.03E-01	9.72E-03	7.02E-03	2.35E-05	7.76E+01	4.12E-01	1.91E+02	2.37E-01	6.11E-01	7.21E-01	2.73E+00	2.37E+00	8.42E-01	5.65E+00	3.52E-06	3.23E-05	1.14E-01	3.44E+00	2.91E-05
DK	5.26E-04	1.23E-03	3.68E-01	1.22E-01	3.64E-01	1.04E-06	3.09E-02	1.16E-03	8.75E-04	5.53E-07	3.54E+00	9.98E-01	1.89E+01	1.84E-02	1.93E-01	1.07E-01	8.46E-01	3.77E+00	4.86E-02	5.59E-01	8.43E-07	1.55E-06	5.70E-04	5.44E-01	2.78E-06
EE	2.18E-02	4.60E-04	9.96E+00	2.14E-02	3.93E+01	2.62E-07	3.19E-01	6.63E-03	7.31E-03	5.27E-06	3.33E-01	1.25E-01	4.24E+01	3.37E-03	9.30E-01	2.48E-01	4.80E+01	2.88E+00	7.22E-02	1.40E+00	1.08E-05	1.29E-04	2.62E-01	7.91E+00	1.09E-04
ES	1.89E-04	2.28E-04	1.37E-02	3.89E-02	7.17E-03	3.47E-05	3.12E-03	5.88E-03	1.60E-03	3.27E-05	2.80E-01	1.41E-02	5.57E-01	7.40E+01	2.83E-02	3.48E-02	3.37E-02	3.02E-02	6.56E-02	6.08E-02	2.11E-07	1.83E-06	1.19E-02	7.06E-02	1.58E-06
FI	1.32E-01	6.45E-04	7.14E+00	3.24E-02	1.38E+01	6.60E-07	6.57E-01	1.64E-02	1.69E-02	8.92E-06	6.06E-01	1.97E+00	5.48E+01	4.29E-03	1.99E+00	5.05E-01	1.94E+02	2.29E+01	1.21E-01	2.08E+00	3.10E-04	8.75E-04	6.41E-01	1.59E+01	1.11E-03
FR	1.71E-03	1.41E-02	1.16E-01	9.33E+00	8.22E-02	1.23E-02	2.83E-02	2.18E-02	1.01E-02	1.83E-04	9.26E+00	7.58E-02	6.76E+00	2.42E+00	2.26E-01	2.71E-01	3.06E-01	3.47E-01	5.89E-01	4.92E-01	8.95E-07	1.06E-05	6.61E-02	6.48E-01	8.88E-06
GB	7.25E-04	6.95E-04	1.29E-01	1.02E-01	1.48E-01	5.38E-06	4.29E-03	2.29E-04	1.78E-04	9.36E-08	3.78E+00	5.60E-01	3.49E+00	8.05E-01	4.31E-02	4.03E-02	3.30E-01	7.13E-01	2.10E-02	2.16E-01	2.57E-06	3.96E-06	6.63E-04	2.07E-01	7.84E-06
GE	4.45E-02	2.38E-05	8.66E-03	7.27E-04	4.47E-03	1.86E-07	3.10E-01	1.09E-02	2.05E-02	6.36E-06	4.70E-03	3.02E-04	6.50E-01	3.37E-05	1.20E+00	3.61E-01	2.48E+01	1.89E-03	1.36E-02	1.17E-01	2.58E-05	1.00E-03	3.37E+01	4.53E+00	5.06E-04
GR	1.43E-02	7.47E-05	2.54E-02	1.78E-03	1.29E-02	3.94E-06	1.09E+00	4.24E-01	1.23E+01	7.52E-03	1.09E-02	5.10E-04	2.09E+00	1.11E-03	7.49E+00	1.60E+01	6.57E-01	4.59E-03	7.25E-02	9.82E-01	8.23E-07	2.96E-05	8.67E+01	3.66E+00	1.34E-05
HR	1.78E-03	1.42E-03	1.15E-01	1.83E-02	5.43E-02	7.25E-05	1.79E-01	2.86E+00	2.93E-01	1.42E-03	4.99E-02	2.31E-03	3.30E+01	1.23E-02	6.00E+00	3.38E+01	2.56E-01	2.61E-02	4.39E+01	1.54E+01	3.02E-07	5.89E-06	5.43E-01	1.82E+00	3.97E-06
HU	1.32E-03	3.75E-03	2.46E-01	5.79E-02	9.78E-02	3.11E-05	5.17E-01	2.62E+00	1.83E+00	1.39E-03	1.85E-01	5.78E-03	1.08E+02	7.82E-03	6.98E+01	1.09E+02	4.90E-01	5.06E-02	2.02E+01	1.85E+02	5.04E-07	4.92E-06	4.29E-01	7.41E+00	4.19E-06
IE	5.46E-05	5.69E-05	8.83E-03	8.16E-03	1.02E-02	1.02E-06	1.28E-04	1.66E-05	1.31E-05	6.74E-09	2.16E-01	3.09E-02	1.90E-01	7.48E-02	2.81E-03	3.25E-03	1.79E-02	2.82E-02	1.50E-03	1.47E-02	3.25E-07	3.69E-07	8.56E-05	1.05E-02	8.93E-07
IS	2.59E-05	1.30E-06	1.81E-03	3.20E-04	3.86E-03	1.02E-08	8.18E-05	5.61E-06	3.75E-06	5.12E-09	1.14E-02	9.55E-02	1.94E-02	1.20E-02	2.62E-04	2.32E-04	8.70E-03	2.34E-02	1.27E-04	1.31E-03	3.09E-08	1.42E-07	2.99E-05	1.37E-03	1.33E-07
IT	1.55E-03	5.23E-02	8.55E-02	7.46E-02	4.38E-02	7.17E-03	1.10E-01	2.54E+00	8.77E-01	7.15E-02	1.37E-01	3.50E-03	1.79E+01	6.82E-02	3.15E+00	1.06E+01	1.95E-01	3.27E-02	1.96E+01	5.30E+00	3.49E-07	6.80E-06	9.80E-01	9.94E-01	3.97E-06
KY	9.85E+01	1.57E-07	2.98E-05	2.82E-06	1.20E-05	1.80E-08	5.18E-04	4.00E-05	8.41E-05	1.33E-07	1.88E-05	3.38E-06	2.01E-03	2.36E-06	1.98E-03	7.83E-04	1.02E-01	9.08E-06	3.27E-05	2.09E-04	1.68E+01	1.32E-01	3.91E-02	1.38E-02	2.08E+01
KZ	4.35E+03	1.85E-04	2.48E-01	6.03E-03	1.29E-01	2.41E-06	1.93E+00	2.71E-02	3.26E-02	1.64E-05	6.21E-02	5.02E-03	1.15E+01	4.51E-04	5.39E+00	8.55E-01	5.14E+02	4.66E-02	8.91E-02	9.77E-01	6.37E+00	4.18E+00	1.13E+01	1.23E+02	3.64E+01
LI	4.73E-07	2.29E-02	5.01E-05	4.77E-04	3.11E-05	6.19E-07	1.43E-05	1.81E-06	1.68E-06	1.35E-07	9.99E-04	1.33E-05	4.66E-03	5.12E-05	6.95E-05	4.35E-05	1.29E-04	1.32E-04	2.86E-04	1.59E-04	4.15E-10	3.18E-09	2.04E-05	3.03E-04	2.68E-09
LT	7.80E-03	1.46E-03	2.36E+02	5.69E-02	2.82E+01	1.01E-06	1.38E+00	3.17E-02	3.88E-02	3.01E-05	1.15E+00	1.29E-01	2.43E+02	7.27E-03	4.26E+00	1.06E+00	4.85E+01	2.17E+00	2.56E-01	5.72E+00	1.79E-06	2.72E-05	5.74E-01	3.34E+01	2.19E-05
LU	2.83E-05	1.66E-04	1.63E-03	4.56E+00	1.07E-03	1.44E-06	2.69E-04	3.55E-06	6.64E-06	2.45E-08	3.46E-01	1.67E-03	8.50E-02	5.46E-03	8.06E-04	1.59E-04	5.14E-03	6.39E-03	4.95E-04	2.57E-03	1.34E-08	1.79E-07	5.21E-04	8.53E-03	1.49E-07
LV	2.03E-02	9.95E-04	6.52E+01	4.80E-02	2.88E+02	6.57E-07	8.89E-01	1.73E-02	2.08E-02	1.83E-05	9.14E-01	1.69E-01	1.17E+02	7.84E-03	2.54E+00	5.87E-01	3.71E+01	4.17E+00	1.60E-01	3.25E+00	3.40E-06	8.79E-05	6.38E-01	2.36E+01	6.62E-05
MC	3.62E-08	9.40E-07	1.16E-06	3.86E-06	8.09E-07	1.16E-04	3.02E-06	5.86E-06	4.18E-06	1.07E-08	5.39E-06	3.43E-07	2.32E-04	2.10E-06	8.84E-05	8.61E-05	2.63E-06	1.53E-06	1.62E-04	7.75E-05	9.25E-12	3.08E-10	2.53E-05	1.85E-05	1.84E-10
MD	2.32E-02	1.21E-04	1.06E-01	2.60E-03	4.08E-02	6.08E-07	1.82E+02	2.93E-02	5.48E-02	2.54E-05	1.55E-02	1.06E-03	6.54E+00	7.67E-05	6.20E+01	8.97E-01	3.05E+00	1.57E-02	6.66E-02	1.02E+00	2.02E-06	5.29E-05	4.01E+00	3.61E+01	3.86E-05
ME	3.37E-04	6.59E-05	1.03E-02	1.06E-03	4.01E-03	5.34E-06	2.01E-02	7.20E+01	9.33E-01	3.34E-03	4.72E-03	2.31E-04	1.89E+00	1.57E-03	8.67E-01	2.99E+01	3.55E-02	1.94E-03	6.96E-02	9.05E-01	3.74E-08	7.19E-07	1.51E-01	1.10E-01	3.38E-07
MK	1.19E-03	4.59E-05	1.24E-02	1.14E-03	4.99E-03	1.53E-06	5.50E-02	3.79E-01	7.90E+01	8.44E-04	7.30E-03	3.28E-04	1.57E+00	2.62E-04	2.50E+00	5.75E+01	6.12E-02	2.57E-03	4.71E-02	9.42E-01	8.61E-08	2.35E-06	2.20E+00	2.57E-01	1.02E-06
MT	5.23E-07	5.15E-07	1.47E-05	1.23E-05	3.38E-06	4.88E-08	1.74E-04	8.12E-04	3.43E-04	2.27E-02	1.14E-05	1.54E-07	3.09E-03	6.64E-06	1.06E-03	2.64E-03	1.33E-04	1.61E-06	2.82E-04	7.26E-04	6.95E-11	9.45E-09	6.97E-03	4.85E-04	4.39E-09
NL	1.70E-04	1.02E-03	2.82E-02	5.07E-01	1.57E-02	3.89E-06	4.22E-04	1.01E-04	4.89E-05	5.84E-08	1.13E+02	6.06E-02	1.98E+00	4.15E-02	7.30E-03	1.63E-02	6.68E-02	9.80E-02	1.93E-02	1.21E-01	2.00E-07	5.93E-07	5.54E-04	5.52E-02	7.77E-07
NO	1.63E-02	7.15E-04	9.04E-01	1.07E-01	1.08E+00	1.81E-06	1.03E-01	5.63E-03	5.65E-03	5.84E-07	2.68E+00	1.94E+02	1.81E+01	3.83E-02	3.98E-01	2.21E-01	6.37E+00	1.73E+01	3.77E-02	7.05E-01	4.54E-05	1.14E-04	2.79E-02	1.74E+00	1.44E-04
PL	2.36E-02	2.20E-02	1.92E+01	8.61E-01	6.04E+00	1.80E-05	4.72E+00	5.29E-01	5.05E-01	3.39E-04	7.90E+00	3.33E-01	8.13E+03	4.28E-02	3.95E+01	2.21E+01	5.22E+01	4.03E+00	5.12E+00	2.57E+02	1.49E-05	1.25E-04	1.35E+00	1.15E+02	1.16E-04
PT	1.25E-05	3.51E-06	5.40E-04	6.54E-04	2.46E-04	5.86E-07	1.44E-04	1.98E-04	7.14E-05	1.92E-06	7.84E-03	7.41E-04	2.11E-02	5.55E+02	1.05E-03	1.23E-03	1.50E-03	1.18E-03	1.29E-03	1.52E-03	2.42E-08	1.52E-07	5.47E-04	3.05E-03	1.38E-07
RO	5.76E-02	3.54E-03	5.52E-01	5.11E-02	2.56E-01	1.71E-05	6.32E+01	2.11E+00	3.59E+00	1.20E-03	1.87E-01	1.05E-02	7.32E+01	2.34E-03	2.00E+03	1.59E+02	1.06E+01	1.04E-01	4.42E+00	3.57E+01	7.02E-06	8.97E-05	3.20E+01	8.18E+01	6.17E-05
RS	7.98E-03	1.05E-03	1.46E-01	2.20E-02	6.07E-02	1.60E-05	6.06E-01	1.94E+01	3.06E+01	2.01E-03	1.05E-01	3.93E-03	3.39E+01	2.01E-03	5.77E+01	1.08E+03	4.89E-01	3.55E-02	1.41E+00	2.01E+01	7.76E-07	1.32E-05	3.29E+00	3.02E+00	6.01E-06
RU	1.16E+03	4.04E-03	5.06E+01	1.57E-01	6.91E+01	1.05E-05	2.55E+01	2.76E-01	3.73E-01	2.96E-04	2.66E+00	1.31E+00	4.55E+02	2.44E-02	6.63E+01	1.06E+01	2.81E+04	9.72E+00	1.10E+00	2.19E+01	6.19E-01	9.44E-01	1.28E+02	1.81E+03	1.84E+00
SE	4.03E-02	2.51E-03	7.57E+00	2.23E-01	9.58E+00	2.86E-06	7.64E-01	2.88E-02	2.64E-02	4.22E-06	5.75E+00	2.29E+01	1.28E+02	4.41E-02	2.59E+00	1.10E+00	2.64E+01	4.07E+02	2.15E-01	3.77E+00	1.05E-04	2.50E-04	7.43E-02	1.26E+01	3.58E-04
SI	6.04E-04	8.69E-04	2.50E-02	7.57E-03	1.36E-02	3.77E-05	7.84E-02	5.07E-02	1.62E-02	1.75E-04	1.71E-02	8.93E-04	9.48E+00	3.85E-03	1.03E+00	1.03E+00	6.44E-02	9.82E-03	1.41E+02	3.05E+00	1.37E-07	2.78E-06	1.29E-01	7.57E-01	2.06E-06
SK	1.52E-03	4.71E-03	3.64E-01	7.37E-02	1.33E-01	1.10E-05	6.20E-01	6.84E-01	4.85E-01	3.60E-04	2.41E-01	9.68E-03	3.88E+02	4.67E-03	2.19E+01	2.76E+01	6.66E-01	9.44E-02	4.15E+00	6.40E+02	9.10E-07	5.53E-06	1.71E-01	9.66E+00	5.35E-06
TJ	3.22E+00	4.76E-08	1.52E-05	6.72E-07	6.66E-06	3.23E-09	4.14E-04	1.27E-05	4.05E-05	3.25E-08	5.52E-06	1.27E-06	1.03E-03	5.47E-07	1.43E-03	3.87E-04	6.55E-02	4.01E-06	1.69E-05	1.29E-04	1.31E+02	5.61E-01	2.52E-02	7.98E-03	9.61E+00
TM	7.49E+00	1.95E-06	1.50E-03	4.71E-05	8.80E-04	1.54E-08	2.38E-02	3.23E-04	7.51E-04	1.08E-06	4.07E-04	4.57E-05	8.20E-02	6.64E-06	6.89E-02	1.53E-02	2.99E+00	2.79E-04	9.61E-04	8.90E-03	1.71E+00	5.22E+01	1.03E+00	9.17E-01	1.13E+01
TR	2.16E-01	2.24E-04	1.13E-01	4.91E-03	7.27E-02	3.91E-06	1.04E+01	1.79E-01	7.36E-01	1.41E-03	2.89E-02	2.26E-03	6.71E+00	1.96E-04	3.30E+01	7.73E+00	2.34E+01	2.18E-02	1.35E-01	1.87E+00	5.03E-06	3.39E-04	6.20E+03	5.93E+01	2.11E-04
UA	4.43E+00	5.47E-03	6.27E+00	1.38E-01	2.34E+00	1.57E-05	1.35E+02	7.80E-01	7.74E-01	5.69E-04	8.40E-01	5.52E-02	6.25E+02	7.38E-03	2.96E+02	3.39E+01	4.26E+02	5.64E-01	3.39E+00	9.05E+01	2.56E-04	1.71E-02	7.41E+01	7.40E+03	1.19E-02
UZ	1.10E+02	3.78E-06	4.02E-03	1.56E-04	2.07E-03	2.49E-08	3.00E-02	1.06E-03	1.58E-03	6.73E-07	1.60E-03	9.20E-05	2.24E-01	5.43E-06	1.06E-01	2.59E-02	5.11E+00	7.53E-04	1.76E-03	1.78E-02	2.21E+01	8.79E+00	8.11E-01	2.68E+00	1.45E+02

Table B9. *Source-receptor matrix of HCB deposition to EMEP countries in 2023, kg/year. 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	2.03E-02	2.44E-06	1.53E-02	2.94E-05	2.33E-01	2.62E-03	9.60E-03	4.87E-04	3.79E-04	2.83E-06	7.96E-03	2.88E-03	8.34E-04	8.98E-05	2.26E-03	2.15E-03	6.95E-03	1.51E-02	3.81E-03	1.04E-02	1.10E-03	4.91E-03	8.24E-04	1.67E-05	5.30E-02	3.64E-06
AM	1.05E-05	1.35E-02	2.10E-03	5.26E-03	1.16E-02	7.24E-04	6.97E-04	2.35E-04	8.26E-05	1.48E-05	1.17E-03	6.11E-04	2.92E-04	6.19E-05	3.47E-04	1.25E-03	1.27E-03	4.48E-03	2.01E+00	4.84E-04	7.90E-05	3.32E-04	2.28E-04	7.78E-06	3.73E-03	1.16E-05
AT	2.80E-05	2.94E-06	9.39E+00	3.82E-05	1.82E-01	3.62E-02	2.51E-03	1.93E-03	3.09E-02	2.40E-06	3.53E-01	1.62E-01	9.13E-03	5.63E-04	5.94E-03	1.78E-02	8.02E-02	1.50E-01	3.58E-03	5.86E-04	9.08E-03	3.70E-02	7.01E-03	1.17E-04	5.36E-01	5.42E-06
AZ	2.11E-05	3.64E-03	5.17E-03	4.80E-02	2.68E-02	2.09E-03	1.60E-03	7.81E-04	1.98E-04	2.20E-05	3.25E-03	1.72E-03	9.33E-04	2.40E-04	8.33E-04	4.82E-03	3.25E-03	1.27E-02	2.60E+00	9.37E-04	1.82E-04	8.55E-04	6.47E-04	2.46E-05	8.19E-03	4.47E-05
BA	9.02E-04	5.24E-06	2.07E-01	6.74E-05	4.70E+01	1.38E-02	7.74E-03	2.15E-03	1.75E-03	3.60E-06	1.04E-01	2.18E-02	5.64E-03	5.73E-04	5.75E-03	1.36E-02	2.67E-02	7.24E-02	7.31E-03	2.01E-03	5.31E-02	6.37E-02	3.37E-03	7.04E-05	2.50E-01	1.07E-05
BE	1.74E-06	4.60E-07	6.59E-03	6.59E-06	3.53E-03	1.89E+00	1.84E-04	4.59E-04	1.03E-03	2.77E-07	9.08E-03	5.89E-02	7.25E-03	2.12E-04	3.81E-03	5.65E-03	2.71E-01	4.57E-01	5.16E-04	6.10E-05	4.31E-05	3.06E-04	1.19E-02	1.27E-04	2.93E-03	1.69E-06
BG	6.46E-04	2.35E-05	9.42E-02	2.50E-04	9.08E-01	1.50E-02	8.67E-01	5.35E-03	1.64E-03	1.56E-05	5.10E-02	1.74E-02	6.45E-03	8.11E-04	4.73E-03	1.72E-02	2.31E-02	8.58E-02	3.47E-02	3.26E-02	4.06E-03	2.97E-02	4.08E-03	1.06E-04	8.86E-02	3.95E-05
BY	4.40E-05	1.86E-05	1.26E-01	2.57E-04	2.85E-01	7.32E-02	5.45E-03	1.18E+00	2.99E-03	5.97E-06	1.96E-01	8.60E-02	7.56E-02	2.02E-02	5.30E-03	1.98E-01	5.83E-02	4.55E-01	2.46E-02	1.41E-03	2.46E-03	2.70E-02	1.83E-02	5.60E-04	4.37E-02	6.21E-05
CH	5.86E-06	6.42E-07	1.19E-01	7.31E-06	1.52E-02	2.35E-02	4.29E-04	3.26E-04	1.69E-01	6.24E-07	1.50E-02	4.95E-02	1.93E-03	1.11E-04	4.08E-03	3.66E-03	1.30E-01	7.41E-02	7.69E-04	1.60E-04	2.77E-04	7.95E-04	3.68E-03	5.05E-05	2.02E-01	1.49E-06
CY	1.03E-05	9.09E-07	9.40E-04	5.78E-06	7.48E-03	2.95E-04	6.50E-04	6.86E-05	3.37E-05	5.52E-04	5.37E-04	2.44E-04	9.16E-05	1.14E-05	1.59E-04	2.33E-04	6.43E-04	1.67E-03	9.76E-04	1.61E-03	5.01E-05	1.97E-04	9.39E-05	2.12E-06	2.66E-03	6.92E-07
CZ	2.05E-05	2.61E-06	1.18E+00	4.17E-05	2.83E-01	6.74E-02	1.91E-03	3.04E-03	1.06E-02	1.59E-06	4.18E+00	2.62E-01	1.72E-02	8.52E-04	4.98E-03	2.72E-02	1.05E-01	2.42E-01	3.31E-03	3.95E-04	4.61E-03	4.84E-02	9.25E-03	1.60E-04	6.82E-02	5.87E-06
DE	3.12E-05	6.52E-06	1.24E+00	9.89E-05	9.02E-02	1.41E+00	3.54E-03	9.46E-03	9.62E-02	4.30E-06	1.01E+00	3.71E+00	2.06E-01	4.75E-03	2.82E-02	1.18E-01	1.01E+00	2.94E+00	7.85E-03	1.07E-03	1.41E-03	1.56E-02	8.97E-02	1.21E-03	1.48E-01	2.33E-05
DK	2.23E-06	8.92E-07	1.02E-02	1.08E-05	8.27E-03	7.10E-02	1.79E-04	1.01E-03	5.23E-04	3.06E-07	1.88E-02	5.65E-02	8.85E-01	1.48E-03	1.45E-03	3.51E-02	2.90E-02	4.56E-01	8.97E-04	6.35E-05	9.55E-05	8.43E-04	1.49E-02	2.70E-04	2.66E-03	3.29E-06
EE	3.85E-06	1.56E-06	1.00E-02	2.06E-05	1.73E-02	1.82E-02	4.12E-04	8.08E-03	3.23E-04	3.98E-07	1.73E-02	1.53E-02	2.75E-02	3.16E-01	9.36E-04	3.25E-01	1.14E-02	1.18E-01	1.78E-03	9.19E-05	1.70E-04	1.45E-03	4.90E-03	1.76E-04	3.60E-03	5.93E-06
ES	7.06E-05	6.07E-06	4.44E-02	5.78E-05	1.68E-01	1.07E-01	3.30E-03	1.72E-03	2.55E-03	4.50E-06	3.44E-02	3.62E-02	1.51E-02	5.76E-04	1.12E+00	1.69E-02	2.59E-01	4.99E-01	7.77E-03	1.90E-03	1.98E-03	5.58E-03	3.17E-02	5.99E-04	1.20E-01	1.28E-05
FI	1.68E-05	1.10E-05	2.77E-02	1.22E-04	5.67E-02	5.60E-02	1.69E-03	1.31E-02	1.01E-03	2.20E-06	4.52E-02	4.07E-02	6.30E-02	8.40E-02	3.18E-03	1.86E+01	3.51E-02	3.88E-01	1.14E-02	4.27E-04	5.06E-04	3.93E-03	1.74E-02	1.10E-03	1.35E-02	4.28E-05
FR	6.52E-05	8.56E-06	1.38E-01	1.08E-04	1.85E-01	1.80E+00	4.49E-03	5.22E-03	6.49E-02	6.43E-06	1.47E-01	3.21E-01	5.35E-02	2.08E-03	1.98E-01	5.46E-02	4.76E+00	2.51E+00	1.02E-02	1.85E-03	2.74E-03	9.16E-03	1.46E-01	1.47E-03	3.20E-01	2.25E-05
GB	8.30E-06	3.81E-06	1.66E-02	4.44E-05	2.47E-02	2.88E-01	6.44E-04	1.93E-03	1.19E-03	1.24E-06	2.17E-02	5.23E-02	6.55E-02	2.18E-03	1.32E-02	6.96E-02	1.83E-01	1.12E+01	3.54E-03	2.30E-04	2.51E-04	1.47E-03	6.56E-01	2.25E-03	9.13E-03	1.15E-05
GE	4.04E-05	2.72E-03	1.03E-02	4.55E-03	5.75E-02	3.26E-03	4.00E-03	1.21E-03	3.39E-04	3.71E-05	5.91E-03	2.87E-03	1.55E-03	2.97E-04	1.34E-03	7.16E-03	5.14E-03	2.09E-02	2.25E+01	1.84E-03	3.72E-04	1.75E-03	1.02E-03	3.74E-05	1.48E-02	3.06E-05
GR	2.74E-03	1.39E-05	3.78E-02	1.60E-04	3.66E-01	8.72E-03	8.54E-02	2.09E-03	1.04E-03	1.95E-05	2.12E-02	8.60E-03	2.97E-03	3.66E-04	5.66E-03	8.06E-03	1.96E-02	5.02E-02	2.29E-02	2.55E-01	2.06E-03	1.08E-02	2.73E-03	6.20E-05	1.10E-01	2.08E-05
HR	2.88E-04	3.21E-06	3.84E-01	4.26E-05	9.07E+00	1.26E-02	4.34E-03	1.69E-03	1.84E-03	2.52E-06	1.06E-01	2.15E-02	5.10E-03	4.52E-04	4.98E-03	1.08E-02	2.49E-02	6.44E-02	4.34E-03	9.45E-04	1.98E-01	6.66E-02	3.00E-03	5.85E-05	3.64E-01	6.70E-06
HU	1.46E-04	3.44E-06	9.98E-01	5.09E-05	2.77E+00	2.17E-02	9.54E-03	3.27E-03	3.00E-03	2.29E-06	2.27E-01	3.99E-02	8.40E-03	6.97E-04	3.84E-03	1.62E-02	3.17E-02	9.99E-02	4.73E-03	1.03E-03	4.25E-02	7.93E-01	4.20E-03	9.22E-05	1.39E-01	8.06E-06
IE	2.08E-06	1.15E-06	2.60E-03	1.29E-05	5.84E-03	2.94E-02	1.57E-04	3.62E-04	2.59E-04	3.43E-07	3.23E-03	7.16E-03	6.35E-03	4.14E-04	3.39E-03	1.36E-02	2.48E-02	7.44E-01	1.02E-03	6.22E-05	5.48E-05	2.67E-04	1.98E+00	1.02E-03	2.44E-03	3.50E-06
IS	1.58E-06	5.72E-07	1.40E-03	6.28E-06	5.06E-03	3.84E-03	1.18E-04	2.15E-04	6.82E-05	2.04E-07	1.61E-03	1.85E-03	2.52E-03	2.64E-04	5.71E-04	1.19E-02	3.00E-03	5.22E-02	5.93E-04	4.23E-05	4.75E-05	2.00E-04	6.27E-03	2.87E-02	1.57E-03	2.33E-06
IT	8.31E-04	1.10E-05	6.56E-01	1.29E-04	1.94E+00	4.18E-02	1.31E-02	3.59E-03	3.20E-02	9.04E-06	1.08E-01	6.18E-02	9.31E-03	8.35E-04	3.82E-02	2.05E-02	2.24E-01	2.14E-01	1.58E-02	6.38E-03	2.95E-02	3.35E-02	1.27E-02	1.99E-04	7.95E+00	1.98E-05
KY	1.93E-05	5.63E-05	4.08E-03	5.16E-04	2.26E-02	1.99E-03	9.82E-04	3.48E-04	2.25E-04	1.25E-05	2.31E-03	1.41E-03	5.98E-04	1.33E-04	1.26E-03	3.34E-03	3.59E-03	1.23E-02	4.71E-02	6.78E-04	1.55E-04	5.70E-04	6.29E-04	1.90E-05	8.86E-03	5.99E-02
KZ	2.87E-04	7.13E-04	1.47E-01	1.19E-02	6.12E-01	9.01E-02	2.62E-02	2.98E-02	5.18E-03	9.97E-05	1.26E-01	6.77E-02	4.35E-02	1.31E-02	1.89E-02	2.77E-01	1.01E-01	5.92E-01	7.31E-01	1.01E-02	4.43E-03	2.39E-02	2.66E-02	1.26E-03	1.57E-01	4.07E-02
LI	2.84E-08	3.72E-09	2.17E-03	4.01E-08	8.18E-05	1.10E-04	2.18E-06	1.59E-06	9.65E-04	3.62E-09	8.14E-05	2.89E-04	9.59E-06	6.10E-07	2.10E-05	2.11E-05	3.74E-04	3.78E-04	4.33E-06	8.65E-07	1.65E-06	4.12E-06	1.86E-05	2.77E-07	1.05E-03	8.78E-09
LT	1.04E-05	2.75E-06	3.30E-02	3.74E-05	5.25E-02	3.74E-02	1.06E-03	5.52E-02	9.55E-04	8.40E-07	5.94E-02	3.96E-02	6.36E-02	1.10E-02	1.88E-03	9.41E-02	2.43E-02	2.35E-01	3.23E-03	2.17E-04	5.01E-04	4.93E-03	8.67E-03	2.23E-04	9.34E-03	1.01E-05
LU	2.43E-07	4.67E-08	9.75E-04	6.67E-07	4.73E-04	2.32E-02	2.71E-05	5.06E-05	2.14E-04	3.39E-08	1.85E-03	9.77E-03	4.62E-04	1.72E-05	4.34E-04	5.27E-04	2.67E-02	2.43E-02	5.26E-05	8.44E-06	5.39E-06	5.12E-05	8.66E-04	9.35E-06	4.70E-04	1.67E-07
LV	9.41E-06	3.07E-06	2.66E-02	4.13E-05	4.25E-02	3.89E-02	9.49E-04	3.39E-02	8.33E-04	8.40E-07	4.68E-02	3.78E-02	6.41E-02	5.26E-02	2.06E-03	2.28E-01	2.54E-02	2.37E-01	3.58E-03	2.14E-04	4.10E-04	3.82E-03	9.31E-03	2.88E-04	8.33E-03	1.15E-05
MC	4.32E-09	2.24E-10	6.28E-06	2.50E-09	1.24E-05	1.51E-06	2.20E-07	8.85E-08	7.87E-07	2.72E-10	2.25E-06	1.57E-06	3.01E-07	2.60E-08	1.74E-06	6.33E-07	6.73E-05	7.05E-06	3.38E-07	9.80E-08	2.65E-07	5.16E-07	4.53E-07	6.90E-09	7.94E-05	4.43E-10
MD	1.91E-05	5.31E-06	1.84E-02	5.80E-05	7.53E-02	4.00E-03	6.14E-03	3.54E-03	3.27E-04	1.42E-06	1.30E-02	4.62E-03	2.29E-03	4.18E-04	7.00E-04	7.50E-03	4.81E-03	2.25E-02	6.94E-03	7.04E-04	5.45E-04	5.13E-03	9.54E-04	3.43E-05	1.07E-02	1.14E-05
ME	2.99E-03	1.42E-06	1.92E-02	1.78E-05	1.33E+00	2.38E-03	3.77E-03	4.35E-04	3.03E-04	1.03E-06	1.10E-02	3.08E-03	8.60E-04	8.74E-05	1.51E-03	2.21E-03	5.20E-03	1.30E-02	2.05E-03	1.16E-03	1.97E-03	7.63E-03	6.52E-04	1.36E-05	4.48E-02	1.97E-06
MK	3.19E-03	2.69E-06	1.81E-02	3.24E-05	1.82E-01	2.71E-03	3.61E-02	5.76E-04	3.63E-04	2.45E-06	9.85E-03	3.27E-03	9.69E-04	1.08E-04	1.46E-03	2.56E-03	5.49E-03	1.55E-02	4.27E-03	1.77E-02	8.17E-04	6.59E-03	7.95E-04	1.77E-05	2.76E-02	3.40E-06
MT	3.21E-07	4.34E-09	2.58E-05	4.94E-08	2.82E-04	8.46E-06	5.25E-06	6.62E-07	1.11E-06	2.71E-09	1.20E-05	6.13E-06	1.64E-06	1.63E-07	1.06E-05	4.18E-06	3.59E-05	5.08E-05	5.99E-06	5.28E-06	2.19E-06	3.80E-06	2.81E-06	4.69E-08	2.06E-04	8.43E-09
NL	1.30E-06	4.39E-07	5.68E-03	6.72E-06	3.51E-03	6.57E-01	1.34E-04	4.95E-04	5.31E-04	2.35E-07	8.64E-03	8.91E-02	1.34E-02	3.05E-04	2.51E-03	8.01E-03	1.10E-01	6.67E-01	5.15E-04	4.84E-05	4.76E-05	3.55E-04	1.45E-02	1.57E-04	1.95E-03	1.76E-06
NO	2.22E-05	1.06E-05	2.70E-02	1.08E-04	6.89E-02	1.20E-01	1.74E-03	4.90E-03	1.43E-03	2.93E-06	3.85E-02	5.25E-02	1.38E-01	8.11E-03	5.51E-03	5.46E-01	6.63E-02	1.02E+00	9.68E-03	5.30E-04	5.82E-04	3.61E-03	4.67E-02	2.15E-03	1.74E-02	4.05E-05
PL	9.92E-05	1.15E-05	6.49E-01	1.81E-04	8.87E-01	2.42E-01	7.58E-03	7.42E-02	1.22E-02	5.05E-06	2.29E+00	4.94E-01	1.69E-01	1.13E-02	1.23E-02	2.18E-01	1.95E-01	1.13E+00	1.40E-02	1.43E-03	9.20E-03	1.20E-01	4.08E-02	8.61E-04	1.18E-01	3.94E-05
PT	8.54E-06	8.91E-07	4.17E-03	8.06E-06	1.83E-02	1.40E-02	3.67E-04	1.79E-04	2.48E-04	5.35E-07	3.71E-03	4.19E-03	1.86E-03	6.80E-05	4.74E-02	2.32E-03	2.05E-02	8.62E-02	9.39E-04	2.16E-04	1.78E-04	5.34E-04	5.02E-03	1.43E-04	8.74E-03	2.05E-06
RO	5.41E-04	3.52E-05	3.69E-01	3.59E-04	2.75E+00	3.87E-02	1.51E-01	1.60E-02	4.90E-03	1.55E-05	1.54E-01	5.01E-02	1.61E-02	2.09E-03	9.55E-03	4.22E-02	5.86E-02	2.10E-01	4.66E-02	8.61E-03	1.64E-02	1.56E-01	9.16E-03	2.47E-04	2.25E-01	6.88E-05
RS	3.01E-03	9.29E-06	2.00E-01	1.15E-04	7.22E+00	1.81E-02	7.16E-02	3.26E-03	2.11E-03	6.15E-06	1.09E-01	2.63E-02	6.97E-03	7.37E-04	5.01E-03	1.70E-02	2.83E-02	9.25E-02	1.34E-02	8.85E-03	1.98E-02	1.07E-01	4.14E-03	9.21E-05	1.33E-01	1.81E-05
RU	7.35E-04	1.68E-03	5.61E-01	2.43E-02	1.87E+00	4.96E-01	8.48E-02	4.36E-01	1.70E-02	2.03E-04	6.04E-01	3.73E-01	3.91E-01	3.19E-01	5.66E-02	5.12E+00	4.15E-01	3.50E+00	3.90E+00	2.77E-02	1.43E-02	1.02E-01	1.67E-01	9.80E-03	4.15E-01	7.91E-03
SE	3.13E-05	1.57E-05	5.82E-02	1.69E-04	1.14E-01	1.99E-01	2.71E-03	1.39E-02	2.43E-03	4.11E-06	1.07E-01	1.45E-01	6.25E-01	3.66E-02	8.13E-03	3.77E+00	1.07E-01	1.43E+00	1.54E-02	8.00E-04	1.01E-03	7.76E-03	5.62E-02	2.43E-03	2.70E-02	6.19E-05
SI	2.09E-05	9.61E-07	7.19E-01	1.32E-05	1.54E-01	5.13E-03	9.83E-04	6.09E-04	1.16E-03	7.85E-07	3.71E-02	1.05E-02	1.91E-03	1.42E-04	1.82E-03	3.75E-03	1.09E-02	2.48E-02	1.29E-03	1.99E-04	3.22E-02	1.24E-02	1.23E-03	2.28E-05	2.59E-01	1.73E-06
SK	6.40E-05	2.52E-06	5.63E-01	3.96E-05	8.14E-01	2.06E-02	4.38E-03	3.14E-03	2.99E-03	1.42E-06	5.16E-01	4.14E-02	8.51E-03	6.40E-04	2.80E-03	1.60E-02	3.04E-02	9.37E-02	3.41E-03	5.40E-04	7.48E-03	2.14E-01	3.82E-03	8.43E-05	6.34E-02	6.13E-06
TJ	9.72E-06	3.10E-05	2.06E-03	3.00E-04	1.11E-02	9.56E-04	4.98E-04	1.94E-04	1.09E-04	7.47E-06	1.17E-03	6.99E-04	2.94E-04	7.03E-05	6.13E-04	1.61E-03	1.74E-03	5.91E-03	2.54E-02	3.49E-04	7.74E-05	2.85E-04	3.00E-04	9.32E-06	4.43E-03	1.73E-03
TM	5.28E-05	3.29E-04	1.82E-02	7.13E-03	8.45E-02	9.99E-03	4.18E-03	2.97E-03	7.25E-04	3.53E-05	1.35E-02	7.50E-03	4.15E-03	1.27E-03	3.11E-03	2.60E-02	1.35E-02	6.37E-02	3.19E-01	2.05E-03	5.99E-04	2.93E-03	3.04E-03	1.16E-04	2.52E-02	1.23E-03
TR	6.22E-04	2.67E-03	1.10E-01	3.80E-03	6.46E-01	3.37E-02	8.65E-02	1.33E-02	3.31E-03	1.34E-03	6.53E-02	2.99E-02	1.52E-02	2.13E-03	1.44E-02	4.37E-02	5.63E-02	2.03E-01	8.69E-01	6.12E-02	4.16E-03	2.28E-02	1.07E-02	3.15E-04	1.76E-01	1.54E-04
UA	2.67E-04	9.45E-05	4.08E-01	1.43E-03	1.48E+00	9.71E-02	4.94E-02	1.54E-01	6.80E-03	2.66E-05	3.99E-01	1.21E-01	6.05E-02	1.19E-02	1.29E-02	1.92E-01	1.05E-01	5.75E-01	1.33E-01	9.25E-03	1.09E-02	1.40E-01	2.32E-02	7.92E-04	1.82E-01	2.62E-04
UZ	4.29E-05	1.82E-04	1.77E-02	3.01E-03	7.80E-02	1.05E-02	3.52E-03	3.10E-03	6.88E-04	2.30E-05	1.42E-02	7.71E-03	4.27E-03	1.31E-03	2.80E-03	2.66E-02	1.32E-02	6.75E-02	1.80E-01	1.56E-03	5.57E-04	2.82E-03	3.02E-03	1.22E-04	2.22E-02	8.39E-03

Table B9 *(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	2.11E-03	3.61E-07	1.52E-04	2.83E-04	1.21E-04	2.05E-05	2.01E-04	6.64E-03	7.89E-03	2.54E-04	1.96E-03	2.51E-04	3.14E-03	4.54E-04	9.61E-03	4.23E-02	1.47E-03	6.66E-04	7.60E-04	3.27E-02	8.84E-06	4.05E-05	2.82E-03	1.46E-01	3.24E-05
AM	3.20E-03	7.86E-08	7.02E-05	6.42E-05	7.18E-05	3.34E-06	8.03E-05	4.82E-05	3.92E-05	1.20E-05	5.21E-04	9.88E-05	6.12E-04	1.01E-04	1.34E-03	7.66E-04	1.67E-03	3.01E-04	1.12E-04	3.02E-03	2.10E-05	2.71E-04	1.46E-02	9.49E-02	1.11E-04
AT	2.68E-03	1.39E-04	8.29E-04	5.32E-03	8.14E-04	9.36E-05	3.05E-04	2.36E-04	9.90E-05	3.79E-05	2.46E-02	1.87E-03	4.19E-02	1.19E-03	1.12E-02	9.35E-03	2.52E-03	5.97E-03	5.12E-02	4.81E-01	1.84E-05	6.90E-05	1.69E-03	2.70E-01	5.55E-05
AZ	1.99E-02	1.86E-07	2.42E-04	1.77E-04	2.61E-04	7.51E-06	2.04E-04	1.04E-04	8.08E-05	2.32E-05	1.50E-03	3.50E-04	1.85E-03	2.38E-04	3.36E-03	1.80E-03	1.17E-02	1.08E-03	2.68E-04	8.16E-03	1.37E-04	2.54E-03	1.49E-02	3.11E-01	8.14E-04
BA	4.63E-03	1.91E-06	9.08E-04	1.65E-03	8.04E-04	8.13E-05	5.17E-04	2.26E-02	4.69E-04	2.46E-04	1.15E-02	1.28E-03	3.02E-02	1.19E-03	3.94E-02	1.94E-01	4.06E-03	4.32E-03	8.81E-03	3.86E-01	2.62E-05	1.01E-04	3.26E-03	4.25E-01	8.64E-05
BE	7.38E-04	6.04E-07	2.92E-04	6.54E-02	3.15E-04	9.17E-06	4.09E-05	1.34E-05	7.87E-06	2.35E-06	1.30E-01	1.47E-03	3.24E-03	6.87E-04	6.21E-04	2.88E-04	6.71E-04	3.21E-03	8.94E-05	4.65E-03	7.02E-06	2.12E-05	2.22E-04	3.34E-02	1.80E-05
BG	2.44E-02	1.75E-06	1.39E-03	1.46E-03	1.07E-03	5.22E-05	6.35E-03	4.04E-03	7.51E-03	2.04E-04	1.21E-02	1.82E-03	2.26E-02	1.14E-03	2.91E-01	1.77E-01	1.87E-02	5.42E-03	3.94E-03	1.96E-01	8.72E-05	3.24E-04	3.62E-02	2.49E+00	2.95E-04
BY	3.78E-02	3.70E-06	9.80E-02	5.35E-03	5.69E-02	3.12E-05	6.03E-03	4.93E-04	1.84E-04	3.67E-05	6.61E-02	1.52E-02	3.44E-01	1.30E-03	3.77E-02	1.85E-02	7.73E-02	7.27E-02	3.86E-03	3.86E-01	1.65E-04	4.91E-04	8.52E-03	1.47E+01	4.77E-04
CH	6.24E-04	4.88E-04	1.50E-04	3.23E-03	1.40E-04	7.94E-05	3.92E-05	5.02E-05	2.26E-05	1.03E-05	1.14E-02	5.30E-04	3.22E-03	7.31E-04	1.14E-03	1.04E-03	5.07E-04	1.36E-03	8.32E-04	1.11E-02	5.78E-06	1.91E-05	3.99E-04	3.55E-02	1.55E-05
CY	4.27E-04	2.96E-08	1.89E-05	2.68E-05	1.57E-05	1.69E-06	3.41E-05	3.82E-05	3.42E-05	2.23E-05	2.05E-04	2.95E-05	2.57E-04	3.50E-05	7.98E-04	4.89E-04	3.12E-04	7.48E-05	5.61E-05	1.66E-03	2.19E-06	8.58E-06	1.20E-02	3.44E-02	6.30E-06
CZ	3.01E-03	1.58E-05	1.38E-03	1.16E-02	1.32E-03	3.79E-05	3.30E-04	2.48E-04	7.38E-05	1.84E-05	4.49E-02	3.01E-03	1.69E-01	9.34E-04	1.06E-02	1.22E-02	3.12E-03	1.01E-02	9.09E-03	9.76E-01	1.99E-05	6.96E-05	1.29E-03	3.07E-01	5.84E-05
DE	1.07E-02	2.20E-04	6.47E-03	1.82E-01	6.78E-03	1.42E-04	6.64E-04	2.67E-04	1.43E-04	4.26E-05	9.63E-01	2.08E-02	1.63E-01	5.21E-03	1.31E-02	7.40E-03	1.16E-02	7.30E-02	4.17E-03	2.44E-01	8.55E-05	2.46E-04	3.47E-03	5.97E-01	2.22E-04
DK	1.21E-03	5.40E-07	1.33E-03	2.32E-03	1.83E-03	3.75E-06	5.53E-05	1.87E-05	8.06E-06	2.31E-06	6.41E-02	1.62E-02	1.11E-02	3.75E-04	8.14E-04	5.29E-04	2.02E-03	8.63E-02	1.89E-04	1.20E-02	1.06E-05	3.22E-05	2.88E-04	4.82E-02	2.74E-05
EE	2.69E-03	3.36E-07	1.19E-02	1.01E-03	5.73E-02	3.39E-06	2.09E-04	3.30E-05	1.56E-05	3.11E-06	1.57E-02	6.57E-03	2.23E-02	2.37E-04	1.99E-03	1.03E-03	2.67E-02	5.28E-02	2.93E-04	2.23E-02	1.70E-05	5.05E-05	5.02E-04	2.01E-01	4.79E-05
ES	5.68E-03	1.85E-06	8.41E-04	6.63E-03	7.13E-04	1.70E-04	3.00E-04	5.28E-04	2.24E-04	1.79E-04	5.74E-02	3.99E-03	1.37E-02	2.05E-01	8.02E-03	7.76E-03	3.50E-03	9.00E-03	3.12E-03	5.81E-02	4.71E-05	1.84E-04	3.51E-03	2.45E-01	1.33E-04
FI	1.56E-02	9.98E-07	1.31E-02	2.89E-03	2.81E-02	1.32E-05	5.38E-04	1.35E-04	6.64E-05	1.37E-05	5.09E-02	3.80E-02	4.67E-02	8.32E-04	6.74E-03	3.51E-03	9.98E-02	2.85E-01	8.59E-04	5.63E-02	1.30E-04	4.15E-04	2.63E-03	6.07E-01	3.67E-04
FR	1.05E-02	1.64E-05	2.73E-03	1.06E-01	2.70E-03	1.67E-03	5.88E-04	5.76E-04	2.41E-04	1.47E-04	3.71E-01	1.18E-02	4.30E-02	2.05E-02	1.34E-02	1.11E-02	8.15E-03	2.82E-02	5.61E-03	1.16E-01	9.35E-05	3.17E-04	4.62E-03	4.83E-01	2.56E-04
GB	4.39E-03	1.00E-06	1.62E-03	5.79E-03	2.09E-03	1.57E-05	1.19E-04	6.80E-05	3.09E-05	1.12E-05	1.76E-01	1.90E-02	1.00E-02	5.33E-03	2.18E-03	1.69E-03	4.89E-03	3.65E-02	4.52E-04	1.78E-02	4.87E-05	1.64E-04	9.61E-04	1.12E-01	1.28E-04
GE	9.84E-03	3.42E-07	3.58E-04	2.81E-04	3.50E-04	1.29E-05	5.96E-04	2.13E-04	1.67E-04	3.81E-05	2.46E-03	4.97E-04	3.32E-03	3.88E-04	8.73E-03	4.05E-03	1.38E-02	1.61E-03	5.19E-04	1.59E-02	6.51E-05	5.20E-04	3.65E-02	7.66E-01	2.56E-04
GR	1.24E-02	9.69E-07	5.92E-04	8.38E-04	4.73E-04	5.14E-05	1.53E-03	2.16E-03	1.49E-02	8.24E-04	6.55E-03	9.09E-04	9.60E-03	1.15E-03	4.42E-02	4.72E-02	8.60E-03	2.44E-03	1.95E-03	7.79E-02	4.86E-05	2.08E-04	4.17E-02	9.61E-01	1.72E-04
HR	2.84E-03	2.18E-06	7.08E-04	1.52E-03	6.40E-04	8.24E-05	3.60E-04	2.81E-03	2.23E-04	1.19E-04	9.92E-03	1.05E-03	2.88E-02	9.33E-04	2.44E-02	6.82E-02	2.57E-03	3.60E-03	5.14E-02	3.77E-01	1.77E-05	6.76E-05	1.99E-03	3.03E-01	5.63E-05
HU	3.96E-03	3.73E-06	1.37E-03	2.63E-03	1.09E-03	5.26E-05	6.93E-04	2.40E-03	5.14E-04	5.17E-05	1.62E-02	1.71E-03	7.37E-02	7.88E-04	8.76E-02	1.36E-01	4.09E-03	5.89E-03	3.49E-02	2.05E+00	2.18E-05	7.65E-05	1.94E-03	7.53E-01	6.63E-05
IE	1.22E-03	1.98E-07	2.64E-04	8.35E-04	3.58E-04	4.45E-06	2.66E-05	1.70E-05	7.69E-06	3.97E-06	2.13E-02	2.74E-03	1.74E-03	1.41E-03	4.73E-04	3.72E-04	1.12E-03	4.62E-03	9.21E-05	3.11E-03	1.52E-05	5.06E-05	2.49E-04	2.44E-02	4.01E-05
IS	1.17E-03	5.95E-08	1.68E-04	1.80E-04	2.08E-04	1.72E-06	2.15E-05	1.34E-05	5.74E-06	1.43E-06	2.89E-03	2.30E-03	1.01E-03	2.50E-04	3.57E-04	2.60E-04	7.33E-04	2.77E-03	6.95E-05	2.10E-03	7.29E-06	2.27E-05	1.76E-04	1.91E-02	1.99E-05
IT	1.01E-02	5.54E-05	1.28E-03	5.00E-03	1.12E-03	9.53E-04	8.09E-04	5.03E-03	1.21E-03	1.92E-03	2.60E-02	2.54E-03	3.61E-02	5.67E-03	3.68E-02	5.64E-02	7.05E-03	6.87E-03	5.09E-02	2.83E-01	5.44E-05	2.23E-04	7.92E-03	6.65E-01	1.82E-04
KY	6.35E-02	1.98E-07	1.16E-04	1.62E-04	1.22E-04	9.45E-06	7.77E-05	9.45E-05	7.03E-05	2.16E-05	1.36E-03	2.75E-04	1.13E-03	3.94E-04	1.77E-03	1.32E-03	3.85E-03	7.18E-04	2.39E-04	5.40E-03	6.71E-02	8.50E-03	5.78E-03	1.02E-01	7.70E-02
KZ	1.72E+01	5.00E-06	1.05E-02	6.55E-03	1.08E-02	1.36E-04	5.45E-03	1.88E-03	1.09E-03	2.61E-04	6.91E-02	1.99E-02	7.94E-02	5.27E-03	7.56E-02	3.74E-02	8.01E-01	6.13E-02	6.77E-03	2.55E-01	5.08E-02	7.80E-02	7.62E-02	1.05E+01	2.31E-01
LI	3.22E-06	2.72E-05	7.59E-07	1.50E-05	7.32E-07	4.77E-07	2.04E-07	2.35E-07	1.12E-07	6.00E-08	5.64E-05	2.93E-06	1.64E-05	3.94E-06	5.97E-06	5.10E-06	2.68E-06	7.12E-06	4.91E-06	5.67E-05	3.34E-08	1.07E-07	2.30E-06	1.88E-04	8.66E-08
LT	5.62E-03	1.18E-06	2.58E-01	2.18E-03	6.93E-02	7.40E-06	6.13E-04	1.02E-04	4.45E-05	6.96E-06	3.31E-02	7.69E-03	1.18E-01	4.62E-04	6.12E-03	3.60E-03	1.92E-02	5.26E-02	8.54E-04	8.31E-02	2.98E-05	8.53E-05	9.96E-04	5.63E-01	8.20E-05
LU	7.48E-05	1.04E-07	2.75E-05	4.64E-02	2.65E-05	1.62E-06	5.12E-06	1.99E-06	1.15E-06	3.44E-07	5.62E-03	1.01E-04	4.67E-04	7.07E-05	8.73E-05	4.19E-05	6.56E-05	2.47E-04	1.15E-05	7.90E-04	7.01E-07	2.10E-06	2.75E-05	4.10E-03	1.81E-06
LV	5.73E-03	9.65E-07	7.58E-02	2.32E-03	5.41E-01	7.33E-06	5.50E-04	8.60E-05	3.93E-05	6.85E-06	3.38E-02	9.78E-03	6.70E-02	5.29E-04	5.01E-03	2.69E-03	2.16E-02	8.11E-02	7.13E-04	6.17E-02	3.26E-05	9.33E-05	1.06E-03	5.30E-01	9.16E-05
MC	2.34E-07	6.19E-10	3.17E-08	1.81E-07	3.04E-08	3.20E-06	1.51E-08	3.82E-08	1.43E-08	8.78E-09	9.04E-07	7.98E-08	7.98E-07	1.95E-07	6.49E-07	7.35E-07	1.55E-07	2.41E-07	6.88E-07	5.03E-06	1.34E-09	5.16E-09	1.68E-07	1.28E-05	4.24E-09
MD	7.30E-03	3.69E-07	8.59E-04	3.54E-04	5.93E-04	6.74E-06	7.34E-02	1.87E-04	8.32E-05	1.17E-05	3.30E-03	6.16E-04	1.24E-02	1.65E-04	6.20E-02	5.59E-03	6.58E-03	2.28E-03	7.46E-04	4.70E-02	2.45E-05	8.46E-05	4.14E-03	1.84E+00	8.15E-05
ME	1.40E-03	3.05E-07	1.61E-04	2.72E-04	1.25E-04	1.46E-05	1.36E-04	5.15E-02	4.50E-04	1.34E-04	1.91E-03	2.30E-04	4.08E-03	3.33E-04	8.87E-03	5.03E-02	1.08E-03	6.68E-04	7.81E-04	4.61E-02	5.27E-06	2.47E-05	1.04E-03	1.06E-01	2.03E-05
MK	2.48E-03	3.54E-07	1.81E-04	2.92E-04	1.45E-04	1.50E-05	2.63E-04	1.14E-03	4.77E-02	8.67E-05	2.17E-03	2.76E-04	3.85E-03	3.26E-04	1.45E-02	5.48E-02	1.82E-03	7.80E-04	7.57E-04	4.27E-02	8.34E-06	3.95E-05	3.32E-03	1.86E-01	3.22E-05
MT	3.41E-06	9.69E-10	2.42E-07	8.90E-07	2.05E-07	6.51E-08	2.56E-07	1.30E-06	5.53E-07	8.91E-05	5.04E-06	5.23E-07	4.69E-06	1.54E-06	8.01E-06	1.01E-05	2.10E-06	1.27E-06	2.16E-06	3.12E-05	2.56E-08	1.11E-07	3.80E-06	1.86E-04	7.59E-08
NL	7.69E-04	3.85E-07	3.48E-04	9.69E-03	4.10E-04	4.46E-06	3.32E-05	1.02E-05	5.37E-06	1.74E-06	4.64E-01	2.49E-03	3.23E-03	5.41E-04	4.72E-04	2.55E-04	7.77E-04	4.77E-03	9.23E-05	5.44E-03	6.76E-06	1.94E-05	1.92E-04	2.96E-02	1.71E-05
NO	1.38E-02	1.34E-06	3.83E-03	4.66E-03	5.31E-03	2.03E-05	4.08E-04	1.91E-04	8.06E-05	1.93E-05	9.73E-02	1.30E+00	2.40E-02	1.51E-03	6.41E-03	4.47E-03	1.69E-02	2.01E-01	9.47E-04	4.64E-02	1.34E-04	4.15E-04	2.59E-03	3.53E-01	3.43E-04
PL	2.00E-02	1.61E-05	3.40E-02	2.13E-02	2.05E-02	7.62E-05	2.55E-03	1.33E-03	4.00E-04	5.60E-05	2.21E-01	2.02E-02	3.94E+00	2.50E-03	5.71E-02	5.85E-02	3.16E-02	1.05E-01	1.51E-02	2.64E+00	1.17E-04	3.48E-04	4.63E-03	3.45E+00	3.18E-04
PT	7.35E-04	1.79E-07	1.01E-04	7.31E-04	8.57E-05	1.16E-05	3.39E-05	6.24E-05	2.56E-05	1.27E-05	7.35E-03	5.88E-04	1.42E-03	3.78E-01	8.37E-04	8.49E-04	4.36E-04	1.14E-03	2.53E-04	5.37E-03	7.97E-06	3.07E-05	4.25E-04	2.74E-02	2.11E-05
RO	3.56E-02	5.64E-06	4.52E-03	3.98E-03	3.05E-03	1.23E-04	2.89E-02	6.47E-03	2.70E-03	1.79E-04	2.95E-02	4.42E-03	9.04E-02	2.26E-03	2.03E+00	3.02E-01	3.12E-02	1.41E-02	1.65E-02	8.44E-01	1.42E-04	4.70E-04	2.34E-02	7.06E+00	4.52E-04
RS	8.43E-03	2.36E-06	1.31E-03	2.04E-03	1.03E-03	6.30E-05	1.29E-03	4.01E-02	1.69E-02	1.87E-04	1.47E-02	1.64E-03	3.80E-02	1.15E-03	1.74E-01	1.20E+00	7.42E-03	5.32E-03	7.12E-03	5.18E-01	4.11E-05	1.59E-04	6.29E-03	8.60E-01	1.37E-04
RU	1.68E+01	1.72E-05	1.32E-01	3.11E-02	2.03E-01	3.48E-04	2.60E-02	5.21E-03	2.92E-03	6.48E-04	4.08E-01	1.74E-01	5.62E-01	1.58E-02	2.83E-01	1.22E-01	1.03E+01	6.77E-01	2.22E-02	1.17E+00	1.68E-02	5.23E-02	2.16E-01	6.67E+01	5.42E-02
SE	2.33E-02	2.55E-06	1.59E-02	8.35E-03	2.72E-02	2.92E-05	6.99E-04	2.76E-04	1.19E-04	2.86E-05	1.83E-01	2.69E-01	9.80E-02	2.09E-03	1.09E-02	7.55E-03	4.28E-02	2.32E+00	1.70E-03	1.09E-01	1.96E-04	5.85E-04	3.93E-03	7.08E-01	5.16E-04
SI	9.52E-04	1.44E-06	2.34E-04	6.44E-04	2.15E-04	3.90E-05	1.14E-04	1.51E-04	3.95E-05	2.46E-05	3.73E-03	3.83E-04	9.59E-03	3.22E-04	5.66E-03	6.03E-03	8.56E-04	1.24E-03	1.57E-01	9.15E-02	5.10E-06	2.05E-05	6.01E-04	1.02E-01	1.70E-05
SK	3.42E-03	3.91E-06	1.39E-03	2.55E-03	1.09E-03	2.97E-05	4.99E-04	1.03E-03	2.24E-04	2.59E-05	1.53E-02	1.68E-03	1.71E-01	5.73E-04	3.18E-02	4.87E-02	3.30E-03	5.93E-03	9.63E-03	5.09E+00	1.77E-05	5.89E-05	1.22E-03	6.76E-01	5.20E-05
TJ	1.47E-02	9.80E-08	6.23E-05	7.90E-05	6.55E-05	4.76E-06	4.21E-05	4.63E-05	3.55E-05	1.09E-05	6.51E-04	1.29E-04	5.77E-04	1.94E-04	8.94E-04	6.55E-04	2.11E-03	3.46E-04	1.19E-04	2.73E-03	4.05E-01	2.18E-02	3.23E-03	5.80E-02	3.79E-02
TM	2.08E-01	6.66E-07	1.01E-03	7.95E-04	1.10E-03	2.33E-05	6.45E-04	2.95E-04	2.02E-04	5.62E-05	7.11E-03	1.88E-03	7.79E-03	8.82E-04	1.01E-02	5.48E-03	4.03E-02	5.51E-03	9.25E-04	2.94E-02	2.59E-02	4.31E-01	2.02E-02	1.12E+00	8.47E-02
TR	7.99E-02	3.16E-06	3.54E-03	2.92E-03	2.93E-03	1.34E-04	9.01E-03	2.71E-03	2.64E-03	9.06E-04	2.50E-02	4.52E-03	3.81E-02	3.67E-03	1.34E-01	5.56E-02	7.30E-02	1.32E-02	5.35E-03	1.95E-01	4.13E-04	1.86E-03	3.54E+00	8.82E+00	1.30E-03
UA	1.88E-01	8.02E-06	2.55E-02	8.82E-03	1.74E-02	1.14E-04	7.52E-02	3.03E-03	1.09E-03	1.79E-04	8.44E-02	1.51E-02	4.76E-01	2.99E-03	3.51E-01	1.05E-01	2.90E-01	5.89E-02	1.45E-02	1.54E+00	6.49E-04	2.40E-03	7.30E-02	1.62E+02	2.18E-03
UZ	2.95E-01	6.41E-07	1.08E-03	8.02E-04	1.11E-03	2.02E-05	6.04E-04	2.58E-04	1.63E-04	4.30E-05	7.66E-03	1.94E-03	8.19E-03	7.86E-04	9.25E-03	4.91E-03	4.39E-02	5.81E-03	8.63E-04	2.91E-02	1.19E-01	1.23E-01	1.40E-02	1.12E+00	3.05E-01

Table B10. *Source-receptor matrix of PCB-153 deposition to EMEP countries in 2023, kg/year. 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	1.23E-01	1.82E-05	1.60E-02	6.58E-06	4.35E-04	6.13E-04	3.22E-03	1.54E-04	2.56E-03	3.37E-04	7.82E-03	8.49E-03	1.26E-04	2.75E-06	2.48E-01	1.25E-04	3.80E-02	1.62E-03	7.25E-04	2.96E-03	5.58E-03	3.07E-04	7.72E-06	9.59E-05	7.67E-01	2.64E-06
AM	4.59E-05	1.04E-01	1.71E-03	4.66E-03	1.39E-05	1.10E-04	2.38E-04	5.98E-05	3.30E-04	3.15E-03	8.36E-04	1.28E-03	2.90E-05	1.66E-06	1.48E-02	7.00E-05	2.81E-03	3.16E-04	1.73E-01	1.82E-04	2.35E-04	1.20E-05	1.17E-06	3.39E-05	1.81E-02	4.73E-06
AT	3.46E-04	1.50E-05	1.39E+01	6.81E-06	5.29E-04	1.42E-02	1.39E-03	7.20E-04	2.30E-01	2.63E-04	5.41E-01	8.34E-01	2.36E-03	2.07E-05	7.74E-01	9.54E-04	3.87E-01	2.28E-02	4.47E-04	2.93E-04	5.31E-02	2.31E-03	7.80E-05	8.82E-04	3.13E+00	4.21E-06
AZ	6.96E-05	2.52E-02	3.51E-03	4.45E-02	2.53E-05	2.54E-04	4.59E-04	1.79E-04	6.18E-04	3.61E-03	1.91E-03	2.91E-03	8.77E-05	6.63E-06	2.70E-02	2.63E-04	5.58E-03	7.90E-04	2.71E-01	2.86E-04	4.45E-04	2.33E-05	2.77E-06	9.92E-05	3.13E-02	3.78E-05
BA	3.65E-03	2.87E-05	1.58E-01	1.27E-05	9.97E-02	2.70E-03	3.75E-03	5.93E-04	9.11E-03	4.47E-04	1.13E-01	5.72E-02	8.09E-04	1.15E-05	5.54E-01	6.34E-04	1.10E-01	6.73E-03	9.08E-04	1.11E-03	2.35E-01	3.42E-03	2.54E-05	3.51E-04	2.29E+00	7.40E-06
BE	6.60E-06	1.53E-06	1.22E-02	8.66E-07	4.74E-06	3.11E+00	4.41E-05	1.38E-04	9.03E-03	1.01E-05	1.06E-02	4.58E-01	2.66E-03	1.08E-05	4.30E-01	5.30E-04	3.64E+00	1.73E-01	3.73E-05	9.18E-06	1.81E-04	1.79E-05	2.16E-04	1.31E-03	1.65E-02	1.00E-06
BG	2.98E-03	2.29E-04	8.69E-02	7.28E-05	1.09E-03	2.49E-03	7.40E-01	2.17E-03	7.99E-03	4.08E-03	5.03E-02	4.25E-02	8.40E-04	2.42E-05	4.38E-01	1.02E-03	7.72E-02	7.04E-03	9.64E-03	1.53E-02	1.60E-02	1.85E-03	2.50E-05	5.00E-04	6.28E-01	3.85E-05
BY	5.53E-04	1.41E-04	1.72E-01	7.23E-05	6.32E-04	1.99E-02	5.29E-03	1.05E+00	2.13E-02	5.05E-04	2.57E-01	3.00E-01	1.94E-02	1.20E-03	5.74E-01	1.74E-02	2.22E-01	7.23E-02	5.68E-03	1.45E-03	1.57E-02	1.72E-03	1.96E-04	3.30E-03	4.41E-01	4.19E-05
CH	3.27E-05	2.06E-06	5.52E-02	9.12E-07	3.45E-05	1.05E-02	1.19E-04	8.35E-05	2.52E+00	3.85E-05	1.53E-02	3.33E-01	4.90E-04	3.42E-06	5.77E-01	2.33E-04	8.22E-01	1.33E-02	6.53E-05	3.98E-05	1.93E-03	4.20E-05	5.03E-05	4.29E-04	1.77E+00	8.48E-07
CY	7.84E-05	5.80E-06	7.98E-04	1.09E-06	1.72E-05	5.74E-05	2.37E-04	1.60E-05	1.85E-04	1.12E-01	4.21E-04	5.73E-04	9.93E-06	2.25E-07	1.03E-02	8.67E-06	2.61E-03	1.56E-04	1.57E-04	6.29E-04	2.70E-04	8.76E-06	6.57E-07	1.03E-05	3.25E-02	3.96E-07
CZ	1.99E-04	1.63E-05	1.52E+00	8.32E-06	4.87E-04	2.92E-02	1.34E-03	1.42E-03	6.24E-02	1.55E-04	9.75E+00	1.29E+00	5.67E-03	5.36E-05	5.58E-01	2.20E-03	4.25E-01	4.50E-02	4.77E-04	2.10E-04	2.25E-02	3.21E-03	1.19E-04	1.32E-03	4.26E-01	4.58E-06
DE	1.65E-04	2.80E-05	1.37E+00	1.66E-05	1.93E-04	8.08E-01	1.12E-03	4.03E-03	8.95E-01	2.32E-04	1.95E+00	3.46E+01	9.14E-02	2.51E-04	3.17E+00	9.87E-03	6.24E+00	7.88E-01	7.92E-04	2.41E-04	8.27E-03	1.01E-03	1.44E-03	1.12E-02	9.11E-01	1.59E-05
DK	7.60E-06	3.38E-06	1.88E-02	1.85E-06	1.46E-05	3.11E-02	6.04E-05	5.34E-04	3.90E-03	1.03E-05	2.71E-02	3.23E-01	6.54E-01	9.11E-05	2.07E-01	3.49E-03	1.91E-01	1.68E-01	8.48E-05	2.33E-05	6.08E-04	6.43E-05	3.07E-04	2.64E-03	1.83E-02	1.98E-06
EE	3.56E-05	1.21E-05	1.74E-02	5.46E-06	4.50E-05	6.53E-03	2.93E-04	4.42E-03	2.49E-03	3.60E-05	2.53E-02	6.79E-02	9.12E-03	6.25E-02	1.04E-01	5.37E-02	5.08E-02	2.61E-02	4.38E-04	6.75E-05	1.27E-03	1.07E-04	6.79E-05	1.27E-03	4.04E-02	3.24E-06
ES	2.99E-04	2.68E-05	5.54E-02	9.84E-06	2.81E-04	4.68E-02	6.68E-04	3.62E-04	1.71E-02	2.96E-04	3.38E-02	1.49E-01	3.98E-03	1.25E-05	1.80E+02	1.11E-03	1.53E+00	1.20E-01	1.08E-03	4.40E-04	8.54E-03	2.58E-04	5.39E-04	4.95E-03	7.16E-01	7.58E-06
FI	1.41E-04	9.13E-05	5.78E-02	3.96E-05	1.74E-04	2.20E-02	1.36E-03	8.32E-03	9.47E-03	2.05E-04	7.50E-02	1.82E-01	2.07E-02	1.52E-02	4.26E-01	5.83E+00	1.89E-01	8.87E-02	2.30E-03	3.01E-04	4.89E-03	4.47E-04	2.35E-04	8.61E-03	1.60E-01	5.64E-05
FR	2.74E-04	2.77E-05	2.74E-01	1.34E-05	2.97E-04	1.42E+00	9.45E-04	1.23E-03	6.46E-01	3.67E-04	1.63E-01	2.11E+00	1.73E-02	7.53E-05	1.93E+01	3.98E-03	6.07E+01	7.20E-01	8.73E-04	3.55E-04	1.18E-02	4.20E-04	2.24E-03	1.32E-02	2.07E+00	1.38E-05
GB	8.99E-06	1.11E-05	1.99E-02	6.07E-06	1.39E-05	1.12E-01	7.85E-05	5.77E-04	7.66E-03	3.61E-05	1.62E-02	2.34E-01	2.52E-02	9.94E-05	1.47E+00	5.39E-03	1.17E+00	1.28E+01	1.88E-04	2.31E-05	5.27E-04	4.61E-05	1.39E-02	2.09E-02	3.31E-02	5.89E-06
GE	1.99E-04	2.18E-02	9.39E-03	3.39E-03	8.13E-05	4.59E-04	1.84E-03	3.07E-04	1.49E-03	5.79E-03	3.93E-03	5.66E-03	1.84E-04	7.70E-06	5.11E-02	4.36E-04	1.13E-02	1.68E-03	4.30E+00	8.45E-04	1.42E-03	6.76E-05	6.00E-06	1.87E-04	9.62E-02	2.66E-05
GR	1.21E-02	1.26E-04	4.01E-02	4.49E-05	7.40E-04	1.96E-03	4.33E-02	7.55E-04	6.70E-03	4.14E-03	2.04E-02	2.43E-02	4.52E-04	1.22E-05	5.37E-01	4.70E-04	9.60E-02	5.23E-03	5.49E-03	2.66E-01	1.09E-02	6.43E-04	2.31E-05	3.39E-04	1.35E+00	2.30E-05
HR	2.02E-03	2.08E-05	2.80E-01	1.04E-05	1.73E-02	3.28E-03	2.05E-03	5.40E-04	1.14E-02	3.68E-04	1.61E-01	7.69E-02	9.51E-04	1.17E-05	6.32E-01	5.54E-04	1.34E-01	7.26E-03	6.67E-04	6.46E-04	1.41E+00	4.72E-03	2.73E-05	3.51E-04	2.47E+00	8.01E-06
HU	1.71E-03	2.61E-05	6.39E-01	1.22E-05	3.92E-03	7.36E-03	7.31E-03	1.47E-03	2.19E-02	2.88E-04	4.15E-01	1.67E-01	2.02E-03	2.35E-05	6.15E-01	1.04E-03	1.65E-01	1.50E-02	8.76E-04	1.16E-03	2.11E-01	9.06E-02	4.72E-05	6.31E-04	1.25E+00	9.04E-06
IE	2.25E-06	2.23E-06	3.19E-03	1.33E-06	3.31E-06	9.39E-03	1.74E-05	1.07E-04	1.49E-03	6.46E-06	2.53E-03	2.54E-02	1.77E-03	1.48E-05	3.00E-01	9.06E-04	1.07E-01	2.81E-01	4.10E-05	6.01E-06	1.08E-04	6.45E-06	4.83E-02	8.48E-03	9.18E-03	1.04E-06
IS	3.23E-06	1.93E-06	1.81E-03	9.11E-07	4.78E-06	3.58E-03	2.11E-05	7.38E-05	5.54E-04	7.59E-06	1.99E-03	1.50E-02	1.34E-03	1.72E-05	8.25E-02	1.58E-03	2.76E-02	2.47E-02	4.90E-05	6.58E-06	1.46E-04	8.98E-06	1.71E-04	8.66E-01	7.95E-03	1.12E-06
IT	8.12E-03	8.13E-05	4.28E-01	3.37E-05	5.32E-03	1.44E-02	5.67E-03	1.13E-03	2.94E-01	9.55E-04	1.65E-01	2.95E-01	1.78E-03	2.31E-05	4.06E+00	1.23E-03	1.52E+00	2.79E-02	2.98E-03	3.91E-03	1.91E-01	2.52E-03	1.36E-04	1.46E-03	7.14E+01	2.45E-05
KY	6.59E-05	1.26E-03	4.41E-03	4.44E-04	2.85E-05	4.60E-04	3.19E-04	1.29E-04	9.89E-04	1.76E-03	2.23E-03	4.37E-03	9.13E-05	6.95E-06	5.35E-02	4.06E-04	9.67E-03	1.17E-03	1.37E-02	2.13E-04	5.23E-04	2.47E-05	4.41E-06	1.15E-04	3.54E-02	1.60E-01
KZ	1.34E-03	1.84E-02	1.36E-01	9.33E-03	7.64E-04	1.62E-02	1.40E-02	9.62E-03	2.11E-02	1.97E-02	8.99E-02	1.51E-01	6.83E-03	5.62E-04	9.66E-01	2.44E-02	2.42E-01	5.58E-02	2.61E-01	5.56E-03	1.52E-02	1.01E-03	2.02E-04	6.90E-03	8.04E-01	8.21E-02
LI	1.56E-07	1.18E-08	3.77E-04	5.29E-09	1.75E-07	5.32E-05	6.45E-07	4.69E-07	1.08E-02	1.86E-07	7.50E-05	1.83E-03	2.56E-06	2.09E-08	2.79E-03	1.38E-06	2.16E-03	6.84E-05	3.52E-07	2.14E-07	9.89E-06	2.10E-07	2.66E-07	2.59E-06	7.22E-03	4.97E-09
LT	1.33E-04	3.10E-05	4.57E-02	1.29E-05	1.21E-04	1.15E-02	1.00E-03	3.99E-02	5.70E-03	6.97E-05	8.13E-02	1.58E-01	2.41E-02	6.14E-04	2.01E-01	8.99E-03	9.77E-02	5.04E-02	8.79E-04	1.84E-04	3.19E-03	3.20E-04	1.19E-04	1.65E-03	9.16E-02	6.47E-06
LU	6.52E-07	1.29E-07	1.75E-03	7.08E-08	5.25E-07	5.63E-02	5.33E-06	1.26E-05	1.82E-03	1.13E-06	2.04E-03	6.62E-02	1.51E-04	7.81E-07	4.21E-02	3.98E-05	4.97E-01	6.13E-03	3.30E-06	1.11E-06	1.86E-05	2.52E-06	1.27E-05	8.21E-05	2.43E-03	7.97E-08
LV	8.51E-05	3.01E-05	3.34E-02	1.21E-05	8.50E-05	1.08E-02	7.13E-04	1.91E-02	4.24E-03	6.99E-05	5.45E-02	1.33E-01	2.04E-02	3.62E-03	1.72E-01	2.25E-02	8.34E-02	4.52E-02	9.18E-04	1.44E-04	2.35E-03	2.19E-04	1.13E-04	1.84E-03	7.05E-02	6.13E-06
MC	3.52E-08	1.69E-09	1.11E-05	8.30E-10	3.91E-08	5.97E-07	8.12E-08	2.71E-08	7.53E-06	3.11E-08	3.81E-06	9.74E-06	6.27E-08	6.37E-10	1.51E-04	3.42E-08	6.33E-04	8.64E-07	7.14E-08	3.48E-08	2.12E-06	3.42E-08	4.86E-09	4.18E-08	6.91E-04	9.23E-10
MD	1.95E-04	8.42E-05	2.15E-02	2.64E-05	1.29E-04	9.20E-04	5.10E-03	2.23E-03	2.02E-03	3.39E-04	1.58E-02	1.45E-02	4.60E-04	2.04E-05	8.42E-02	6.66E-04	1.88E-02	2.58E-03	3.22E-03	6.08E-04	2.54E-03	3.04E-04	7.56E-06	2.08E-04	9.98E-02	1.52E-05
ME	1.05E-02	9.13E-06	1.60E-02	3.50E-06	3.20E-03	4.41E-04	1.69E-03	1.20E-04	1.88E-03	1.31E-04	1.01E-02	7.32E-03	1.09E-04	1.96E-06	1.55E-01	1.05E-04	2.51E-02	1.13E-03	2.91E-04	6.26E-04	9.29E-03	4.31E-04	4.96E-06	7.27E-05	6.43E-01	1.28E-06
MK	1.40E-02	1.90E-05	1.85E-02	6.99E-06	2.76E-04	4.83E-04	1.19E-02	1.73E-04	2.06E-03	3.36E-04	9.80E-03	8.68E-03	1.37E-04	2.77E-06	1.33E-01	1.35E-04	2.14E-02	1.38E-03	7.97E-04	7.15E-03	3.89E-03	4.46E-04	5.76E-06	8.59E-05	2.64E-01	2.72E-06
MT	2.63E-06	5.53E-08	3.83E-05	2.62E-08	7.59E-07	4.53E-06	3.29E-06	4.32E-07	1.37E-05	3.80E-07	1.85E-05	3.45E-05	5.77E-07	1.10E-08	1.25E-03	4.27E-07	2.73E-04	1.03E-05	1.67E-06	5.01E-06	1.35E-05	2.76E-07	5.26E-08	4.71E-07	1.84E-03	4.01E-08
NL	3.93E-06	2.01E-06	1.20E-02	1.20E-06	4.91E-06	4.21E-01	2.54E-05	1.83E-04	5.07E-03	9.96E-06	1.13E-02	7.77E-01	5.78E-03	1.54E-05	3.03E-01	8.34E-04	9.96E-01	3.04E-01	4.77E-05	7.30E-06	2.65E-04	2.55E-05	3.09E-04	1.92E-03	1.51E-02	1.23E-06
NO	5.79E-05	6.77E-05	4.65E-02	2.59E-05	7.64E-05	6.07E-02	5.54E-04	2.81E-03	1.20E-02	1.43E-04	6.33E-02	3.15E-01	5.72E-02	6.45E-04	5.75E-01	1.24E-01	4.16E-01	2.97E-01	1.64E-03	2.02E-04	2.20E-03	2.18E-04	7.18E-04	1.88E-02	9.73E-02	3.54E-05
PL	1.09E-03	6.70E-05	7.74E-01	3.85E-05	1.55E-03	9.10E-02	6.73E-03	4.88E-02	7.33E-02	7.80E-04	4.81E+00	2.40E+00	6.64E-02	5.57E-04	1.39E+00	1.83E-02	8.49E-01	2.45E-01	2.54E-03	1.28E-03	5.05E-02	7.44E-03	5.63E-04	6.77E-03	9.60E-01	3.13E-05
PT	2.37E-05	2.89E-06	3.55E-03	1.20E-06	1.99E-05	4.43E-03	5.02E-05	2.74E-05	1.13E-03	2.40E-05	2.36E-03	1.28E-02	3.77E-04	1.25E-06	3.05E+00	1.53E-04	7.76E-02	1.85E-02	8.88E-05	3.46E-05	4.83E-04	1.69E-05	7.92E-05	1.13E-03	3.40E-02	9.62E-07
RO	3.25E-03	4.50E-04	3.92E-01	1.26E-04	3.20E-03	8.60E-03	1.10E-01	7.56E-03	2.74E-02	3.75E-03	1.96E-01	1.60E-01	2.77E-03	7.55E-05	9.08E-01	3.10E-03	2.15E-01	2.19E-02	1.61E-02	5.32E-03	6.18E-02	9.90E-03	6.80E-05	1.40E-03	1.52E+00	8.81E-05
RS	1.40E-02	7.05E-05	1.83E-01	2.90E-05	9.13E-03	3.75E-03	4.16E-02	1.20E-03	1.10E-02	7.27E-04	1.33E-01	7.56E-02	1.21E-03	1.92E-05	5.03E-01	1.00E-03	1.03E-01	9.32E-03	2.65E-03	4.26E-03	8.67E-02	8.57E-03	3.02E-05	4.97E-04	1.13E+00	1.87E-05
RU	5.11E-03	3.26E-02	7.54E-01	1.57E-02	3.71E-03	1.26E-01	6.42E-02	2.19E-01	1.06E-01	4.92E-02	6.64E-01	1.17E+00	8.85E-02	5.65E-02	4.67E+00	1.28E+00	1.38E+00	4.88E-01	9.49E-01	2.24E-02	7.99E-02	6.33E-03	1.54E-03	6.27E-02	3.45E+00	1.68E-02
SE	1.30E-04	8.96E-05	8.67E-02	3.42E-05	1.73E-04	7.73E-02	1.18E-03	9.10E-03	1.77E-02	1.69E-04	1.37E-01	6.85E-01	3.31E-01	2.98E-03	8.18E-01	7.76E-01	5.20E-01	3.65E-01	2.45E-03	3.33E-04	4.94E-03	4.70E-04	8.33E-04	1.82E-02	1.60E-01	3.60E-05
SI	2.38E-04	6.01E-06	2.53E-01	2.86E-06	3.78E-04	1.50E-03	5.36E-04	1.84E-04	7.59E-03	1.26E-04	5.61E-02	4.32E-02	3.61E-04	3.69E-06	2.65E-01	1.62E-04	6.34E-02	2.78E-03	1.78E-04	1.56E-04	2.14E-01	9.41E-04	1.11E-05	1.31E-04	1.68E+00	1.93E-06
SK	5.66E-04	1.51E-05	4.61E-01	7.64E-06	1.16E-03	6.42E-03	3.22E-03	1.30E-03	1.86E-02	1.40E-04	1.04E+00	1.57E-01	2.01E-03	2.12E-05	3.28E-01	9.93E-04	1.20E-01	1.31E-02	4.86E-04	4.65E-04	3.62E-02	1.50E-02	3.77E-05	5.50E-04	5.08E-01	4.83E-06
TJ	2.98E-05	5.68E-04	1.76E-03	2.19E-04	1.18E-05	1.97E-04	1.46E-04	6.50E-05	3.86E-04	8.25E-04	1.01E-03	1.90E-03	3.86E-05	3.15E-06	2.45E-02	1.57E-04	4.13E-03	4.84E-04	5.78E-03	9.60E-05	2.11E-04	1.00E-05	1.87E-06	4.88E-05	1.50E-02	1.03E-02
TM	1.21E-04	3.76E-03	1.03E-02	2.88E-03	5.57E-05	1.16E-03	8.78E-04	5.75E-04	1.76E-03	4.29E-03	6.50E-03	1.14E-02	3.42E-04	3.50E-05	9.06E-02	1.60E-03	2.00E-02	3.47E-03	4.38E-02	4.41E-04	1.11E-03	6.28E-05	1.20E-05	3.87E-04	6.71E-02	1.60E-03
TR	4.00E-03	2.80E-02	1.07E-01	1.91E-03	1.07E-03	6.13E-03	5.08E-02	4.89E-03	1.71E-02	3.09E-01	5.83E-02	7.50E-02	2.08E-03	6.59E-05	1.18E+00	2.59E-03	2.02E-01	1.81E-02	2.73E-01	3.21E-02	1.84E-02	1.19E-03	6.85E-05	1.58E-03	1.57E+00	1.16E-04
UA	2.75E-03	1.81E-03	5.20E-01	6.87E-04	2.54E-03	2.40E-02	3.92E-02	9.53E-02	4.52E-02	1.05E-02	4.92E-01	3.98E-01	1.34E-02	5.58E-04	1.41E+00	1.44E-02	3.96E-01	7.12E-02	7.95E-02	9.27E-03	5.64E-02	7.94E-03	2.13E-04	4.70E-03	1.80E+00	2.52E-04
UZ	1.37E-04	3.37E-03	1.11E-02	1.73E-03	6.26E-05	1.51E-03	9.89E-04	7.46E-04	1.91E-03	4.06E-03	7.50E-03	1.36E-02	4.38E-04	4.50E-05	1.02E-01	1.94E-03	2.36E-02	4.64E-03	3.91E-02	4.83E-04	1.22E-03	6.94E-05	1.58E-05	4.87E-04	7.41E-02	3.06E-02

Table B10 *(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	1.35E-04	1.01E-05	6.98E-05	1.23E-04	7.82E-06	5.44E-06	4.62E-04	4.03E-02	5.23E-02	6.18E-04	2.00E-05	4.12E-05	9.05E-03	6.15E-04	5.91E-03	1.45E-01	1.56E-03	3.19E-04	8.32E-05	1.17E-02	9.91E-07	7.69E-06	7.85E-04	2.43E-03	1.02E-05
AM	4.46E-04	1.26E-06	2.47E-05	1.68E-05	3.58E-06	3.74E-07	1.29E-04	6.39E-05	1.79E-04	1.64E-05	3.94E-06	1.36E-05	1.10E-03	5.30E-05	8.79E-04	6.40E-04	3.71E-03	1.62E-04	8.29E-06	6.75E-04	1.97E-06	1.07E-04	8.34E-03	1.29E-03	6.08E-05
AT	1.36E-04	2.58E-03	5.28E-04	4.20E-03	7.66E-05	3.04E-05	6.36E-04	8.61E-04	7.63E-04	1.05E-04	4.42E-05	3.63E-04	1.97E-01	2.52E-03	6.57E-03	1.39E-02	2.27E-03	4.43E-03	1.21E-02	3.45E-01	1.71E-06	8.62E-06	3.49E-04	5.28E-03	1.34E-05
AZ	4.16E-03	2.30E-06	8.27E-05	3.77E-05	1.31E-05	6.66E-07	2.88E-04	1.04E-04	2.98E-04	2.76E-05	9.49E-06	4.32E-05	2.78E-03	1.03E-04	1.81E-03	1.18E-03	2.99E-02	5.39E-04	1.69E-05	1.41E-03	2.41E-05	9.79E-04	6.39E-03	3.29E-03	5.18E-04
BA	2.40E-04	4.00E-05	3.63E-04	6.16E-04	4.42E-05	2.14E-05	9.56E-04	5.60E-02	2.62E-03	5.99E-04	1.03E-04	1.76E-04	9.09E-02	1.48E-03	1.69E-02	1.82E-01	3.09E-03	2.01E-03	7.66E-04	1.29E-01	2.55E-06	1.77E-05	6.58E-04	6.29E-03	2.47E-05
BE	3.07E-05	1.91E-05	1.88E-04	8.03E-02	2.88E-05	1.45E-06	7.14E-05	1.39E-05	2.04E-05	2.32E-06	1.20E-02	3.87E-04	1.02E-02	1.87E-03	3.92E-04	1.79E-04	4.56E-04	2.56E-03	8.18E-06	2.07E-03	5.88E-07	1.23E-06	1.52E-05	4.48E-04	3.21E-06
BG	1.83E-03	3.37E-05	7.00E-04	4.80E-04	7.43E-05	1.11E-05	1.71E-02	5.79E-03	3.96E-02	5.21E-04	1.01E-04	2.37E-04	5.73E-02	1.19E-03	3.17E-01	2.73E-01	2.59E-02	2.46E-03	3.69E-04	7.07E-02	1.21E-05	7.04E-05	1.41E-02	5.75E-02	1.09E-04
BY	2.17E-03	8.90E-05	1.09E-01	2.71E-03	7.89E-03	9.88E-06	1.34E-02	1.33E-03	2.33E-03	1.67E-04	9.44E-04	2.59E-03	9.67E-01	2.42E-03	5.11E-02	2.53E-02	1.24E-01	5.88E-02	5.60E-04	1.47E-01	1.61E-05	7.68E-05	3.27E-03	1.98E-01	1.32E-04
CH	2.81E-05	8.70E-03	7.84E-05	3.18E-03	9.97E-06	2.65E-05	5.68E-05	7.57E-05	9.48E-05	2.73E-05	2.32E-04	1.19E-04	9.03E-03	1.90E-03	4.79E-04	8.28E-04	3.26E-04	8.71E-04	1.37E-04	3.44E-03	4.62E-07	1.14E-06	5.20E-05	4.30E-04	2.60E-06
CY	2.05E-05	7.29E-07	5.12E-06	1.03E-05	6.07E-07	4.19E-07	5.73E-05	1.00E-04	1.73E-04	5.65E-05	1.88E-06	3.75E-06	4.37E-04	2.20E-05	5.06E-04	5.24E-04	2.85E-04	2.63E-05	5.66E-06	4.26E-04	1.64E-07	7.83E-07	2.09E-03	3.79E-04	1.18E-06
CZ	1.73E-04	3.00E-04	1.19E-03	8.62E-03	1.74E-04	8.73E-06	8.62E-04	5.79E-04	7.11E-04	4.78E-05	9.69E-04	6.63E-04	1.00E+00	1.94E-03	7.98E-03	1.51E-02	3.26E-03	9.33E-03	9.51E-04	7.64E-01	2.00E-06	1.09E-05	2.90E-04	7.63E-03	1.65E-05
DE	5.62E-04	4.07E-03	5.42E-03	3.15E-01	8.37E-04	2.63E-05	1.37E-03	3.75E-04	5.40E-04	6.32E-05	4.85E-02	5.07E-03	7.34E-01	1.27E-02	7.77E-03	7.21E-03	1.01E-02	6.36E-02	5.20E-04	1.11E-01	8.01E-06	2.26E-05	3.60E-04	1.12E-02	4.95E-05
DK	7.28E-05	1.39E-05	1.55E-03	1.72E-03	3.01E-04	7.15E-07	1.21E-04	1.89E-05	2.66E-05	2.90E-06	2.52E-03	4.14E-03	3.88E-02	1.52E-03	6.95E-04	5.32E-04	1.77E-03	9.43E-02	3.05E-05	6.33E-03	9.68E-07	2.29E-06	2.77E-05	1.01E-03	5.60E-06
EE	1.45E-04	9.34E-06	1.10E-02	5.42E-04	1.03E-02	1.05E-06	5.15E-04	9.22E-05	1.67E-04	1.01E-05	3.36E-04	1.40E-03	7.31E-02	6.51E-04	2.59E-03	1.74E-03	2.24E-02	8.19E-02	5.55E-05	9.74E-03	1.46E-06	4.98E-06	1.74E-04	4.12E-03	9.95E-06
ES	3.06E-04	5.45E-05	3.34E-04	4.64E-03	4.18E-05	3.34E-05	3.01E-04	6.38E-04	7.89E-04	3.07E-04	1.32E-03	9.40E-04	3.27E-02	2.67E-01	2.74E-03	5.09E-03	2.39E-03	5.20E-03	3.33E-04	1.80E-02	3.99E-06	1.00E-05	3.86E-04	2.55E-03	2.27E-05
FI	2.01E-03	3.69E-05	1.28E-02	1.77E-03	4.50E-03	4.48E-06	1.93E-03	3.34E-04	7.00E-04	3.44E-05	1.14E-03	1.48E-02	1.86E-01	2.34E-03	1.10E-02	6.81E-03	8.15E-02	4.86E-01	2.13E-04	3.56E-02	3.50E-05	7.34E-05	8.81E-04	1.59E-02	1.95E-04
FR	4.28E-04	6.02E-04	1.34E-03	2.40E-01	1.96E-04	9.40E-04	7.08E-04	6.49E-04	7.58E-04	1.65E-04	1.24E-02	2.83E-03	1.16E-01	4.94E-02	4.90E-03	6.83E-03	4.71E-03	2.03E-02	5.81E-04	3.86E-02	7.64E-06	1.64E-05	4.15E-04	5.11E-03	4.19E-05
GB	2.02E-04	2.45E-05	1.06E-03	3.30E-03	1.91E-04	1.95E-06	9.34E-05	2.34E-05	3.96E-05	7.18E-06	6.23E-03	5.34E-03	2.25E-02	1.95E-02	6.33E-04	5.59E-04	2.96E-03	2.99E-02	2.57E-05	4.40E-03	4.23E-06	8.15E-06	5.51E-05	8.99E-04	2.21E-05
GE	9.45E-04	5.45E-06	1.27E-04	7.15E-05	1.80E-05	1.87E-06	9.24E-04	3.12E-04	1.00E-03	6.31E-05	1.96E-05	6.78E-05	5.62E-03	1.99E-04	6.30E-03	4.20E-03	3.73E-02	8.65E-04	5.49E-05	3.79E-03	9.72E-06	1.30E-04	1.60E-02	9.57E-03	1.08E-04
GR	1.02E-03	2.61E-05	2.73E-04	3.65E-04	3.17E-05	1.29E-05	4.21E-03	5.25E-03	7.62E-02	2.25E-03	6.69E-05	1.43E-04	2.33E-02	1.28E-03	4.15E-02	8.18E-02	1.16E-02	1.19E-03	2.20E-04	2.61E-02	8.51E-06	4.87E-05	1.70E-02	1.99E-02	7.29E-05
HR	1.78E-04	5.14E-05	3.61E-04	8.05E-04	4.62E-05	2.74E-05	7.00E-04	7.83E-03	1.47E-03	3.85E-04	1.17E-04	1.77E-04	1.20E-01	1.61E-03	1.23E-02	8.20E-02	2.04E-03	2.18E-03	1.11E-02	1.70E-01	2.77E-06	1.28E-05	4.24E-04	5.35E-03	2.06E-05
HU	2.32E-04	9.37E-05	1.00E-03	1.82E-03	1.09E-04	2.12E-05	1.61E-03	4.93E-03	5.48E-03	2.67E-04	2.61E-04	3.24E-04	3.55E-01	1.88E-03	5.19E-02	2.12E-01	4.24E-03	4.05E-03	3.99E-03	1.82E+00	3.06E-06	1.29E-05	7.00E-04	2.55E-02	2.20E-05
IE	4.41E-05	4.38E-06	1.36E-04	4.51E-04	2.64E-05	5.72E-07	1.73E-05	6.38E-06	9.52E-06	3.28E-06	4.43E-04	7.46E-04	4.13E-03	3.07E-03	1.19E-04	1.06E-04	6.81E-04	3.44E-03	5.12E-06	7.06E-04	6.74E-07	1.52E-06	1.27E-05	1.54E-04	3.80E-06
IS	5.92E-05	2.09E-06	1.17E-04	2.05E-04	2.58E-05	3.12E-07	1.81E-05	1.03E-05	1.32E-05	1.76E-06	1.55E-04	1.40E-03	2.66E-03	1.41E-03	1.21E-04	1.07E-04	6.21E-04	4.86E-03	5.76E-06	6.20E-04	4.75E-07	1.23E-06	1.37E-05	1.35E-04	2.93E-06
IT	7.59E-04	1.18E-03	6.26E-04	3.43E-03	7.63E-05	5.88E-04	1.68E-03	1.45E-02	8.86E-03	5.75E-03	3.79E-04	5.27E-04	1.42E-01	8.76E-03	2.07E-02	6.87E-02	7.03E-03	3.99E-03	1.02E-02	1.30E-01	9.01E-06	4.33E-05	1.75E-03	1.17E-02	6.82E-05
KY	1.91E-01	4.19E-06	6.90E-05	6.78E-05	1.10E-05	8.95E-07	1.64E-04	1.09E-04	2.89E-04	2.15E-05	1.55E-05	7.01E-05	2.89E-03	2.16E-04	1.15E-03	1.21E-03	7.57E-03	8.14E-04	2.10E-05	1.38E-03	2.24E-02	2.48E-03	1.99E-03	1.51E-03	8.90E-02
KZ	5.06E+00	8.15E-05	4.72E-03	2.00E-03	8.08E-04	1.89E-05	1.05E-02	2.32E-03	6.81E-03	4.55E-04	6.68E-04	4.02E-03	1.60E-01	4.52E-03	6.94E-02	3.56E-02	9.07E-01	5.07E-02	6.12E-04	6.17E-02	2.15E-02	3.52E-02	3.36E-02	1.19E-01	1.68E-01
LI	1.57E-07	4.55E-04	4.66E-07	1.61E-05	5.74E-08	1.53E-07	3.03E-07	3.55E-07	4.73E-07	1.37E-07	1.17E-06	6.52E-07	4.44E-05	9.26E-06	2.48E-06	4.22E-06	1.80E-06	4.86E-06	6.98E-07	1.67E-05	2.62E-09	6.59E-09	3.01E-07	2.24E-06	1.50E-08
LT	3.59E-04	2.23E-05	5.44E-01	1.15E-03	1.08E-02	2.05E-06	1.70E-03	2.99E-04	5.35E-04	3.13E-05	6.51E-04	1.60E-03	3.28E-01	1.01E-03	8.70E-03	5.18E-03	2.75E-02	5.34E-02	1.28E-04	3.38E-02	2.65E-06	1.39E-05	3.18E-04	1.39E-02	2.33E-05
LU	2.57E-06	3.14E-06	1.53E-05	1.50E-01	2.18E-06	2.39E-07	6.43E-06	1.38E-06	2.45E-06	2.88E-07	2.21E-04	2.28E-05	1.34E-03	1.58E-04	4.03E-05	2.26E-05	3.63E-05	1.88E-04	8.91E-07	2.57E-04	4.66E-08	1.02E-07	1.69E-06	4.45E-05	2.58E-07
LV	2.98E-04	1.64E-05	8.11E-02	9.65E-04	1.16E-01	1.66E-06	1.26E-03	1.98E-04	3.62E-04	2.26E-05	5.99E-04	1.82E-03	1.78E-01	1.03E-03	6.07E-03	3.41E-03	2.33E-02	9.52E-02	9.94E-05	2.13E-02	2.49E-06	1.16E-05	3.43E-04	1.03E-02	1.98E-05
MC	1.81E-08	2.72E-08	1.48E-08	1.64E-07	1.95E-09	8.71E-06	2.89E-08	8.04E-08	8.03E-08	1.35E-08	1.56E-08	1.56E-08	2.89E-06	3.09E-07	3.44E-07	7.51E-07	1.46E-07	1.18E-07	1.29E-07	2.27E-06	2.99E-10	6.63E-10	3.34E-08	2.17E-07	1.60E-09
MD	6.27E-04	8.33E-06	6.97E-04	1.61E-04	6.51E-05	2.10E-06	2.35E-01	3.79E-04	9.38E-04	4.65E-05	3.93E-05	1.05E-04	4.22E-02	2.61E-04	1.73E-01	7.11E-03	1.18E-02	1.77E-03	8.47E-05	1.80E-02	4.45E-06	2.48E-05	1.90E-03	8.22E-02	3.96E-05
ME	7.07E-05	7.56E-06	5.88E-05	9.76E-05	6.56E-06	4.22E-06	2.73E-04	2.36E-01	2.80E-03	3.62E-04	1.52E-05	3.22E-05	1.08E-02	4.04E-04	4.43E-03	1.15E-01	9.00E-04	2.91E-04	7.76E-05	1.49E-02	4.74E-07	5.24E-06	2.27E-04	1.55E-03	6.37E-06
MK	1.45E-04	8.81E-06	7.57E-05	1.01E-04	8.85E-06	3.34E-06	6.21E-04	2.65E-03	4.03E-01	2.11E-04	1.88E-05	3.86E-05	1.04E-02	3.36E-04	8.75E-03	2.17E-01	1.85E-03	3.50E-04	8.18E-05	1.58E-02	9.49E-07	7.48E-06	1.12E-03	3.00E-03	9.97E-06
MT	8.29E-07	4.39E-08	2.17E-07	1.25E-06	2.42E-08	2.39E-08	1.59E-06	3.76E-06	3.57E-06	6.13E-04	1.17E-07	1.91E-07	1.88E-05	2.29E-06	1.22E-05	1.63E-05	5.44E-06	1.06E-06	2.95E-07	1.49E-05	1.72E-08	3.57E-08	2.55E-06	8.11E-06	8.24E-08
NL	4.05E-05	1.58E-05	2.59E-04	6.55E-03	4.12E-05	8.55E-07	4.87E-05	9.40E-06	1.20E-05	1.70E-06	1.05E-01	7.50E-04	1.06E-02	1.64E-03	2.25E-04	1.60E-04	6.03E-04	4.02E-03	1.12E-05	2.87E-03	7.31E-07	1.50E-06	1.64E-05	4.52E-04	3.88E-06
NO	1.13E-03	4.44E-05	3.68E-03	3.68E-03	8.27E-04	3.47E-06	7.05E-04	1.55E-04	2.81E-04	2.07E-05	3.44E-03	6.73E-01	9.13E-02	3.62E-03	3.78E-03	2.97E-03	1.64E-02	4.02E-01	1.01E-04	1.94E-02	1.91E-05	3.88E-05	4.33E-04	6.58E-03	1.02E-04
PL	1.21E-03	3.12E-04	5.11E-02	1.41E-02	2.78E-03	1.93E-05	7.42E-03	2.95E-03	4.17E-03	1.92E-04	4.72E-03	4.33E-03	2.34E+01	5.58E-03	4.64E-02	6.64E-02	4.62E-02	9.35E-02	1.83E-03	1.33E+00	1.29E-05	5.12E-05	1.58E-03	1.18E-01	9.56E-05
PT	3.38E-05	3.66E-06	3.25E-05	3.84E-04	4.26E-06	1.44E-06	2.23E-05	5.44E-05	6.62E-05	1.10E-05	1.34E-04	1.29E-04	2.15E-03	2.03E+00	1.91E-04	3.98E-04	2.16E-04	6.22E-04	1.69E-05	1.09E-03	5.71E-07	1.34E-06	3.07E-05	1.84E-04	3.10E-06
RO	2.61E-03	1.15E-04	2.99E-03	1.88E-03	2.65E-04	2.79E-05	8.23E-02	8.53E-03	1.61E-02	5.54E-04	3.25E-04	6.58E-04	3.03E-01	2.63E-03	2.78E+00	3.91E-01	4.42E-02	8.15E-03	1.53E-03	3.56E-01	2.41E-05	1.07E-04	1.09E-02	1.94E-01	1.86E-04
RS	5.38E-04	4.84E-05	6.48E-04	8.38E-04	7.08E-05	1.56E-05	3.04E-03	8.60E-02	1.29E-01	5.17E-04	1.55E-04	2.40E-04	1.31E-01	1.31E-03	7.30E-02	3.34E+00	7.44E-03	2.64E-03	6.81E-04	2.28E-01	5.89E-06	3.09E-05	1.87E-03	1.67E-02	4.84E-05
RU	1.56E+00	4.12E-04	1.05E-01	1.31E-02	2.30E-02	7.87E-05	6.56E-02	1.02E-02	2.58E-02	1.99E-03	5.81E-03	3.97E-02	1.57E+00	2.44E-02	3.65E-01	1.70E-01	1.98E+01	7.37E-01	3.02E-03	4.27E-01	7.69E-03	2.18E-02	1.12E-01	1.09E+00	4.95E-02
SE	1.36E-03	6.83E-05	1.72E-02	5.18E-03	4.66E-03	5.51E-06	1.86E-03	3.58E-04	5.90E-04	3.03E-05	4.57E-03	7.66E-02	2.83E-01	5.10E-03	9.92E-03	7.33E-03	3.58E-02	1.20E+01	2.10E-04	4.10E-02	1.91E-05	4.43E-05	6.36E-04	1.56E-02	1.06E-04
SI	5.24E-05	3.50E-05	1.10E-04	3.98E-04	1.46E-05	1.43E-05	2.34E-04	5.18E-04	3.29E-04	7.84E-05	4.94E-05	6.56E-05	3.83E-02	7.01E-04	3.09E-03	7.44E-03	6.71E-04	7.75E-04	5.49E-02	4.36E-02	6.89E-07	3.79E-06	1.31E-04	1.85E-03	5.63E-06
SK	1.60E-04	8.46E-05	9.96E-04	1.54E-03	1.05E-04	8.88E-06	1.09E-03	1.74E-03	2.12E-03	9.35E-05	2.42E-04	2.84E-04	7.94E-01	1.12E-03	1.63E-02	5.03E-02	3.06E-03	3.81E-03	1.06E-03	6.67E+00	1.75E-06	8.60E-06	3.43E-04	2.27E-02	1.36E-05
TJ	3.11E-02	1.62E-06	3.48E-05	2.74E-05	5.33E-06	3.86E-07	7.74E-05	4.76E-05	1.37E-04	9.39E-06	6.47E-06	2.98E-05	1.31E-03	1.04E-04	5.19E-04	5.38E-04	3.48E-03	3.33E-04	8.26E-06	5.95E-04	9.82E-02	2.90E-03	9.17E-04	7.68E-04	4.81E-02
TM	7.43E-02	6.79E-06	3.03E-04	1.63E-04	5.20E-05	1.64E-06	7.26E-04	1.94E-04	5.50E-04	4.43E-05	4.24E-05	2.30E-04	9.74E-03	3.76E-04	4.39E-03	2.51E-03	4.83E-02	2.89E-03	4.55E-05	3.90E-03	5.03E-03	1.42E-01	4.61E-03	8.10E-03	7.99E-02
TR	6.37E-03	6.69E-05	1.56E-03	1.04E-03	1.85E-04	2.76E-05	2.09E-02	5.39E-03	1.64E-02	2.66E-03	2.26E-04	6.87E-04	8.28E-02	3.32E-03	1.49E-01	6.12E-02	1.24E-01	7.19E-03	5.54E-04	5.99E-02	4.58E-05	4.03E-04	1.21E+00	1.57E-01	4.25E-04
UA	1.86E-02	1.90E-04	1.92E-02	4.29E-03	1.85E-03	3.63E-05	1.81E-01	6.29E-03	1.18E-02	8.28E-04	1.07E-03	2.62E-03	1.55E+00	4.77E-03	4.88E-01	1.25E-01	5.19E-01	4.23E-02	1.84E-03	6.25E-01	9.42E-05	7.19E-04	3.69E-02	4.23E+00	1.02E-03
UZ	2.95E-01	7.50E-06	3.89E-04	1.92E-04	6.60E-05	1.83E-06	7.59E-04	2.20E-04	6.29E-04	4.74E-05	5.84E-05	2.92E-04	1.16E-02	4.15E-04	4.74E-03	2.84E-03	4.92E-02	3.59E-03	4.91E-05	4.39E-03	3.07E-02	3.11E-02	4.74E-03	8.87E-03	3.98E-01

Table B11. *Source-receptor matrix of PCDD/Fs deposition to EMEP countries in 2023, kg TEQ/year. 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	5.23E-04	1.46E-07	1.85E-05	1.56E-07	9.76E-05	2.71E-06	4.48E-05	3.77E-06	5.22E-06	6.08E-08	7.73E-06	2.25E-05	2.46E-06	3.26E-07	2.70E-04	4.49E-07	4.17E-05	1.03E-05	5.93E-07	1.93E-04	2.68E-05	4.01E-05	9.12E-07	3.11E-08	9.39E-04	2.89E-07
AM	1.99E-07	1.70E-03	2.75E-06	1.04E-04	5.34E-06	7.53E-07	6.54E-06	1.38E-06	1.23E-06	2.75E-07	1.00E-06	4.79E-06	6.68E-07	1.12E-07	3.22E-05	1.55E-07	6.24E-06	2.95E-06	2.44E-04	4.80E-06	2.19E-06	2.52E-06	2.30E-07	1.04E-08	4.68E-05	6.86E-07
AT	7.18E-07	1.24E-07	1.36E-02	1.69E-07	8.71E-05	3.81E-05	1.12E-05	1.25E-05	4.33E-04	3.66E-08	4.54E-04	1.96E-03	2.03E-05	1.55E-06	6.30E-04	2.46E-06	3.60E-04	8.55E-05	4.34E-07	4.43E-06	2.42E-04	4.41E-04	5.77E-06	1.86E-07	2.62E-03	2.84E-07
AZ	3.06E-07	2.88E-04	5.07E-06	1.13E-03	9.74E-06	1.78E-06	1.15E-05	4.37E-06	2.31E-06	3.54E-07	2.31E-06	1.09E-05	1.74E-06	5.55E-07	6.87E-05	7.44E-07	1.31E-05	6.72E-06	4.03E-04	7.43E-06	3.79E-06	4.99E-06	4.93E-07	3.41E-08	7.73E-05	3.81E-06
BA	1.44E-05	2.40E-07	1.91E-04	2.95E-07	2.20E-02	1.18E-05	3.97E-05	1.10E-05	1.68E-05	5.68E-08	8.77E-05	1.27E-04	1.10E-05	1.44E-06	5.05E-04	1.90E-06	1.09E-04	3.69E-05	9.25E-07	1.64E-05	1.69E-03	4.79E-04	2.64E-06	9.91E-08	2.10E-03	6.38E-07
BE	3.35E-08	2.64E-08	7.76E-06	4.09E-08	1.60E-06	1.07E-02	8.69E-07	3.31E-06	1.43E-05	3.64E-09	7.20E-06	9.43E-04	2.90E-05	7.11E-07	3.83E-04	1.00E-06	2.21E-03	6.26E-04	7.70E-08	3.54E-07	1.13E-06	2.00E-06	1.18E-05	2.74E-07	2.13E-05	1.00E-07
BG	7.40E-06	1.90E-06	9.16E-05	1.41E-06	3.32E-04	1.38E-05	1.55E-02	3.67E-05	1.74E-05	3.88E-07	4.06E-05	1.07E-04	1.41E-05	2.02E-06	4.36E-04	2.47E-06	9.46E-05	4.73E-05	7.57E-06	5.42E-04	9.28E-05	2.16E-04	3.41E-06	1.63E-07	8.30E-04	2.97E-06
BY	7.98E-07	1.06E-06	1.16E-04	1.29E-06	1.06E-04	6.25E-05	5.03E-05	1.69E-02	2.79E-05	9.45E-08	1.69E-04	5.10E-04	1.75E-04	7.28E-05	4.57E-04	4.17E-05	1.83E-04	2.52E-04	4.61E-06	1.76E-05	5.18E-05	1.93E-04	1.34E-05	8.22E-07	3.39E-04	2.98E-06
CH	1.18E-07	2.60E-08	1.53E-04	3.23E-08	6.22E-06	2.57E-05	1.59E-06	1.71E-06	4.40E-03	7.39E-09	9.09E-06	6.41E-04	6.12E-06	2.89E-07	5.17E-04	4.49E-07	9.62E-04	4.72E-05	8.01E-08	9.03E-07	5.48E-06	2.80E-06	3.33E-06	7.81E-08	2.00E-03	6.95E-08
CY	4.74E-07	1.34E-07	2.14E-06	6.02E-08	6.94E-06	5.49E-07	8.25E-06	7.27E-07	9.41E-07	1.02E-04	8.48E-07	3.59E-06	3.97E-07	5.79E-08	2.98E-05	6.24E-08	6.85E-06	1.96E-06	3.26E-07	2.49E-05	2.82E-06	2.69E-06	1.59E-07	6.55E-09	9.95E-05	1.01E-07
CZ	3.89E-07	1.19E-07	1.51E-03	1.93E-07	1.05E-04	7.43E-05	9.62E-06	2.68E-05	1.23E-04	2.18E-08	6.63E-03	2.89E-03	4.59E-05	2.95E-06	4.61E-04	4.58E-06	4.04E-04	1.39E-04	4.15E-07	2.95E-06	1.08E-04	4.08E-04	7.29E-06	2.51E-07	4.17E-04	3.21E-07
DE	5.71E-07	3.22E-07	1.62E-03	5.08E-07	4.25E-05	3.31E-03	1.52E-05	7.09E-05	1.75E-03	5.70E-08	1.08E-03	6.47E-02	9.06E-04	1.72E-05	2.74E-03	2.17E-05	6.28E-03	2.65E-03	1.08E-06	6.17E-06	3.01E-05	7.80E-05	8.24E-05	2.40E-06	1.00E-03	1.23E-06
DK	2.95E-08	6.88E-08	1.27E-05	8.90E-08	4.04E-06	1.17E-04	1.52E-06	1.12E-05	5.55E-06	5.41E-09	1.82E-05	7.60E-04	8.54E-03	7.24E-06	1.33E-04	8.46E-06	1.27E-04	7.06E-04	1.92E-07	5.54E-07	3.25E-06	1.01E-05	2.01E-05	9.36E-07	2.20E-05	2.93E-07
EE	7.37E-08	1.15E-07	1.05E-05	1.33E-07	7.65E-06	1.85E-05	3.63E-06	1.01E-04	3.18E-06	8.17E-09	1.51E-05	1.05E-04	6.41E-05	1.10E-03	7.73E-05	1.60E-04	3.54E-05	7.06E-05	4.34E-07	1.27E-06	4.04E-06	9.93E-06	3.33E-06	2.85E-07	3.22E-05	3.69E-07
ES	1.84E-06	4.35E-07	6.33E-05	4.60E-07	7.78E-05	1.44E-04	1.99E-05	1.70E-05	4.26E-05	9.02E-08	3.26E-05	3.50E-04	6.51E-05	2.35E-06	1.94E-01	3.35E-06	2.22E-03	4.81E-04	1.37E-06	1.45E-05	5.41E-05	4.54E-05	5.23E-05	1.74E-06	1.65E-03	9.98E-07
FI	3.35E-07	9.05E-07	3.29E-05	9.28E-07	3.08E-05	6.17E-05	1.82E-05	1.51E-04	1.22E-05	5.24E-08	3.85E-05	2.81E-04	1.47E-04	3.78E-04	3.24E-04	4.17E-03	1.30E-04	2.48E-04	2.69E-06	5.53E-06	1.53E-05	3.34E-05	1.29E-05	1.92E-06	1.43E-04	3.45E-06
FR	1.34E-06	4.76E-07	1.59E-04	6.27E-07	7.33E-05	2.86E-03	2.13E-05	3.50E-05	1.28E-03	1.02E-07	9.52E-05	3.98E-03	1.95E-04	6.79E-06	2.62E-02	8.99E-06	6.86E-02	3.02E-03	1.46E-06	1.17E-05	5.84E-05	4.82E-05	1.72E-04	4.15E-06	2.82E-03	1.42E-06
GB	9.66E-08	2.60E-07	2.31E-05	3.32E-07	1.03E-05	5.26E-04	4.31E-06	1.70E-05	1.69E-05	2.16E-08	1.88E-05	5.68E-04	2.89E-04	8.49E-06	1.30E-03	1.29E-05	1.26E-03	5.30E-02	5.58E-07	1.69E-06	7.13E-06	1.66E-05	1.21E-03	6.76E-06	7.30E-05	9.33E-07
GE	5.33E-07	1.59E-04	1.08E-05	5.54E-05	2.18E-05	3.14E-06	3.93E-05	7.91E-06	3.52E-06	4.85E-07	4.72E-06	1.94E-05	3.96E-06	7.15E-07	8.75E-05	1.04E-06	1.94E-05	1.32E-05	4.70E-03	1.61E-05	8.76E-06	1.40E-05	9.86E-07	5.34E-08	1.44E-04	2.25E-06
GR	2.18E-05	1.02E-06	4.90E-05	9.51E-07	1.70E-04	1.03E-05	9.03E-04	1.80E-05	1.56E-05	6.65E-07	2.07E-05	7.40E-05	1.01E-05	1.37E-06	7.17E-04	1.71E-06	1.22E-04	3.67E-05	4.19E-06	1.06E-02	5.93E-05	8.60E-05	3.12E-06	1.23E-07	2.39E-03	2.14E-06
HR	6.80E-06	2.02E-07	5.31E-04	2.56E-07	4.00E-03	1.32E-05	2.57E-05	1.18E-05	2.30E-05	5.33E-08	1.36E-04	1.75E-04	1.15E-05	1.44E-06	5.48E-04	1.80E-06	1.33E-04	4.02E-05	7.65E-07	1.01E-05	9.63E-03	9.79E-04	2.75E-06	1.03E-07	2.98E-03	5.92E-07
HU	3.28E-06	2.06E-07	1.43E-03	2.97E-07	1.38E-03	2.59E-05	6.33E-05	3.34E-05	3.78E-05	4.02E-08	3.78E-04	3.66E-04	2.35E-05	2.46E-06	4.85E-04	3.01E-06	1.55E-04	7.08E-05	7.86E-07	1.50E-05	1.56E-03	1.74E-02	4.32E-06	1.93E-07	1.15E-03	5.26E-07
IE	2.48E-08	6.87E-08	3.19E-06	8.64E-08	2.34E-06	3.00E-05	1.02E-06	2.94E-06	2.96E-06	4.78E-09	2.34E-06	4.79E-05	1.99E-05	1.50E-06	3.66E-04	2.33E-06	1.35E-04	1.14E-03	1.37E-07	4.21E-07	1.40E-06	2.72E-06	6.22E-03	3.30E-06	1.89E-05	2.74E-07
IS	3.00E-08	6.08E-08	2.73E-06	7.26E-08	2.77E-06	1.18E-05	1.26E-06	2.89E-06	1.44E-06	4.91E-09	2.00E-06	2.97E-05	1.38E-05	1.99E-06	1.18E-04	4.16E-06	3.07E-05	9.74E-05	1.64E-07	4.92E-07	1.83E-06	2.38E-06	1.41E-05	2.10E-04	2.34E-05	2.57E-07
IT	3.32E-05	7.16E-07	8.96E-04	8.06E-07	1.20E-03	4.97E-05	8.37E-05	2.73E-05	5.53E-04	1.90E-07	1.33E-04	6.97E-04	2.63E-05	3.06E-06	5.60E-03	3.99E-06	1.82E-03	1.52E-04	2.71E-06	7.17E-05	1.04E-03	2.96E-04	1.35E-05	4.41E-07	1.17E-01	1.74E-06
KY	2.49E-07	5.02E-06	3.99E-06	5.53E-06	8.05E-06	1.62E-06	5.27E-06	2.00E-06	2.54E-06	1.74E-07	1.62E-06	9.19E-06	1.06E-06	3.21E-07	1.01E-04	5.15E-07	1.47E-05	6.03E-06	7.06E-06	4.35E-06	2.67E-06	2.62E-06	4.75E-07	2.54E-08	6.74E-05	8.99E-03
KZ	4.24E-06	7.30E-05	1.51E-04	1.24E-04	2.39E-04	9.34E-05	2.49E-04	2.64E-04	5.93E-05	2.12E-06	9.89E-05	4.75E-04	1.18E-04	4.36E-05	1.86E-03	5.78E-05	4.16E-04	3.71E-04	1.47E-04	1.05E-04	9.52E-05	1.64E-04	2.54E-05	2.22E-06	1.43E-03	4.26E-03
LI	5.75E-10	1.44E-10	2.68E-06	1.78E-10	3.17E-08	1.26E-07	8.04E-09	9.08E-09	1.81E-05	3.77E-11	5.29E-08	3.35E-06	3.02E-08	1.62E-09	2.47E-06	2.65E-09	2.00E-06	2.39E-07	4.19E-10	4.63E-09	2.93E-08	1.34E-08	1.69E-08	4.52E-10	9.50E-06	3.76E-10
LT	2.02E-07	1.49E-07	3.03E-05	2.06E-07	1.96E-05	3.69E-05	9.24E-06	9.16E-04	7.61E-06	1.30E-08	5.18E-05	2.73E-04	2.13E-04	4.98E-05	1.55E-04	2.72E-05	7.44E-05	1.61E-04	5.42E-07	2.53E-06	1.01E-05	3.31E-05	6.98E-06	4.13E-07	7.20E-05	5.07E-07
LU	3.95E-09	2.29E-09	1.05E-06	3.41E-09	1.92E-07	1.41E-04	1.03E-07	2.94E-07	3.22E-06	4.06E-10	1.31E-06	1.33E-04	1.71E-06	4.82E-08	4.00E-05	7.31E-08	2.24E-04	2.00E-05	7.14E-09	4.28E-08	1.15E-07	2.21E-07	7.27E-07	1.54E-08	3.27E-06	8.34E-09
LV	1.47E-07	1.78E-07	2.08E-05	2.23E-07	1.42E-05	3.47E-05	7.45E-06	3.96E-04	5.73E-06	1.35E-08	3.28E-05	2.24E-04	1.63E-04	1.97E-04	1.38E-04	6.37E-05	6.46E-05	1.34E-04	7.03E-07	2.44E-06	7.46E-06	2.11E-05	6.14E-06	4.24E-07	5.82E-05	6.35E-07
MC	1.53E-10	1.94E-11	1.17E-08	2.05E-11	7.76E-09	1.79E-09	2.32E-09	5.61E-10	1.37E-08	7.52E-12	2.86E-09	2.05E-08	1.07E-09	9.36E-11	2.02E-07	1.16E-10	7.06E-07	4.58E-09	7.45E-11	1.34E-09	8.63E-09	5.39E-09	4.40E-10	1.17E-11	1.03E-06	5.14E-11
MD	3.64E-07	4.39E-07	2.02E-05	4.00E-07	3.15E-05	4.17E-06	8.60E-05	4.44E-05	4.10E-06	3.46E-08	1.41E-05	3.46E-05	5.91E-06	1.50E-06	9.21E-05	1.63E-06	2.32E-05	1.48E-05	1.69E-06	8.70E-06	1.22E-05	4.21E-05	9.04E-07	6.93E-08	1.03E-04	7.86E-07
ME	3.20E-05	6.73E-08	1.65E-05	7.47E-08	4.20E-04	1.88E-06	2.07E-05	2.68E-06	3.02E-06	1.80E-08	8.54E-06	1.71E-05	1.79E-06	2.36E-07	1.38E-04	3.33E-07	2.25E-05	6.36E-06	2.60E-07	1.16E-05	4.05E-05	4.58E-05	5.12E-07	1.85E-08	5.30E-04	1.20E-07
MK	3.18E-05	1.58E-07	2.12E-05	1.55E-07	7.53E-05	2.87E-06	2.20E-04	3.95E-06	4.51E-06	5.30E-08	9.17E-06	2.44E-05	2.85E-06	3.45E-07	1.53E-04	4.89E-07	2.72E-05	1.00E-05	6.70E-07	4.53E-04	2.06E-05	5.33E-05	7.80E-07	3.14E-08	3.46E-04	2.44E-07
MT	1.80E-08	6.95E-10	6.32E-08	7.11E-10	2.37E-07	2.07E-08	6.37E-08	1.24E-08	3.53E-08	9.75E-11	2.34E-08	1.14E-07	1.12E-08	1.12E-09	2.34E-06	1.43E-09	5.04E-07	7.47E-08	2.11E-09	1.25E-07	1.08E-07	5.74E-08	7.19E-09	2.01E-10	1.64E-05	2.52E-09
NL	2.09E-08	3.08E-08	7.72E-06	4.69E-08	1.69E-06	3.22E-03	7.94E-07	4.11E-06	8.54E-06	3.78E-09	7.58E-06	1.64E-03	6.57E-05	1.27E-06	2.66E-04	1.90E-06	8.63E-04	1.39E-03	8.93E-08	3.30E-07	1.56E-06	3.30E-06	2.13E-05	4.56E-07	1.69E-05	1.31E-07
NO	2.64E-07	8.32E-07	3.28E-05	8.95E-07	2.71E-05	1.83E-04	1.46E-05	5.99E-05	1.77E-05	5.22E-08	3.53E-05	4.92E-04	5.33E-04	3.90E-05	5.34E-04	9.47E-05	2.88E-04	1.06E-03	2.04E-06	4.61E-06	1.47E-05	2.95E-05	4.96E-05	6.56E-06	1.51E-04	3.89E-06
PL	1.77E-06	5.69E-07	7.13E-04	9.04E-07	3.41E-04	2.71E-04	5.21E-05	1.04E-03	1.13E-04	9.81E-08	3.57E-03	4.74E-03	6.27E-04	4.25E-05	1.10E-03	4.53E-05	6.66E-04	7.95E-04	2.10E-06	1.44E-05	2.15E-04	1.12E-03	3.54E-05	1.58E-06	8.42E-04	2.13E-06
PT	1.62E-07	5.97E-08	4.62E-06	6.49E-08	6.44E-06	1.21E-05	1.84E-06	1.65E-06	3.17E-06	9.33E-09	2.65E-06	2.93E-05	6.61E-06	2.38E-07	3.44E-03	3.93E-07	1.00E-04	8.16E-05	1.56E-07	1.42E-06	3.94E-06	3.82E-06	9.35E-06	4.74E-07	7.97E-05	1.56E-07
RO	7.90E-06	3.41E-06	4.19E-04	2.38E-06	1.17E-03	3.95E-05	2.29E-03	1.34E-04	5.60E-05	4.25E-07	1.54E-04	3.58E-04	3.90E-05	6.60E-06	9.60E-04	7.56E-06	2.54E-04	1.28E-04	1.23E-05	1.10E-04	4.32E-04	2.12E-03	8.50E-06	4.06E-07	1.86E-03	5.56E-06
RS	3.76E-05	5.75E-07	2.09E-04	6.00E-07	2.98E-03	1.75E-05	6.05E-04	2.03E-05	2.25E-05	1.08E-07	1.03E-04	1.71E-04	1.65E-05	1.93E-06	4.96E-04	2.60E-06	1.18E-04	5.27E-05	2.34E-06	1.12E-04	6.39E-04	1.19E-03	3.47E-06	1.44E-07	1.26E-03	1.29E-06
RU	1.26E-05	1.39E-04	6.19E-04	2.35E-04	8.32E-04	4.95E-04	9.97E-04	5.85E-03	1.92E-04	4.91E-06	4.99E-04	2.45E-03	9.25E-04	1.16E-03	5.35E-03	1.52E-03	1.53E-03	2.12E-03	6.52E-04	3.69E-04	3.64E-04	8.04E-04	1.31E-04	1.60E-05	4.30E-03	6.58E-04
SE	3.81E-07	8.88E-07	5.83E-05	1.03E-06	4.01E-05	2.33E-04	1.97E-05	1.57E-04	2.54E-05	5.74E-08	8.77E-05	1.18E-03	2.77E-03	1.49E-04	6.55E-04	4.24E-04	3.55E-04	1.17E-03	2.43E-06	5.95E-06	2.19E-05	5.70E-05	4.91E-05	4.85E-06	1.96E-04	3.89E-06
SI	4.97E-07	4.81E-08	9.41E-04	6.69E-08	6.92E-05	4.38E-06	5.00E-06	3.66E-06	1.37E-05	1.56E-08	4.63E-05	8.57E-05	3.49E-06	3.97E-07	2.11E-04	5.32E-07	5.56E-05	1.30E-05	1.86E-07	1.92E-06	1.28E-03	1.40E-04	9.14E-07	3.47E-08	1.78E-03	1.37E-07
SK	1.17E-06	1.22E-07	7.30E-04	1.73E-07	3.35E-04	1.80E-05	2.42E-05	2.67E-05	2.87E-05	2.25E-08	8.27E-04	2.97E-04	1.92E-05	1.96E-06	2.52E-04	2.64E-06	1.03E-04	4.89E-05	4.59E-07	5.83E-06	1.95E-04	2.48E-03	2.98E-06	1.15E-07	4.53E-04	3.57E-07
TJ	1.26E-07	2.82E-06	2.00E-06	3.12E-06	3.94E-06	7.41E-07	2.84E-06	9.61E-07	1.28E-06	1.03E-07	7.98E-07	4.49E-06	5.15E-07	1.40E-07	5.11E-05	2.14E-07	7.29E-06	2.92E-06	3.68E-06	2.38E-06	1.37E-06	1.36E-06	2.36E-07	1.20E-08	3.51E-05	2.57E-04
TM	6.89E-07	2.61E-05	1.61E-05	6.89E-05	2.76E-05	7.88E-06	2.67E-05	1.64E-05	7.82E-06	6.10E-07	8.65E-06	4.39E-05	7.14E-06	2.85E-06	2.67E-04	4.04E-06	5.04E-05	3.02E-05	4.32E-05	1.49E-05	1.05E-05	1.49E-05	2.10E-06	1.43E-07	2.01E-04	8.99E-05
TR	1.48E-05	2.67E-04	1.64E-04	3.09E-05	3.61E-04	4.39E-05	1.35E-03	1.20E-04	5.91E-05	4.87E-05	7.11E-05	2.88E-04	4.20E-05	7.14E-06	2.04E-03	8.43E-06	3.78E-04	1.57E-04	1.77E-04	8.88E-04	1.40E-04	2.24E-04	1.20E-05	6.37E-07	3.28E-03	1.59E-05
UA	4.93E-06	8.23E-06	4.59E-04	9.81E-06	5.97E-04	9.28E-05	5.88E-04	2.00E-03	7.61E-05	8.13E-07	4.03E-04	8.08E-04	1.48E-04	3.95E-05	1.37E-03	3.65E-05	4.20E-04	3.39E-04	4.30E-05	1.20E-04	2.71E-04	1.55E-03	2.10E-05	1.35E-06	1.69E-03	1.87E-05
UZ	6.24E-07	1.72E-05	1.61E-05	2.87E-05	2.69E-05	9.59E-06	2.45E-05	2.12E-05	7.61E-06	4.62E-07	9.55E-06	4.90E-05	8.81E-06	3.54E-06	2.62E-04	4.81E-06	5.19E-05	3.59E-05	2.85E-05	1.29E-05	1.02E-05	1.52E-05	2.43E-06	1.66E-07	1.86E-04	1.46E-03

Table B11 *(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	2.24E-06	2.10E-08	1.66E-06	5.66E-07	1.18E-06	2.89E-08	5.38E-06	4.99E-06	3.22E-04	7.79E-07	6.15E-06	1.21E-06	6.09E-05	6.82E-06	1.42E-04	1.36E-03	6.74E-05	1.10E-06	7.69E-06	1.99E-05	4.67E-07	7.89E-07	2.76E-04	3.15E-05	1.53E-06
AM	6.19E-06	4.46E-09	3.95E-07	1.26E-07	3.10E-07	4.26E-09	3.43E-06	4.00E-08	1.45E-06	3.21E-08	1.74E-06	3.57E-07	1.01E-05	1.34E-06	3.10E-05	8.77E-06	9.54E-05	3.64E-07	1.32E-06	1.74E-06	7.94E-07	6.64E-06	2.06E-03	2.45E-05	4.33E-06
AT	2.67E-06	6.60E-06	6.80E-06	1.16E-05	5.55E-06	1.14E-07	7.55E-06	2.32E-07	2.22E-06	9.01E-08	7.53E-05	8.70E-06	1.03E-03	2.04E-05	1.23E-04	6.08E-05	9.17E-05	9.62E-06	1.17E-03	4.25E-04	6.72E-07	1.04E-06	1.28E-04	5.44E-05	2.20E-06
AZ	1.06E-04	8.34E-09	1.34E-06	2.84E-07	1.30E-06	7.81E-09	6.37E-06	6.91E-08	2.22E-06	5.15E-08	4.12E-06	1.26E-06	2.47E-05	2.74E-06	5.80E-05	1.51E-05	1.15E-03	1.42E-06	2.30E-06	3.78E-06	8.85E-06	1.28E-04	1.43E-03	7.34E-05	5.52E-05
BA	4.36E-06	7.50E-08	6.83E-06	2.48E-06	5.20E-06	9.11E-08	1.00E-05	1.65E-05	1.19E-05	6.15E-07	2.69E-05	4.74E-06	5.48E-04	1.39E-05	4.12E-04	1.61E-03	1.34E-04	5.93E-06	8.19E-05	1.65E-04	9.92E-07	1.54E-06	2.14E-04	6.31E-05	3.20E-06
BE	1.16E-06	3.34E-08	2.78E-06	6.84E-04	2.37E-06	6.25E-09	8.93E-07	1.10E-08	1.61E-07	3.70E-09	2.77E-03	1.31E-05	4.95E-05	1.66E-05	8.10E-06	1.89E-06	3.49E-05	6.91E-06	8.88E-07	2.06E-06	2.87E-07	3.63E-07	1.48E-05	8.12E-06	9.16E-07
BG	2.38E-05	7.29E-08	1.03E-05	2.45E-06	7.69E-06	5.76E-08	2.56E-04	2.86E-06	2.36E-04	5.14E-07	3.21E-05	6.39E-06	3.18E-04	1.27E-05	7.19E-03	2.75E-03	8.62E-04	7.22E-06	3.51E-05	1.03E-04	4.16E-06	5.75E-06	4.00E-03	7.48E-04	1.28E-05
BY	3.81E-05	1.29E-07	1.53E-03	8.06E-06	6.88E-04	3.09E-08	2.35E-04	4.16E-07	7.10E-06	1.25E-07	1.67E-04	4.91E-05	7.45E-03	2.22E-05	8.69E-04	1.57E-04	6.75E-03	1.24E-04	3.17E-05	2.12E-04	5.59E-06	7.64E-06	8.34E-04	1.20E-02	1.85E-05
CH	7.27E-07	2.41E-05	1.06E-06	8.08E-06	8.93E-07	1.03E-07	7.78E-07	3.03E-08	3.67E-07	2.29E-08	4.04E-05	2.75E-06	4.05E-05	1.61E-05	1.00E-05	4.12E-06	1.75E-05	2.15E-06	6.18E-06	3.17E-06	2.08E-07	2.59E-07	2.38E-05	6.18E-06	6.60E-07
CY	1.01E-06	3.55E-09	2.30E-07	1.08E-07	1.80E-07	4.61E-09	1.80E-06	6.28E-08	1.95E-06	1.60E-07	1.20E-06	2.32E-07	6.94E-06	7.87E-07	2.33E-05	9.97E-06	2.55E-05	1.88E-07	1.15E-06	1.61E-06	2.25E-07	2.90E-07	2.77E-03	1.29E-05	6.21E-07
CZ	3.27E-06	6.43E-07	1.53E-05	2.60E-05	1.14E-05	3.66E-08	9.13E-06	2.05E-07	2.05E-06	4.09E-08	1.45E-04	1.39E-05	6.22E-03	1.64E-05	1.45E-04	1.04E-04	1.49E-04	1.98E-05	9.11E-05	8.98E-04	7.52E-07	1.15E-06	9.51E-05	7.99E-05	2.48E-06
DE	1.35E-05	1.04E-05	6.76E-05	1.05E-03	5.96E-05	1.22E-07	1.61E-05	2.09E-07	2.72E-06	7.30E-08	7.47E-03	1.44E-04	3.88E-03	1.09E-04	1.55E-04	4.49E-05	5.99E-04	1.66E-04	3.53E-05	1.11E-04	3.16E-06	3.90E-06	2.37E-04	1.52E-04	1.00E-05
DK	3.56E-06	2.16E-08	2.32E-05	6.72E-06	2.30E-05	3.04E-09	2.94E-06	1.64E-08	2.44E-07	5.02E-09	3.79E-04	1.62E-04	3.54E-04	1.11E-05	2.34E-05	7.28E-06	1.88E-04	2.44E-04	2.41E-06	8.23E-06	6.80E-07	7.68E-07	2.70E-05	2.32E-05	2.10E-06
EE	5.24E-06	1.26E-08	1.82E-04	1.62E-06	9.05E-04	3.56E-09	7.68E-06	3.43E-08	6.08E-07	1.05E-08	4.80E-05	2.35E-05	5.13E-04	4.97E-06	4.37E-05	1.14E-05	2.39E-03	1.50E-04	2.80E-06	1.08E-05	7.97E-07	1.01E-06	6.53E-05	9.38E-05	2.59E-06
ES	9.60E-06	1.51E-07	1.03E-05	1.80E-05	8.69E-06	2.26E-07	1.25E-05	4.10E-07	5.21E-06	4.03E-07	2.44E-04	3.18E-05	3.21E-04	4.80E-03	1.26E-04	6.02E-05	2.14E-04	2.10E-05	3.10E-05	3.30E-05	2.68E-06	3.42E-06	3.15E-04	8.58E-05	8.27E-06
FI	4.68E-05	5.01E-08	1.63E-04	5.25E-06	3.50E-04	1.68E-08	2.64E-05	1.40E-07	2.85E-06	4.01E-08	1.60E-04	1.75E-04	1.01E-03	1.99E-05	1.85E-04	4.55E-05	8.29E-03	7.24E-04	1.03E-05	3.14E-05	8.85E-06	9.48E-06	3.58E-04	3.04E-04	2.78E-05
FR	1.49E-05	1.00E-06	2.39E-05	6.48E-04	2.11E-05	2.28E-06	1.60E-05	3.77E-07	4.54E-06	2.49E-07	2.26E-03	8.47E-05	6.34E-04	5.32E-04	1.60E-04	6.01E-05	3.95E-04	5.42E-05	4.41E-05	4.66E-05	3.99E-06	5.06E-06	3.34E-04	1.22E-04	1.30E-05
GB	1.15E-05	6.03E-08	1.87E-05	1.86E-05	2.12E-05	1.38E-08	4.68E-06	4.75E-08	7.28E-07	1.88E-08	1.15E-03	2.11E-04	2.39E-04	2.25E-04	4.47E-05	1.73E-05	3.28E-04	8.85E-05	5.28E-06	1.21E-05	2.93E-06	3.36E-06	8.04E-05	4.37E-05	9.23E-06
GE	1.96E-05	1.37E-08	2.26E-06	4.76E-07	1.98E-06	1.20E-08	2.54E-05	1.55E-07	4.97E-06	8.13E-08	7.40E-06	1.88E-06	5.59E-05	3.67E-06	2.01E-04	4.24E-05	1.32E-03	2.20E-06	4.84E-06	9.38E-06	3.43E-06	9.54E-06	3.22E-03	2.24E-04	1.12E-05
GR	1.75E-05	5.98E-08	6.10E-06	1.94E-06	4.76E-06	7.66E-08	6.36E-05	1.72E-06	5.26E-04	3.54E-06	2.34E-05	4.79E-06	1.69E-04	1.75E-05	9.05E-04	7.13E-04	4.60E-04	4.61E-06	2.21E-05	4.60E-05	3.64E-06	4.84E-06	5.82E-03	2.82E-04	1.05E-05
HR	3.89E-06	1.09E-07	6.97E-06	2.99E-06	5.40E-06	1.17E-07	9.94E-06	2.38E-06	6.78E-06	3.32E-07	2.97E-05	4.93E-06	7.64E-04	1.35E-05	3.71E-04	8.87E-04	1.07E-04	6.54E-06	1.24E-03	2.21E-04	9.66E-07	1.35E-06	1.76E-04	6.38E-05	2.94E-06
HU	4.44E-06	1.64E-07	1.58E-05	5.97E-06	1.03E-05	7.75E-08	2.34E-05	2.25E-06	2.16E-05	1.93E-07	5.84E-05	8.90E-06	2.12E-03	1.51E-05	2.77E-03	2.54E-03	2.06E-04	1.22E-05	7.10E-04	3.27E-03	9.45E-07	1.50E-06	1.80E-04	1.82E-04	3.16E-06
IE	3.33E-06	8.81E-09	2.98E-06	1.68E-06	3.59E-06	3.46E-09	9.68E-07	1.11E-08	1.77E-07	6.39E-09	6.97E-05	2.87E-05	3.40E-05	5.06E-05	8.49E-06	3.46E-06	6.82E-05	9.13E-06	9.68E-07	2.01E-06	8.28E-07	9.06E-07	1.89E-05	7.92E-06	2.58E-06
IS	4.31E-06	5.59E-09	2.99E-06	8.41E-07	3.94E-06	2.98E-09	1.22E-06	1.27E-08	2.18E-07	5.32E-09	2.76E-05	5.06E-05	2.99E-05	2.37E-05	9.75E-06	3.26E-06	8.87E-05	1.13E-05	1.08E-06	1.70E-06	5.64E-07	7.19E-07	2.56E-05	9.00E-06	1.81E-06
IT	1.33E-05	2.56E-06	1.40E-05	1.25E-05	1.09E-05	1.59E-06	2.36E-05	5.04E-06	4.05E-05	9.35E-06	9.48E-05	1.56E-05	9.22E-04	9.61E-05	5.59E-04	5.07E-04	3.46E-04	1.32E-05	7.93E-04	1.69E-04	3.20E-06	4.80E-06	7.55E-04	1.58E-04	1.01E-05
KY	2.28E-03	8.94E-09	7.36E-07	2.57E-07	6.85E-07	8.81E-09	2.00E-06	5.86E-08	1.60E-06	3.89E-08	3.64E-06	1.03E-06	1.39E-05	4.16E-06	2.37E-05	9.22E-06	1.83E-04	1.01E-06	1.78E-06	2.20E-06	3.63E-03	1.55E-04	4.18E-04	1.88E-05	9.74E-03
KZ	1.47E-01	2.16E-07	9.65E-05	1.17E-05	9.94E-05	1.56E-07	2.23E-04	1.41E-06	3.52E-05	6.78E-07	2.25E-04	9.65E-05	1.36E-03	8.20E-05	1.71E-03	3.41E-04	6.75E-02	1.12E-04	6.13E-05	1.35E-04	2.98E-03	2.35E-03	8.67E-03	3.62E-03	2.03E-02
LI	4.00E-09	1.32E-06	5.83E-09	3.76E-08	4.83E-09	6.20E-10	3.64E-09	1.44E-10	1.83E-09	1.22E-10	2.02E-07	1.55E-08	2.13E-07	7.85E-08	5.00E-08	2.01E-08	9.70E-08	1.14E-08	3.29E-08	1.46E-08	1.17E-09	1.45E-09	1.25E-07	2.99E-08	3.66E-09
LT	6.29E-06	3.10E-08	6.31E-03	3.47E-06	9.49E-04	7.27E-09	2.42E-05	9.23E-08	1.58E-06	2.38E-08	1.01E-04	3.14E-05	3.12E-03	8.85E-06	1.27E-04	3.09E-05	2.06E-03	1.42E-04	7.07E-06	4.44E-05	1.05E-06	1.38E-06	9.52E-05	3.19E-04	3.49E-06
LU	9.07E-08	5.85E-09	2.03E-07	5.74E-04	1.59E-07	1.07E-09	9.96E-08	1.35E-09	1.93E-08	4.68E-10	4.27E-05	6.19E-07	5.73E-06	1.39E-06	9.25E-07	2.17E-07	2.78E-06	4.67E-07	9.36E-08	2.68E-07	2.39E-08	2.99E-08	1.64E-06	8.47E-07	7.65E-08
LV	7.94E-06	2.27E-08	1.19E-03	3.05E-06	8.78E-03	6.10E-09	1.78E-05	6.65E-08	1.21E-06	2.09E-08	9.15E-05	3.28E-05	1.39E-03	8.88E-06	9.18E-05	2.18E-05	1.86E-03	1.99E-04	5.20E-06	2.45E-05	1.26E-06	1.52E-06	1.12E-04	2.31E-04	4.03E-06
MC	3.39E-10	5.66E-11	2.84E-10	5.36E-10	2.74E-10	9.94E-09	5.42E-10	4.00E-11	4.99E-10	2.17E-11	3.27E-09	4.82E-10	1.93E-08	3.10E-09	1.33E-08	6.80E-09	6.42E-09	4.90E-10	8.66E-09	3.50E-09	9.03E-11	1.11E-10	2.14E-08	3.16E-09	2.79E-10
MD	8.18E-06	1.65E-08	8.82E-06	6.82E-07	5.35E-06	9.82E-09	7.61E-03	1.66E-07	3.50E-06	3.76E-08	1.03E-05	2.81E-06	2.49E-04	2.87E-06	3.10E-03	5.60E-05	4.29E-04	4.41E-06	7.19E-06	3.64E-05	1.12E-06	1.78E-06	4.78E-04	2.20E-03	3.84E-06
ME	9.91E-07	1.28E-08	1.39E-06	3.93E-07	9.04E-07	1.63E-08	2.72E-06	3.39E-05	1.77E-05	3.49E-07	4.30E-06	7.97E-07	6.55E-05	3.83E-06	9.43E-05	7.17E-04	3.88E-05	8.38E-07	6.04E-06	2.04E-05	1.93E-07	3.97E-07	7.58E-05	1.65E-05	7.06E-07
MK	2.04E-06	1.87E-08	1.63E-06	5.59E-07	1.24E-06	1.87E-08	6.49E-06	8.78E-07	3.13E-03	2.34E-07	6.80E-06	1.20E-06	6.47E-05	4.08E-06	2.19E-04	1.75E-03	7.29E-05	1.23E-06	7.65E-06	2.54E-05	3.76E-07	7.26E-07	3.49E-04	3.62E-05	1.32E-06
MT	2.13E-08	1.32E-10	5.24E-09	5.07E-09	4.05E-09	1.85E-10	2.63E-08	1.84E-09	2.69E-08	2.20E-06	3.73E-08	6.90E-09	1.92E-07	3.26E-08	2.77E-07	1.88E-07	3.56E-07	4.92E-09	4.12E-08	3.38E-08	5.41E-09	6.08E-09	9.50E-07	1.35E-07	1.35E-08
NL	1.57E-06	2.84E-08	3.94E-06	5.91E-05	3.76E-06	3.69E-09	9.50E-07	8.41E-09	1.21E-07	3.23E-09	1.19E-02	3.35E-05	6.83E-05	1.57E-05	7.64E-06	2.27E-06	5.06E-05	1.28E-05	1.14E-06	2.92E-06	3.74E-07	4.27E-07	1.52E-05	9.02E-06	1.14E-06
NO	4.59E-05	6.68E-08	5.58E-05	1.13E-05	7.61E-05	1.96E-08	1.92E-05	1.39E-07	2.49E-06	3.71E-08	4.68E-04	8.59E-03	5.60E-04	4.28E-05	1.45E-04	4.71E-05	1.48E-03	5.20E-04	9.84E-06	2.58E-05	9.46E-06	9.26E-06	2.63E-04	1.68E-04	2.71E-05
PL	2.20E-05	5.24E-07	5.07E-04	4.16E-05	2.25E-04	7.50E-08	1.00E-04	1.08E-06	1.39E-05	1.54E-07	7.53E-04	9.58E-05	1.63E-01	4.63E-05	1.15E-03	5.27E-04	2.88E-03	2.79E-04	1.44E-04	2.64E-03	4.64E-06	5.79E-06	4.41E-04	1.26E-03	1.45E-05
PT	1.56E-06	1.14E-08	1.03E-06	1.27E-06	8.48E-07	1.06E-08	1.36E-06	3.67E-08	4.82E-07	2.56E-08	2.31E-05	4.88E-06	2.91E-05	2.59E-02	1.15E-05	5.49E-06	2.59E-05	2.34E-06	2.05E-06	2.54E-06	4.89E-07	5.85E-07	3.21E-05	9.21E-06	1.46E-06
RO	3.99E-05	2.44E-07	4.02E-05	7.34E-06	2.62E-05	1.40E-07	1.94E-03	4.93E-06	9.21E-05	5.35E-07	8.97E-05	1.76E-05	1.65E-03	3.04E-05	9.72E-02	4.36E-03	1.68E-03	2.35E-05	1.72E-04	6.18E-04	7.20E-06	9.34E-06	3.13E-03	2.52E-03	2.22E-05
RS	8.68E-06	9.99E-08	1.04E-05	3.47E-06	7.36E-06	7.55E-08	3.38E-05	2.98E-05	1.02E-03	5.41E-07	4.05E-05	6.31E-06	6.88E-04	1.40E-05	3.22E-03	3.93E-02	2.63E-04	7.65E-06	6.91E-05	3.33E-04	1.85E-06	2.79E-06	5.57E-04	1.66E-04	5.88E-06
RU	2.89E-02	7.65E-07	1.43E-03	5.31E-05	2.06E-03	4.14E-07	1.21E-03	4.60E-06	1.16E-04	2.13E-06	1.24E-03	7.82E-04	1.09E-02	3.01E-04	7.30E-03	1.35E-03	1.43E+00	1.17E-03	2.21E-04	6.54E-04	1.24E-03	1.49E-03	2.92E-02	3.11E-02	4.01E-03
SE	5.08E-05	1.04E-07	2.32E-04	1.63E-05	3.41E-04	2.54E-08	3.29E-05	1.94E-07	3.38E-06	4.90E-08	6.32E-04	1.44E-03	2.45E-03	4.79E-05	2.25E-04	6.93E-05	2.89E-03	7.61E-03	1.52E-05	5.43E-05	9.72E-06	9.61E-06	3.07E-04	3.13E-04	2.91E-05
SI	9.66E-07	6.45E-08	1.79E-06	1.13E-06	1.46E-06	5.68E-08	3.06E-06	1.10E-07	9.25E-07	5.95E-08	9.65E-06	1.62E-06	2.37E-04	5.08E-06	7.16E-05	3.41E-05	2.69E-05	2.02E-06	4.36E-03	4.96E-05	2.42E-07	3.72E-07	5.16E-05	2.01E-05	7.70E-07
SK	3.02E-06	1.37E-07	1.47E-05	4.12E-06	8.77E-06	3.18E-08	1.87E-05	8.05E-07	8.37E-06	6.96E-08	4.10E-05	6.19E-06	5.92E-03	9.04E-06	6.17E-04	4.87E-04	1.34E-04	9.69E-06	1.07E-04	8.15E-03	6.62E-07	9.08E-07	9.44E-05	1.41E-04	2.10E-06
TJ	2.95E-04	4.51E-09	3.47E-07	1.22E-07	3.08E-07	4.50E-09	1.10E-06	2.89E-08	8.82E-07	2.00E-08	1.68E-06	4.67E-07	7.01E-06	2.16E-06	1.24E-05	4.88E-06	8.93E-05	4.49E-07	9.04E-07	1.10E-06	2.55E-02	2.21E-04	2.30E-04	1.06E-05	6.30E-03
TM	1.25E-03	2.79E-08	5.87E-06	1.17E-06	5.88E-06	2.31E-08	1.72E-05	1.77E-07	4.93E-06	1.14E-07	1.81E-05	6.41E-06	9.33E-05	1.02E-05	1.57E-04	3.80E-05	1.97E-03	7.06E-06	6.89E-06	1.20E-05	1.69E-03	2.52E-02	1.67E-03	2.08E-04	1.07E-02
TR	1.62E-04	2.23E-07	2.96E-05	7.50E-06	2.41E-05	2.41E-07	4.90E-04	2.82E-06	1.10E-04	3.93E-06	9.87E-05	2.25E-05	7.18E-04	6.39E-05	3.81E-03	7.26E-04	6.63E-03	2.34E-05	7.16E-05	1.41E-04	3.02E-05	4.38E-05	7.17E-01	3.10E-03	8.52E-05
UA	2.72E-04	3.34E-07	2.69E-04	1.52E-05	1.58E-04	1.43E-07	4.86E-03	2.46E-06	4.25E-05	6.58E-07	2.36E-04	6.11E-05	1.01E-02	5.14E-05	1.14E-02	1.05E-03	2.86E-02	1.05E-04	1.48E-04	1.28E-03	3.33E-05	5.19E-05	1.03E-02	1.48E-01	1.11E-04
UZ	5.10E-03	2.71E-08	7.63E-06	1.29E-06	7.74E-06	2.16E-08	1.72E-05	1.69E-07	4.46E-06	9.76E-08	2.22E-05	7.46E-06	1.10E-04	1.00E-05	1.55E-04	3.59E-05	2.20E-03	8.46E-06	6.71E-06	1.27E-05	7.62E-03	3.49E-03	1.33E-03	2.42E-04	6.32E-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, IP, HCB, PCB-153 and PCDD/Fs 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[7]. 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-C18. Measurement sites not included in the statistical summary are marked in grey in the tables. Spatial correlation was not calculated when fewer than three measurement sites were available. Temporal correlation was not calculated for sites with data coverage of less than three months.

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	38	0.6	27	79
	wet deposition	36	0.65	-28	69
Cd	air concentration	37	0.54	23	78
	wet deposition	36	0.4	-54	44
Hg	air concentration	15	0.04	-8	100
	wet deposition	22	0.59	74	55
B(a)P	air concentration	17	0.69	27	65
	wet deposition	19	0.84	-44	63
B(b)F	air concentration	9	0.88	2	89
	wet deposition	14	0.85	-35	50
B(k)F	air concentration	7	0.89	-20	71
	wet deposition	14	0.83	-38	50
IP	air concentration	14	0.59	-11	79
	wet deposition	19	0.78	-52	63
HCB	air concentration	9	0.87	-1	100
PCB-153	air concentration	8	0.7	24	100
PCDD/Fs	air concentration	2	-	-15	100

7 The PCDD/Fs statistical parameters were calculated based on the data from measurement sites with coverage below six months due to absence of sites with enough coverage

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	2.21	3.79	0.84	71.32
Agia Marina Xyliatou / Cyprus Atmospheric Observatory	CY0002R	33.06	35.04	4.30	1.12	0.80	-74.04
Kosetice (NAOK)	CZ0003R	15.08	49.57	1.63	2.67	0.51	63.69
Churanov	CZ0005R	13.60	49.07	0.86	1.40	0.20	62.63
Westerland	DE0001R	8.31	54.93	1.11	1.88	0.62	68.58
Waldhof	DE0002R	10.76	52.80	1.77	2.55	0.56	44.68
Schauinsland	DE0003R	7.91	47.91	0.77	1.91	0.52	147.61
Neuglobsow	DE0007R	13.03	53.14	1.67	1.82	0.60	8.39
Schmücke	DE0008R	10.77	50.65	1.06	2.00	0.11	87.70
Zingst	DE0009R	12.72	54.44	1.33	1.88	0.76	41.31
Anholt	DK0008R	11.52	56.72	1.11	1.41	0.79	26.42
Villum Research Station, Station Nord	DK0010G	-16.67	81.60	0.15	0.05	0.73	-67.45
Risø	DK0012R	12.09	55.69	1.25	4.22	0.24	236.75
Lahemaa	EE0009R	25.90	59.50	0.99	0.63	0.59	-35.88
San Pablo de los Montes	ES0001R	-4.35	39.55	1.04	0.93	0.22	-11.03
Víznar	ES0007R	-3.53	37.24	1.31	1.13	0.05	-13.65
Niembro	ES0008R	-4.85	43.44	1.45	2.25	-0.23	55.54
Campisabalos	ES0009R	-3.14	41.27	0.92	0.95	0.35	3.41
Els Torms	ES0014R	0.73	41.39	1.04	1.68	-0.17	61.35
Montseny	ES1778R	2.35	41.77	1.07	3.95	0.28	269.82
Virolahti III	FI0018R	27.67	60.53	1.31	0.54	-0.13	-58.92
Pallas (Matorova)	FI0036R	24.24	68.00	0.26	0.17	0.25	-35.88
Hyytiälä	FI0050R	24.28	61.85	0.74	0.24	0.33	-68.06
Donon	FR0008R	7.13	48.50	1.07	1.59	0.74	49.37
Revin	FR0009R	4.63	49.90	2.34	2.15	0.53	-8.34
Peyrusse Vieille	FR0013R	0.18	43.62	1.12	0.94	0.51	-16.38
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	0.88	0.86	0.77	-2.33
Verneuil	FR0025R	2.61	46.81	1.04	1.09	0.88	5.06
Kergoff	FR0028R	-2.94	48.26	0.67	1.41	0.85	109.74
Yarner Wood	GB0013R	-3.71	50.60	1.24	1.98	0.76	59.64
Heigham Holmes	GB0017R	1.62	52.72	2.21	2.94	0.75	33.09
Auchencorth Moss	GB0048R	-3.24	55.79	0.76	1.55	-0.01	103.57
Chilbolton Observatory	GB1055R	-1.44	51.15	2.48	3.07	0.82	23.80
K-puszta	HU0002R	19.54	46.97	3.43	4.08	0.68	19.00
Storhofdi	IS0091R	-20.29	63.40	0.09	0.61	-0.14	569.04
Monte Martano	IT0019R	12.57	42.81	3.62	2.11	-0.12	-41.74
Rucava	LV0010R	21.17	56.16	1.69	0.98	0.52	-42.01
Bilthoven	NL0008R	5.20	52.12	3.89	4.05	0.80	4.13
Birkenes II	NO0002R	8.25	58.39	0.39	0.47	0.79	22.10
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.14	0.23	0.35	68.99
Svanvik	NO0047R	30.03	69.45	0.47	0.27	0.13	-42.73
Sofienbergparken	NO0073U	10.77	59.92	1.55	1.30	0.82	-16.26
Diabla Gora	PL0005R	22.07	54.15	1.30	1.39	0.76	6.89
Zielonka	PL0009R	17.93	53.66	1.28	2.29	0.35	78.94
Bredkälen	SE0005R	15.33	63.85	0.20	0.14	0.27	-31.87
Råö	SE0014R	11.91	57.39	0.79	0.86	0.25	8.74
Hallahus	SE0020R	13.15	56.04	0.82	1.24	0.46	52.25
Norunda Stenen	SE0022R	17.51	60.09	0.48	0.25	0.68	-48.15
Iskrba	SI0008R	14.87	45.57	1.42	1.37	0.18	-3.25
Chopok	SK0002R	19.58	48.93	0.85	1.18	0.29	38.94
Stará Lesná	SK0004R	20.28	49.15	1.44	2.21	0.29	52.98
Starina	SK0006R	22.27	49.05	1.45	1.81	0.51	24.68
Topolniky	SK0007R	17.86	47.96	2.33	3.25	0.80	39.52

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	271.06	319.12	0.56	17.73
Westerland	DE0001R	8.31	54.93	278.12	394.98	0.21	42.02
Waldhof	DE0002R	10.76	52.80	284.09	327.70	0.57	15.35
Schauinsland	DE0003R	7.91	47.91	646.98	360.95	0.41	-44.21
Neuglobsow	DE0007R	13.03	53.14	233.67	299.20	-0.21	28.04
Schmücke	DE0008R	10.77	50.65	489.96	422.91	0.86	-13.69
Zingst	DE0009R	12.72	54.44	169.03	190.77	0.17	12.87
Keldsnor	DK0005R	10.74	54.75	128.26	185.99	0.97	45.01
Anholt	DK0008R	11.52	56.72	13,895.83	188.52	0.45	-98.64
Sepstrup Sande	DK0022R	9.42	56.08	557.66	229.86	0.05	-58.78
Ulborg	DK0031R	8.43	56.29	18,180.29	302.58	0.55	-98.34
Lahemaa	EE0009R	25.90	59.50	165.55	120.61	0.69	-27.15
Vilsandi	EE0011R	21.82	58.38	152.63	175.02	0.32	14.67
San Pablo de los Montes	ES0001R	-4.35	39.55	234.03	104.06	0.99	-55.53
Víznar	ES0007R	-3.53	37.24	182.58	109.31	0.98	-40.13
Niembro	ES0008R	-4.85	43.44	153,384.9	121.23	0.83	-99.92
Campisabalos	ES0009R	-3.14	41.27	2,836.79	141.61	0.37	-95.01
Zarra	ES0012R	-1.10	39.08	284.57	44.58	0.15	-84.33
Els Torms	ES0014R	0.73	41.39	75.89	52.21	0.91	-31.20
Virolahti III	FI0018R	27.67	60.53	339.71	113.18	0.17	-66.68
Pallas (Matorova)	FI0036R	24.24	68.00	93.88	44.85	0.29	-52.23
Hyytiälä	FI0050R	24.28	61.85	166.94	57.65	0.07	-65.47
Hailuoto II	FI0053R	24.69	65.00	90.13	51.85	0.32	-42.47
Hietajärvi	FI0092R	30.72	63.17	135.91	53.84	0.09	-60.39
Kotinen	FI0093R	25.07	61.23	142.55	64.85	0.31	-54.51
Donon	FR0008R	7.13	48.50	802.40	171.90	0.51	-78.58
Revin	FR0009R	4.63	49.90	6,409.76	293.61	0.04	-95.42
Peyrusse Vieille	FR0013R	0.18	43.62	366.87	114.50	0.30	-68.79
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	1,918.37	275.19	0.09	-85.66
Verneuil	FR0025R	2.61	46.81	276.34	177.08	0.28	-35.92
Kergoff	FR0028R	-2.94	48.26	149.02	106.21	0.39	-28.73
Porspoder	FR0090R	-4.75	48.52	249.67	255.75	0.96	2.44
Lough Navar	GB0006R	-7.87	54.44	63.58	237.14	0.98	273.00
Yarner Wood	GB0013R	-3.71	50.60	92.50	126.68	0.70	36.95
Heigham Holmes	GB0017R	1.62	52.72	91.65	164.08	0.22	79.02
Auchencorth Moss	GB0048R	-3.24	55.79	55.93	196.24	0.51	250.86
Chilbolton Observatory	GB1055R	-1.44	51.15	68.88	223.45	0.53	224.40
Puntijarka	HR0002R	15.97	45.90	49.36	571.50	0.67	1,057.76
Zavizan	HR0004R	14.98	44.82	82.76	563.91	0.00	581.36
K-puszta	HU0002R	19.54	46.97	632.27	356.68	0.78	-43.59
Storhofdi	IS0091R	-20.29	63.40	365.19	282.44	0.33	-22.66
Monte Martano	IT0019R	12.57	42.81	1,841.37	164.86	-0.03	-91.05
Vredepeel	NL0010R	5.85	51.54	482.64	340.64	0.66	-29.42
De Zilk	NL0091R	4.50	52.30	441.67	389.79	0.47	-11.75
Birkenes	NO0001R	8.25	58.38	485.18	381.53	0.02	-21.36
Kårvatn	NO0039R	8.88	62.78	605.03	142.31	0.22	-76.48
Svanvik	NO0047R	30.03	69.45	95.77	46.31	0.01	-51.64
Hurdal	NO0056R	11.08	60.37	725.27	133.31	-0.18	-81.62
Leba	PL0004R	17.53	54.75	91.50	203.73	-0.09	122.66
Diabla Gora	PL0005R	22.07	54.15	457.46	290.65	-0.20	-36.46
Bredkälen	SE0005R	15.33	63.85	70.00	45.78	0.44	-34.61
Råö	SE0014R	11.91	57.39	178.31	201.84	0.02	13.20
Hallahus	SE0020R	13.15	56.04	229.13	297.29	0.19	29.75
Norunda Stenen	SE0022R	17.51	60.09	127.67	74.39	0.12	-41.73
Iskrba	SI0008R	14.87	45.57	1,265.96	490.67	0.79	-61.24
Chopok	SK0002R	19.58	48.93	881.65	384.26	-0.03	-56.42
Stará Lesná	SK0004R	20.28	49.15	810.45	447.64	0.20	-44.77
Starina	SK0006R	22.27	49.05	575.87	607.33	-0.61	5.46
Topolniky	SK0007R	17.86	47.96	404.86	286.74	-0.35	-29.18

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Amberd	AM0001R	44.26	40.38	0.09	0.02	0.65	-74.72
Koksijde	BE0014R	2.66	51.12	0.05	0.13	0.73	145.38
Agia Marina Xyliatou / Cyprus Atmospheric Observatory	CY0002R	33.06	35.04	0.07	0.04	0.65	-51.86
Kosetice (NAOK)	CZ0003R	15.08	49.57	0.07	0.09	0.17	30.29
Churanov	CZ0005R	13.60	49.07	0.03	0.05	-0.18	46.61
Westerland	DE0001R	8.31	54.93	0.04	0.07	0.45	93.39
Waldhof	DE0002R	10.76	52.80	0.06	0.09	0.32	57.08
Schauinsland	DE0003R	7.91	47.91	0.02	0.06	0.51	183.14
Neuglobsow	DE0007R	13.03	53.14	0.06	0.06	0.59	-4.98
Schmücke	DE0008R	10.77	50.65	0.03	0.06	-0.07	98.42
Zingst	DE0009R	12.72	54.44	0.05	0.06	0.62	37.58
Anholt	DK0008R	11.52	56.72	0.13	0.10	-0.06	-22.88
Villum Research Station, Station Nord	DK0010G	-16.67	81.60	0.01	0.01	0.88	36.36
Risø	DK0012R	12.09	55.69	0.16	0.16	-0.66	-4.44
Lahemaa	EE0009R	25.90	59.50	0.05	0.04	0.75	-18.78
San Pablo de los Montes	ES0001R	-4.35	39.55	0.03	0.04	0.50	24.71
Víznar	ES0007R	-3.53	37.24	0.05	0.05	-0.35	-5.54
Niembro	ES0008R	-4.85	43.44	0.07	0.05	0.53	-18.38
Campisabalos	ES0009R	-3.14	41.27	0.05	0.03	-0.06	-33.39
Els Torms	ES0014R	0.73	41.39	0.04	0.07	-0.28	58.63
Montseny	ES1778R	2.35	41.77	0.05	0.17	0.16	231.18
Virolahti III	FI0018R	27.67	60.53	0.04	0.02	0.42	-46.16
Pallas (Matorova)	FI0036R	24.24	68.00	0.01	0.01	0.36	-13.28
Hyytiälä	FI0050R	24.28	61.85	0.03	0.01	0.57	-61.68
Donon	FR0008R	7.13	48.50	0.03	0.05	0.62	47.23
Revin	FR0009R	4.63	49.90	0.06	0.06	-0.26	-87.27
Peyrusse Vieille	FR0013R	0.18	43.62	0.03	0.03	0.50	1.26
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	0.02	0.02	0.78	4.33
Verneuil	FR0025R	2.61	46.81	0.03	0.03	0.85	-10.64
Kergoff	FR0028R	-2.94	48.26	0.02	0.04	0.83	57.58
Yarner Wood	GB0013R	-3.71	50.60	0.03	0.06	0.83	90.09
Heigham Holmes	GB0017R	1.62	52.72	0.06	0.10	0.81	77.40
Auchencorth Moss	GB0048R	-3.24	55.79	0.02	0.06	0.07	210.07
Chilbolton Observatory	GB1055R	-1.44	51.15	0.07	0.10	0.68	56.93
K-puszta	HU0002R	19.54	46.97	0.07	0.17	0.78	132.80
Storhofdi	IS0091R	-20.29	63.40	0.01	0.02	-0.47	128.44
Monte Martano	IT0019R	12.57	42.81	0.13	0.04	-0.24	-67.32
Rucava	LV0010R	21.17	56.16	0.06	0.04	0.71	-33.18
Bilthoven	NL0008R	5.20	52.12	0.23	0.28	1.00	21.00
Birkenes II	NO0002R	8.25	58.39	0.02	0.02	0.70	25.29
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.02	0.01	0.38	-48.28
Svanvik	NO0047R	30.03	69.45	0.02	0.02	0.46	-6.98
Sofienbergparken	NO0073U	10.77	59.92	0.07	0.10	0.66	34.58
Diabla Gora	PL0005R	22.07	54.15	0.06	0.06	0.43	-5.38
Zielonka	PL0009R	17.93	53.66	0.04	0.08	0.83	84.29
Bredkälen	SE0005R	15.33	63.85	0.01	0.01	0.22	-26.91
Råö	SE0014R	11.91	57.39	0.03	0.03	0.26	26.35
Hallahus	SE0020R	13.15	56.04	0.03	0.04	0.12	20.74
Norunda Stenen	SE0022R	17.51	60.09	0.02	0.01	0.86	-39.92
Iskrba	SI0008R	14.87	45.57	0.11	0.09	0.32	-16.07
Chopok	SK0002R	19.58	48.93	0.04	0.04	0.34	8.56
Stará Lesná	SK0004R	20.28	49.15	0.07	0.08	0.49	18.09
Starina	SK0006R	22.27	49.05	0.08	0.06	0.14	-25.73
Topolniky	SK0007R	17.86	47.96	0.07	0.1	0.29	40.64

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,%
TMNT09 Vielsalm	BE0007R	6.20	50.30	12.86	10.14	0.91	-21.18
Koksijde	BE0014R	2.66	51.12	13.57	11.12	0.53	-18.08
Westerland	DE0001R	8.31	54.93	10.50	14.78	0.35	40.81
Waldhof	DE0002R	10.76	52.80	11.41	11.88	0.36	4.07
Schauinsland	DE0003R	7.91	47.91	16.91	12.94	0.66	-23.52
Neuglobsow	DE0007R	13.03	53.14	10.31	10.77	-0.04	4.42
Schmücke	DE0008R	10.77	50.65	17.62	13.99	0.70	-20.60
Zingst	DE0009R	12.72	54.44	8.91	7.50	0.24	-15.75
Keldsnor	DK0005R	10.74	54.75	32.71	7.33	-0.04	-77.60
Sepstrup Sande	DK0022R	9.42	56.08	17.63	9.30	0.23	-47.27
Ulborg	DK0031R	8.43	56.29	14.58	11.53	0.49	-20.90
Lahemaa	EE0009R	25.90	59.50	15.69	4.49	0.86	-71.40
Vilsandi	EE0011R	21.82	58.38	13.82	5.14	0.87	-62.83
San Pablo de los Montes	ES0001R	-4.35	39.55	3.65	1.35	1.00	-62.99
Víznar	ES0007R	-3.53	37.24	3.65	5.48	0.95	50.11
Niembro	ES0008R	-4.85	43.44	0.38	4.72	0.36	1131,07
Niembro	ES0008R	-4.85	43.44	38.26	3.63	0.95	-90.51
Campisabalos	ES0009R	-3.14	41.27	83.61	5.42	0.34	-93.51
Zarra	ES0012R	-1.10	39.08	8.49	1.44	0.45	-82.98
Virolahti III	FI0018R	27.67	60.53	11.82	4.80	0.57	-59.34
Pallas (Matorova)	FI0036R	24.24	68.00	3.74	2.56	0.33	-31.51
Hyytiälä	FI0050R	24.28	61.85	7.04	2.59	0.09	-63.29
Hailuoto II	FI0053R	24.69	65.00	4.58	2.63	0.49	-42.57
Hietajärvi	FI0092R	30.72	63.17	5.59	2.74	0.23	-50.95
Kotinen	FI0093R	25.07	61.23	8.12	2.98	0.76	-63.38
Donon	FR0008R	7.13	48.50	43.41	6.35	-0.39	-85.36
Revin	FR0009R	4.63	49.90	25.26	7.69	0.61	-69.54
Peyrusse Vieille	FR0013R	0.18	43.62	15.22	4.17	0.00	-72.63
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	21.92	7.12	0.65	-67.51
Verneuil	FR0025R	2.61	46.81	14.01	5.76	0.04	-58.85
Kergoff	FR0028R	-2.94	48.26	15.80	3.44	0.80	-78.23
Porspoder	FR0090R	-4.75	48.52	21.24	9.61	0.49	-54.75
Lough Navar	GB0006R	-7.87	54.44	12.53	10.20	1.00	-18.54
Yarner Wood	GB0013R	-3.71	50.60	7.74	5.62	0.80	-27.42
Heigham Holmes	GB0017R	1.62	52.72	8.17	6.08	0.82	-25.57
Auchencorth Moss	GB0048R	-3.24	55.79	3.89	6.24	0.87	60.36
Chilbolton Observatory	GB1055R	-1.44	51.15	6.71	8.31	0.65	23.71
Puntijarka	HR0002R	15.97	45.90	221.67	24.11	0.56	-89.12
Zavizan	HR0004R	14.98	44.82	219.44	15.10	0.20	-93.12
K-puszta	HU0002R	19.54	46.97	136.90	13.32	0.68	-90.27
Storhofdi	IS0091R	-20.29	63.40	21.96	11.08	0.27	-49.51
Monte Martano	IT0019R	12.57	42.81	159.85	5.36	0.62	-96.65
Vredepeel	NL0010R	5.85	51.54	30.65	16.26	0.88	-46.94
De Zilk	NL0091R	4.50	52.30	44.11	7.73	0.86	-82.48
Birkenes	NO0001R	8.25	58.38	22.12	11.82	0.39	-46.58
Kårvatn	NO0039R	8.88	62.78	19.42	5.99	0.43	-69.17
Svanvik	NO0047R	30.03	69.45	4.99	2.03	0.13	-59.41
Hurdal	NO0056R	11.08	60.37	27.80	6.00	0.58	-78.43
Leba	PL0004R	17.53	54.75	8.86	7.44	0.23	-15.99
Diabla Gora	PL0005R	22.07	54.15	19.56	9.79	0.41	-49.93
Bredkälen	SE0005R	15.33	63.85	7.70	2.23	-0.20	-71.04
Råö	SE0014R	11.91	57.39	43.64	8.07	0.20	-81.50
Hallahus	SE0020R	13.15	56.04	29.16	11.37	-0.17	-61.03
Norunda Stenen	SE0022R	17.51	60.09	7.96	3.47	0.67	-56.48
Iskrba	SI0008R	14.87	45.57	34.93	3.15	0.99	-90.99
Chopok	SK0002R	19.58	48.93	57.21	11.78	0.24	-79.41
Stará Lesná	SK0004R	20.28	49.15	98.16	14.76	0.47	-84.97
Starina	SK0006R	22.27	49.05	48.69	16.96	0.69	-65.18
Topolniky	SK0007R	17.86	47.96	40.80	9.37	0.62	-77.04

Table C6. *Statistical parameters for evaluating modelled Hg air concentration (ng m^{-3}) against measurements.*

Stationname	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Waldhof	DE0002R	10.76	52.80	1.62	1.27	0.53	-21.57
Schauinsland	DE0003R	7.91	47.91	1.21	1.23	0.22	1.45
Schmücke	DE0008R	10.77	50.65	1.47	1.28	0.84	-13.25
Zingst	DE0009R	12.72	54.44	1.43	1.34	0.03	-6.27
VillumResearchStation,StationNord	DK0010G	-16.67	81.60	1.22	1.16	0.62	-5.08
Lahemaa	EE0009R	25.90	59.50	1.06	1.30	0.75	22.43
VirolahtiIII	FI0018R	27.67	60.53	1.18	1.28	-0.28	7.92
Pallas(Matorova)	FI0036R	24.24	68.00	1.35	1.21	-0.30	-10.15
Hyytiälä	FI0050R	24.28	61.85	1.28	1.24	-0.50	-3.04
AuchencorthMoss	GB0048R	-3.24	55.79	1.30	1.25	0.29	-3.82
ChilboltonObservatory	GB1055R	-1.44	51.15	1.46	1.31	0.63	-10.04
Rucava	LV0010R	21.17	56.16	1.45	1.19	-0.77	-17.84
BirkenesII	NO0002R	8.25	58.39	1.48	1.27	-0.42	-13.69
Zeppelinmountain(Ny-Ålesund)	NO0042G	11.89	78.91	1.51	1.21	0.54	-19.80
Sofienbergparken	NO0073U	10.77	59.92	1.52	1.23	0.30	-19.11
DiablaGora	PL0005R	22.07	54.15	1.41	1.24	-0.16	-12.12
Råö	SE0014R	11.91	57.39	1.29	1.32	0.27	2.60
Iskrba	SI0008R	14.87	45.57	1.24	1.30	-0.39	4.58

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,%
Westerland	DE0001R	8.31	54.93	4.40	8.59	0.66	95.22
Waldhof	DE0002R	10.76	52.80	4.88	7.16	0.94	46.62
Schauinsland	DE0003R	7.91	47.91	13.98	16.39	0.85	17.24
Schmücke	DE0008R	10.77	50.65	6.42	10.70	0.71	66.73
Zingst	DE0009R	12.72	54.44	3.13	4.37	0.80	39.88
Niembro	ES0008R	-4.85	43.44	25.82	2.55	0.15	-90.12
Virolahti III	FI0018R	27.67	60.53	1.95	6.01	-0.05	208.98
Pallas (Matorova)	FI0036R	24.24	68.00	1.55	12.54	-0.16	711.81
Hyytiälä	FI0050R	24.28	61.85	1.57	5.64	0.05	259.12
Kotinen	FI0093R	25.07	61.23	1.82	5.20	0.30	185.84
Yarner Wood	GB0013R	-3.71	50.60	6.23	7.10	0.32	13.88
Heigham Holmes	GB0017R	1.62	52.72	3.84	5.31	0.63	38.25
Auchencorth Moss	GB0048R	-3.24	55.79	2.54	4.13	0.42	62.48
Chilbolton Observatory	GB1055R	-1.44	51.15	4.01	8.56	0.63	113.68
De Zilk	NL0091R	4.50	52.30	9.27	8.77	0.61	-5.47
Birkenes	NO0001R	8.25	58.38	11.59	11.17	0.19	-3.63
Kårvatn	NO0039R	8.88	62.78	5.80	14.32	0.61	147.16
Hurdal	NO0056R	11.08	60.37	8.02	10.21	0.79	27.29
Diabla Gora	PL0005R	22.07	54.15	2.86	7.15	0.07	150.29
Bredkälen	SE0005R	15.33	63.85	2.05	6.68	0.45	226.81
Råö	SE0014R	11.91	57.39	3.76	6.51	0.83	73.08
Hallahus	SE0020R	13.15	56.04	4.17	8.85	0.80	112.03
Iskrba	SI0008R	14.87	45.57	7.17	14.41	0.73	101.05

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Houtem	BE0013R	2.58	51.02	0.05	0.06	0.94	16.41
Kosetice (NAOK)	CZ0003R	15.08	49.57	0.23	0.57	0.88	145.44
Westerland	DE0001R	8.31	54.93	0.02	0.04	0.82	71.20
Waldhof	DE0002R	10.76	52.80	0.05	0.08	0.78	70.38
Schauinsland	DE0003R	7.91	47.91	0.01	0.10	0.51	886.18
Schmücke	DE0008R	10.77	50.65	0.03	0.09	0.73	175.53
Zingst	DE0009R	12.72	54.44	0.06	0.06	0.91	7.46
Lahemaa	EE0009R	25.90	59.50	0.08	0.04	0.96	-46.98
Víznar	ES0007R	-3.53	37.24	0.08	0.06	-	-24.23
Els Torms	ES0014R	0.73	41.39	0.09	0.02	-	-80.19
Virolahti III	FI0018R	27.67	60.53	0.13	0.06	0.89	-56.24
Pallas (Matorova)	FI0036R	24.24	68.00	0.01	0.01	0.96	-38.29
Hyytiälä	FI0050R	24.28	61.85	0.09	0.05	0.90	-47.80
Donon	FR0008R	7.13	48.50	0.03	0.05	0.60	51.37
Revin	FR0009R	4.63	49.90	0.04	0.05	0.75	26.73
Peyrusse Vieille	FR0013R	0.18	43.62	0.04	0.02	0.81	-50.92
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	0.10	0.01	0.76	-87.80
Verneuil	FR0025R	2.61	46.81	0.08	0.03	0.68	-68.58
Kergoff	FR0028R	-2.94	48.26	0.03	0.03	0.85	11.21
High Muffles	GB0014R	-0.81	54.33	0.04	0.03	0.85	-23.57
Auchencorth Moss	GB0048R	-3.24	55.79	0.02	0.02	0.77	37.44
Chilbolton Observatory	GB1055R	-1.44	51.15	0.07	0.03	0.89	-53.04
Puntijarka	HR0002R	15.97	45.90	0.09	0.53	0.02	463.79
Rucava	LV0010R	21.17	56.16	0.15	0.10	0.35	-32.86
De Zilk	NL0091R	4.50	52.30	0.02	0.06	0.76	178.80
Birkenes II	NO0002R	8.25	58.39	0.02	0.01	0.22	-58.15
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.01	0.00	-0.41	-99.89
Diabla Gora	PL0005R	22.07	54.15	0.47	0.27	0.81	-41.89
Zielonka	PL0009R	17.93	53.66	0.45	0.59	0.98	29.41
Råö	SE0014R	11.91	57.39	0.03	0.03	0.77	4.21
Hallahus	SE0020R	13.15	56.04	0.02	0.08	0.54	288.03
Norunda Stenen	SE0022R	17.51	60.09	0.01	0.02	0.88	46.11
Iskrba	SI0008R	14.87	45.57	0.22	0.16	0.93	-26.66

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Houtem	BE0013R	2.58	51.02	6.60	1.70	0.51	-74.18
Kosetice (NAOK)	CZ0003R	15.08	49.57	14.92	40.23	0.84	169.62
Westerland	DE0001R	8.31	54.93	1.01	1.19	0.45	17.22
Waldhof	DE0002R	10.76	52.80	2.31	1.71	0.55	-26.40
Schauinsland	DE0003R	7.91	47.91	4.59	3.95	0.71	-13.78
Schmücke	DE0008R	10.77	50.65	5.45	3.19	0.83	-41.75
Zingst	DE0009R	12.72	54.44	1.62	1.18	0.55	-27.39
Víznar	ES0007R	-3.53	37.24	1.21	0.97	1.00	-19.67
Virolahti III	FI0018R	27.67	60.53	3.05	2.16	0.97	-29.44
Pallas (Matorova)	FI0036R	24.24	68.00	0.54	0.79	0.90	46.52
Hyytiälä	FI0050R	24.28	61.85	0.89	1.44	0.74	60.41
Donon	FR0008R	7.13	48.50	4.10	0.92	-0.01	-77.61
Revin	FR0009R	4.63	49.90	3.75	1.36	0.48	-63.83
Peyrusse Vieille	FR0013R	0.18	43.62	2.77	0.38	-0.27	-86.37
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	1.80	0.34	-0.13	-81.44
Verneuil	FR0025R	2.61	46.81	1.72	0.49	-0.47	-71.76
Kergoff	FR0028R	-2.94	48.26	1.29	0.32	-0.54	-75.31
Chilbolton Observatory	GB1055R	-1.44	51.15	14.05	0.12	0.95	-99.00
De Zilk	NL0091R	4.50	52.30	1.47	1.58	0.15	7.46
Diabla Gora	PL0005R	22.07	54.15	11.30	5.78	0.54	-49.00
Råö	SE0014R	11.91	57.39	0.81	1.03	0.59	25.97
Hallahus	SE0020R	13.15	56.04	2.06	2.07	0.59	0.62
Norunda Stenen	SE0022R	17.51	60.09	0.98	0.61	0.23	-37.77
Iskrba	SI0008R	14.87	45.57	8.96	8.00	0.91	-10.94

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Kosetice (NAOK)	CZ0003R	15.08	49.57	0.30	0.52	0.86	75.65
Els Torms	ES0014R	0.73	41.39	0.12	0.05		-60.20
Pallas (Matorova)	FI0036R	24.24	68.00	0.01	0.02	0.98	12.57
Donon	FR0008R	7.13	48.50	0.04	0.11	0.66	154.50
Revin	FR0009R	4.63	49.90	0.06	0.09	0.78	56.66
Peyrusse Vieille	FR0013R	0.18	43.62	0.06	0.05	0.86	-29.03
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	0.11	0.03	0.81	-69.70
Verneuil	FR0025R	2.61	46.81	0.11	0.06	0.77	-45.04
Kergoff	FR0028R	-2.94	48.26	0.03	0.05	0.92	42.11
High Muffles	GB0014R	-0.81	54.33	0.07	0.05	0.94	-22.03
Auchencorth Moss	GB0048R	-3.24	55.79	0.03	0.04	0.96	15.23
Chilbolton Observatory	GB1055R	-1.44	51.15	0.09	0.06	0.92	-33.26
Rucava	LV0010R	21.17	56.16	0.20	0.18	0.66	-11.33
Birkenes II	NO0002R	8.25	58.39	0.04	0.03	0.75	-32.37
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.02	0.00	0.18	-99.16
Diabla Gora	PL0005R	22.07	54.15	0.74	0.44	0.97	-40.80
Zielonka	PL0009R	17.93	53.66	0.66	0.93	0.93	40.29
Råö	SE0014R	11.91	57.39	0.04	0.06	0.79	56.81
Hallahus	SE0020R	13.15	56.04	0.04	0.10	0.80	179.06
Norunda Stenen	SE0022R	17.51	60.09	0.02	0.04	0.85	85.31

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Houtem	BE0013R	2.58	51.02	4.83	3.21	0.52	-33.63
Kosetice (NAOK)	CZ0003R	15.08	49.57	16.21	45.77	0.91	181.01
Víznar	ES0007R	-3.53	37.24	0.88	1.63	1.00	82.37
Niembro	ES0008R	-4.85	43.44	0.99	3.61	0.89	263.21
Els Torms	ES0014R	0.73	41.39	0.76	0.94	1.00	24.23
Virolahti III	FI0018R	27.67	60.53	6.06	5.30	0.95	-13.22
Pallas (Matorova)	FI0036R	24.24	68.00	0.51	0.84	0.56	60.08
Hyytiälä	FI0050R	24.28	61.85	1.72	2.81	0.75	60.03
Donon	FR0008R	7.13	48.50	7.76	2.33	0.61	-70.03
Revin	FR0009R	4.63	49.90	8.37	3.08	0.88	-63.50
Peyrusse Vieille	FR0013R	0.18	43.62	5.27	0.93	-0.09	-82.35
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	2.60	0.96	0.38	-64.44
Verneuil	FR0025R	2.61	46.81	3.16	1.31	-0.25	-58.80
Kergoff	FR0028R	-2.94	48.26	2.03	0.72	-0.36	-64.72
Auchencorth Moss	GB0048R	-3.24	55.79	8.76	0.66	0.99	-92.50
Chilbolton Observatory	GB1055R	-1.44	51.15	11.42	1.21	0.50	-88.96
Diabla Gora	PL0005R	22.07	54.15	17.98	12.27	0.67	-32.13
Råö	SE0014R	11.91	57.39	1.51	3.18	0.62	109.50
Hallahus	SE0020R	13.15	56.04	4.45	5.28	0.65	18.22
Norunda Stenen	SE0022R	17.51	60.09	1.50	2.15	0.71	40.95

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Kosetice (NAOK)	CZ0003R	15.08	49.57	0.17	0.31	0.86	87.06
Els Torms	ES0014R	0.73	41.39	0.08	0.01	-	-84.30
Pallas (Matorova)	FI0036R	24.24	68.00	0.01	0.01	0.98	68.67
Donon	FR0008R	7.13	48.50	0.03	0.06	0.61	124.81
Revin	FR0009R	4.63	49.90	0.03	0.04	0.79	39.47
Peyrusse Vieille	FR0013R	0.18	43.62	0.04	0.02	0.78	-42.44
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	0.06	0.01	0.72	-77.83
Verneuil	FR0025R	2.61	46.81	0.06	0.03	0.78	-50.85
Kergoff	FR0028R	-2.94	48.26	0.02	0.03	0.95	25.70
High Muffles	GB0014R	-0.81	54.33	0.03	0.03	0.86	-23.02
Auchencorth Moss	GB0048R	-3.24	55.79	0.02	0.02	0.86	4.62
Chilbolton Observatory	GB1055R	-1.44	51.15	0.05	0.03	0.89	-44.41
Rucava	LV0010R	21.17	56.16	0.14	0.08	0.43	-43.33
Birkenes II	NO0002R	8.25	58.39	0.02	0.01	0.59	-41.48
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.01	0.00	0.31	-98.93
Diabla Gora	PL0005R	22.07	54.15	0.36	0.17	0.97	-52.88
Zielonka	PL0009R	17.93	53.66	0.35	0.37	0.98	4.68
Råö	SE0014R	11.91	57.39	0.02	0.02	0.78	20.89
Hallahus	SE0020R	13.15	56.04	0.01	0.04	0.74	175.31
Norunda Stenen	SE0022R	17.51	60.09	0.01	0.01	0.85	40.72

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

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Houtem	BE0013R	2.58	51.02	2.45	1.53	0.52	-37.83
Kosetice (NAOK)	CZ0003R	15.08	49.57	9.41	19.89	0.80	111.41
Niembro	ES0008R	-4.85	43.44	0.53	0.99	1.00	88.55
Virolahti III	FI0018R	27.67	60.53	2.93	2.40	0.95	-18.86
Pallas (Matorova)	FI0036R	24.24	68.00	0.21	0.46	0.65	120.54
Hyytiälä	FI0050R	24.28	61.85	0.84	1.40	0.81	63.67
Donon	FR0008R	7.13	48.50	3.31	0.94	0.37	-71.66
Revin	FR0009R	4.63	49.90	3.48	1.27	0.77	-63.70
Peyrusse Vieille	FR0013R	0.18	43.62	2.90	0.35	-0.38	-88.06
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	1.47	0.35	-0.14	-76.81
Verneuil	FR0025R	2.61	46.81	1.45	0.48	-0.31	-66.74
Kergoff	FR0028R	-2.94	48.26	0.98	0.28	-0.34	-71.14
Auchencorth Moss	GB0048R	-3.24	55.79	6.57	0.23	0.99	-96.61
Chilbolton Observatory	GB1055R	-1.44	51.15	7.55	0.54	0.61	-92.73
Diabla Gora	PL0005R	22.07	54.15	6.69	4.61	0.63	-31.53
Råö	SE0014R	11.91	57.39	0.63	1.15	0.55	82.70
Hallahus	SE0020R	13.15	56.04	2.02	2.00	0.66	-1.47
Norunda Stenen	SE0022R	17.51	60.09	0.63	0.71	0.49	11.79

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	0.06	0.09	0.93	43.96
Kosetice (NAOK)	CZ0003R	15.08	49.57	0.34	0.43	0.86	26.87
Lahemaa	EE0009R	25.90	59.50	0.08	0.08	0.96	-3.25
Niembro	ES0008R	-4.85	43.44	0.07	0.05	-	-23.97
Zarra	ES0012R	-1.10	39.08	0.08	0.02	-	-80.37
Els Torms	ES0014R	0.73	41.39	0.09	0.04	-0.51	-61.05
Virolahti III	FI0018R	27.67	60.53	0.07	0.09	0.75	24.85
Pallas (Matorova)	FI0036R	24.24	68.00	0.01	0.01	0.92	74.40
Pallas (Matorova)	FI0036R	24.24	68.00	0.01	0.01	0.96	52.54
Hyytiälä	FI0050R	24.28	61.85	0.05	0.07	0.83	48.27
Donon	FR0008R	7.13	48.50	0.04	0.07	0.72	103.37
Revin	FR0009R	4.63	49.90	0.05	0.06	0.79	24.49
Peyrusse Vieille	FR0013R	0.18	43.62	0.05	0.03	0.85	-34.96
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	0.09	0.02	0.82	-78.59
Verneuil	FR0025R	2.61	46.81	0.09	0.04	0.75	-57.67
Kergoff	FR0028R	-2.94	48.26	0.02	0.03	0.94	26.38
High Muffles	GB0014R	-0.81	54.33	0.04	0.06	0.92	27.23
Auchencorth Moss	GB0048R	-3.24	55.79	0.03	0.04	0.88	53.99
Chilbolton Observatory	GB1055R	-1.44	51.15	0.07	0.06	0.93	-7.17
Puntijarka	HR0002R	15.97	45.90	0.11	0.49	0.48	326.93
Rucava	LV0010R	21.17	56.16	0.05	0.14	0.48	157.05
De Zilk	NL0091R	4.50	52.30	0.04	0.07	0.89	81.81
Birkenes II	NO0002R	8.25	58.39	0.03	0.01	0.49	-63.85
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.01	0.00	0.13	-99.32
Diabla Gora	PL0005R	22.07	54.15	0.53	0.21	0.93	-60.84
Zielonka	PL0009R	17.93	53.66	0.68	0.33	0.80	-52.04
Råö	SE0014R	11.91	57.39	0.03	0.03	0.73	23.02
Hallahus	SE0020R	13.15	56.04	0.03	0.06	0.66	89.73
Norunda Stenen	SE0022R	17.51	60.09	0.01	0.02	0.85	67.99
Iskrba	SI0008R	14.87	45.57	0.23	0.18	0.94	-23.20

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	2.35	1.78	0.45	-24.26
Kosetice (NAOK)	CZ0003R	15.08	49.57	12.40	30.61	0.91	146.87
Westerland	DE0001R	8.31	54.93	1.75	2.02	0.80	15.17
Waldhof	DE0002R	10.76	52.80	4.30	2.95	0.84	-31.37
Schauinsland	DE0003R	7.91	47.91	7.54	4.20	0.85	-44.25
Schmücke	DE0008R	10.77	50.65	12.58	4.42	0.90	-64.83
Zingst	DE0009R	12.72	54.44	3.07	2.01	0.69	-34.61
Víznar	ES0007R	-3.53	37.24	1.16	0.84	1.00	-28.13
Virolahti III	FI0018R	27.67	60.53	3.86	2.80	0.96	-27.61
Pallas (Matorova)	FI0036R	24.24	68.00	0.48	0.66	0.37	34.98
Hyytiälä	FI0050R	24.28	61.85	1.16	1.64	0.76	41.17
Donon	FR0008R	7.13	48.50	6.76	1.21	0.60	-82.13
Peyrusse Vieille	FR0013R	0.18	43.62	4.83	0.49	-0.26	-89.84
Saint-Nazaire-le-Désert	FR0023R	5.28	44.57	2.50	0.40	0.29	-84.24
Verneuil	FR0025R	2.61	46.81	2.65	0.68	-0.37	-74.27
Kergoff	FR0028R	-2.94	48.26	2.04	0.36	-0.48	-82.32
Auchencorth Moss	GB0048R	-3.24	55.79	8.03	0.49	0.99	-93.95
Chilbolton Observatory	GB1055R	-1.44	51.15	9.31	0.95	0.62	-89.85
De Zilk	NL0091R	4.50	52.30	1.69	1.77	0.39	4.51
Diabla Gora	PL0005R	22.07	54.15	13.54	4.70	0.68	-65.29
Råö	SE0014R	11.91	57.39	1.06	1.59	0.60	49.28
Hallahus	SE0020R	13.15	56.04	3.33	2.73	0.59	-17.91
Norunda Stenen	SE0022R	17.51	60.09	1.09	0.99	0.60	-9.71
Iskrba	SI0008R	14.87	45.57	11.23	7.26	0.92	-35.36

Table C16. *Statistical parameters for evaluating modelled HCB air concentration (pg m^{-3}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Kosetice (NAOK)	CZ0003R	15.08	49.57	66.36	16.67	0.89	-74.88
Westerland	DE0001R	8.31	54.93	15.52	12.93	-0.67	-16.70
Waldhof	DE0002R	10.76	52.80	16.15	16.69	-0.02	3.34
Schauinsland	DE0003R	7.91	47.91	16.39	16.09	-0.81	-1.81
Schmücke	DE0008R	10.77	50.65	18.09	16.91	-0.73	-6.55
Zingst	DE0009R	12.72	54.44	14.85	15.15	-0.82	2.01
Villum Research Station, Station Nord	DK0010G	-16.67	81.60	44.63	7.63	-0.66	-82.90
Pallas (Matorova)	FI0036R	24.24	68.00	15.69	12.51	-0.84	-20.27
Storhofdi	IS0091R	-20.29	63.40	4.60	7.92	-0.79	72.09
Birkenes II	NO0002R	8.25	58.39	37.66	13.37	-0.81	-64.49
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	52.48	7.90	0.08	-84.94
Råö	SE0014R	11.91	57.39	12.12	14.19	-0.74	17.12
Norunda Stenen	SE0022R	17.51	60.09	14.29	13.74	-0.82	-3.89

Table C17. *Statistical parameters for evaluating modelled PCB-153 air concentration (pg m^{-3}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Kosetice (NAOK)	CZ0003R	15.08	49.57	0.80	1.19	0.81	48.24
Westerland	DE0001R	8.31	54.93	1.12	0.62	0.74	-44.33
Waldhof	DE0002R	10.76	52.80	0.93	1.16	0.70	23.78
Schauinsland	DE0003R	7.91	47.91	1.01	1.87	0.90	84.10
Schmücke	DE0008R	10.77	50.65	0.79	1.45	0.54	82.65
Zingst	DE0009R	12.72	54.44	0.54	0.66	0.59	22.62
Pallas (Matorova)	FI0036R	24.24	68.00	0.12	0.17	0.97	41.91
Storhofdi	IS0091R	-20.29	63.40	0.23	0.11	-0.06	-52.41
Birkenes II	NO0002R	8.25	58.39	0.20	0.22	0.77	9.53
Zeppelin mountain (Ny-Ålesund)	NO0042G	11.89	78.91	0.07	0.03	-0.11	-56.22
Råö	SE0014R	11.91	57.39	0.63	0.42	0.65	-33.51
Norunda Stenen	SE0022R	17.51	60.09	0.22	0.30	0.92	37.82

Table C18. *Statistical parameters for evaluating modelled PCDD/Fs air concentration (fg TEQ m^{-3}) against measurements.*

Station name	Code	Longitude	Latitude	Observed	Modelled	Rcorr	Bias,%
Råö	SE0014R	11.91	57.39	0.61	0.58	0.38	-4.35
Norunda Stenen	SE0022R	17.51	60.09	0.43	0.29	0.81	-30.74

Annex D. Positive matrix factorization (PMF) analysis of PAH pollution for individual moss species

Considering that morphological and ecological differences between the moss species might significantly influence their PAH uptake dynamics in several key ways, the Positive Matrix Factorization (PMF) analysis was performed with PAH measurements for individual moss species – *Hylocomium Splendens, Hypnum cupressiforme, Pleurozium schreberi* (Fig. D.1).

Hypnum cupressiforme (3 countries, 53 samples) PMF-based sources were divided in *Source 1*: with dominance of naphthalene and phenanthrene linked to road transport and waste; *Source 2*: with dominance of naphthalene associated with road transport; and *Source 3*: with dominance of fluoranthene, pyrene, as well as other heavy molecular weight compounds strongly linked to waste and stationary combustion. Deposition flux per source vs. Source 3 presented significant correlation coefficient with sectors *J_Wst* and *C_OSC*, while *B_Ind* and *Reemission* is negatively related to both Source 1 and Source 3. Differently, source relative contribution was strongly correlated for Source 3 and *C_OSC* and *J_Wst*, Source 2 and *F_RTr*, and Source 1 and *F_RTr*, *J_Wst*, and *restAnt*. This pattern suggests *H. cupressiforme* effectively discriminates between fresh combustion sources (LMW-dominated) and aged/industrial sources (HMW-dominated).

Hylocomium splendens (3 countries, 28 samples) PMF sources were divided in: *Source 1* with dominance of other HMW compounds, *Source 2* with dominance of naphthalene and of other LMW compounds, and *Source 3* with dominance of phenanthrene and fluoranthene and a few other LMW compounds. Deposition flux per source presented high correlation coefficients of Source 1 with *F_RTr* and transboundary sources, while it was negatively correlated to Source 2. On the other hand, the *C_OSC*, *F_RTr* and *J_Wst* relative contribution was significantly correlated to Source 1, while Source 2 was positively correlated to *C_OSC*. Showing a better capture of regional/long-range transport patterns.

Pleurozium schreberi (3 countries, 31 samples) PMF sources were divided in: *Source 1* with dominance of mainly naphthalene and a few other LMW compounds, *Source 2* with dominance of HMW compounds, and *Source 3* with low dominance of naphthalene, phenanthrene and a few other LMW compounds. Deposition flux per source presented positive correlation coefficients of Source 1 with *C_OSC*, *F_RTr*, *J_Wst* and reemission, of Source 2 with transboundary sources, and Source 3 with all identified sources with exception of Industry while negatively correlated to transboundary sources. Meanwhile, the *C_OSC* was strongly correlated to Source 1, transboundary sources to Source 2 and, *F_RTr*, *J_Wst* and *C_OSC* and again while negatively correlated to transboundary sources. P. *schreberi* showed the most complex source interactions. It captures influence from multiple source types simultaneously, strong sensitivity to local combustion sources (*C_OSC*, *F_RTr*, *J_Wst*), and detection of negative correlations with transboundary sources.

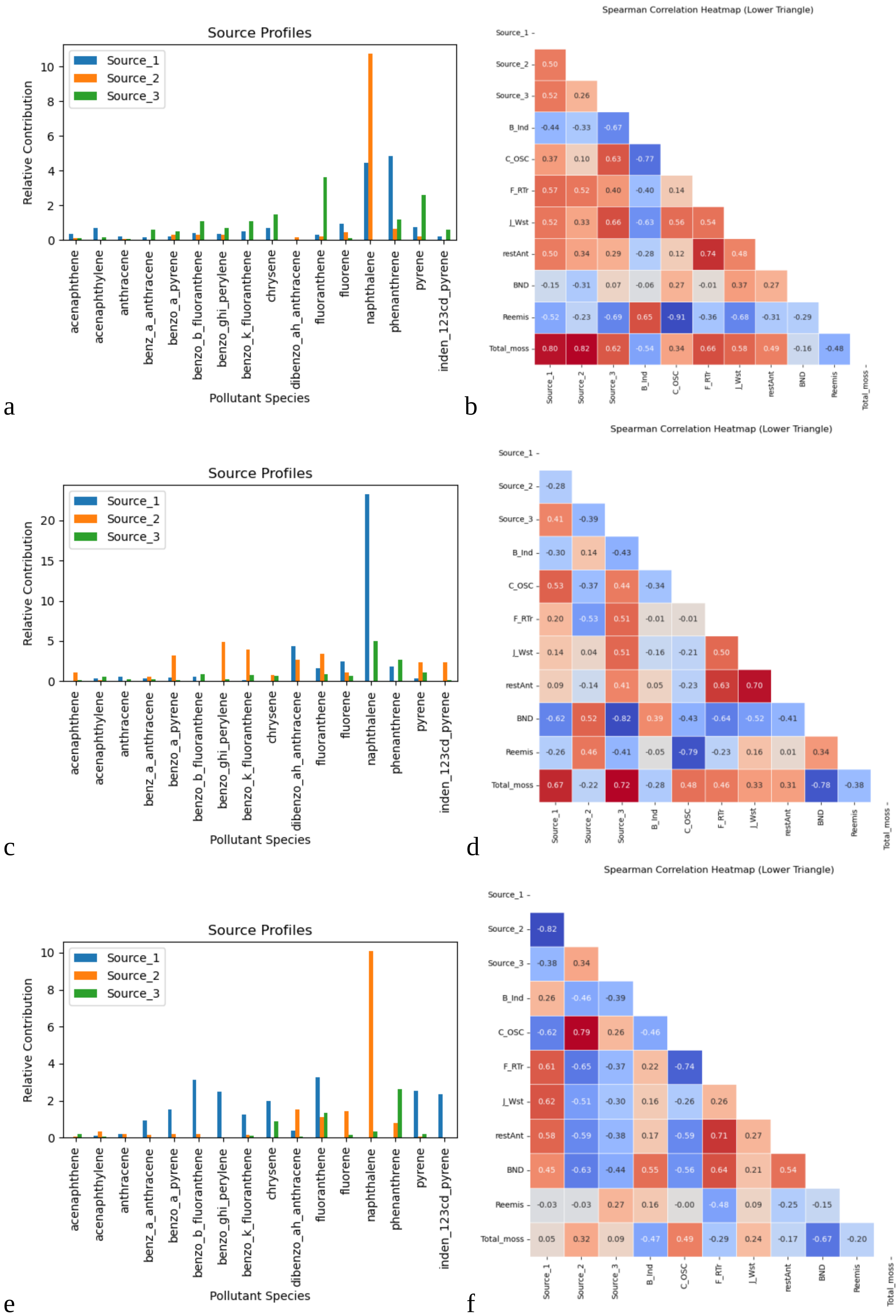


__Fig. D.1.__ Positive Matrix Factorization (PMF) source profiles and corresponding Spearman correlation heatmaps between PMF-based sources and simulated deposition of the sum of 4 PAHs from different emission sectors (B_Ind: Industry, C_OSC: Other Stationary Combustion, F_RTr: Road Transport, J_Wst: Waste, restAnt: other EMEP sources, BND: non-EMEP sources, Reemis: Re-emission). Results are shown for individual moss species: H. cupressiforme (a, b), H. splendens (c, d), and P. schreberi (e, f).

emep

Meteorological Synthesizing Centre - East
Jožef Stefan Institute (JSI)
Jamova cesta 39, 1000 Ljubljana, Slovenia

ccc
NILU
P.O. Box 100
NO-2027 Kjeller
Norway
Phone: +47 63 89 80 00
E-mail: kjetil.torseth@nilu.no
Internet: www.nilu.no

ciam
International Institute for Applied Systems Analysis (IIASA)
Schlossplatz 1
A-2361 Laxenburg
Austria
Phone: +43 2236 807 0
E-mail: klimont@iiasa.ac.at
Internet: www.iiasa.ac.at

ceip
Umweltbundesamt GmbH
Spittelauer Lände 5
1090 Vienna
Austria
Phone: +43-(0)1-313 04
E-mail: emep.emissions@umweltbundesamt.at
Internet: http://www.umweltbundesamt.at/

msc-e
Meteorological Synthesizing Centre-East
Jožef Stefan Institute (JSI)
Department of Environmental Sciences, Jamova cesta 39, 1000 Ljubljana
Slovenia
Phone: +386 1 588 53 55
E-mail: o2-tajnistvo@ijs.si
Internet: msc-east.org

msc-w
Norwegian Meteorological Institute (MET Norway)
P.O. Box 43 Blindern
NO-0313 OSLO
Norway
Phone: +47 22 96 30 00
E-mail: emep.mscw@met.no
Internet: www.emep.int