Convention on Long-range Transboundary Air Pollution

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

TECHNICAL REPORT CEIP 1/2023

Summary of the Stage 3 ad-hoc review 2022 of emission inventories submitted under the UNECE LRTAP Convention

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CEIP umweltbundesamt
PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT

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Project management

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Introduction

1) At its seventh joint session in September 2021 the Steering Body and the Working Group on Effects approved the plan to perform (in 2022) an in-depth review of $PM_{2.5}$ emissions from residential heating and road transport, with a special focus on the topic of '*condensable particulate matter*'.

2) This report summarizes the results of the stage 3 centralised review (ad hoc review) 2022 of the UNECE LRTAP Convention that was dedicated to the topic of $PM_{2.5}$ emissions from residential heating and road transport, with a special focus on the topic of '*condensable particulate matter*'. The review was coordinated by the EMEP emission centre CEIP acting as review secretariat. The review took place between April and June 2022 and was performed as desk review with an in person meeting between 30 May 2022 and 3 June 2022. The following team of nominated experts from the roster of experts performed the review.

   1A3b Road Transport: Gudrun Stranner (Austria), Katrina Young (EU), Magdalena Zimakowska-Laskowska (Poland), Martina Toceva (North Macedonia) and Rebecca Rose (United Kingdom)

   1A4bi Residential: stationary: Aleksandra Nestorovska-Krsteska (North Macedonia), André Amaro (Portugal), Benjamin Cuniasse (France), Canan Esin Köksal (Turkey), Damian Zasina (Poland), Laureta Dibra (Albania), Marion Pinterits (EU), Sam Gorji (United Kingdom) and Wolfgang Schieder (Austria)

   Kristina Saarinen (Finland), Jeroen Kuenen (Netherlands) and Ben Richmond (United Kingdom) acted as the lead reviewers.

3) Parties provided the necessary resources to enable the nominated expert's participation in the review. The European Union has supported the travel/accommodation for seven experts from the Western Balkan and Turkey via the European pre-accession funds.

4) All Parties that provided an Informative Inventory Report before the start of the desk review (20 April 2022) were reviewed. In total 40 Parties were reviewed (see Table 1 and Table 2). National experts answered the questions of the expert review team and provided additional information. Thus they considerably contributed to the review.

5) Particulate matter consists of solid or liquid matter which is directly emitted (the "filterable" portion), however additional particulate matter can be formed when hot flue gases in the stack are discharged into ambient air. Upon cooling and dilution, these hot gases condense and/or react which may form additional particulate matter (the "condensable" portion). All condensable PM is assumed to be in the $PM_{2.5}$ size fraction. The inclusion of the condensable component of $PM_{2.5}$ emissions can have a big impact on the emission estimate for certain sources[1].

[1] For more technical details please refer to the EMEP/EEA Guidebook (https://www.eea.europa.eu/publications/emep-eea-guidebook-2019) or the report 'How should condensables be included in PM emission inventories reported to EMEP/CLRTAP?' https://emep.int/publ/reports/2020/emep_mscw_technical_report_4_2020.pdf

6) The aim of this summary report is to provide the results of the review to all experts that work on the topic condensables for the LRTAP Convention in an easily accessible format. More details of the review are publically available in the country review reports on the CEIP website.[2]

[2] https://www.ceip.at/status-of-reporting-and-review-results/2022-submission

Summary of the review results

Summary of the review results for 1.A.4.b.i Residential: stationary

Table 1: Summary table of 1.A.4.b.i Residential: stationary

Country	Method Tier	Source of Activity Data	Includes wood harvested outside formal market activity	Biomass includes condensable components of $PM_{2.5}$ emissions	Spatial distribution of $PM_{2.5}$ emissions from small combustion
Austria	☐ 1 ☒ 2 ☐ 3	National energy balance provided by Statistik Austria	Yes	Yes, partially	Emissions are spatially distributed using proxy data based on an energy demand model for space heating and based on the Austrian register of buildings and dwellings
Belgium	☐ 1 ☒ 2 ☐ 3	Based on the energy balances from Flanders and Walloon region and regional energy balance for Brussels Capital region	Yes (Flanders, Walloon); unknown (Brussels)	Yes	Emissions are spatially distributed using different proxy data for each region. • For Flanders, the spatial distribution is based on energy consumption per municipality disaggregated according to the residential floor area map. • For Brussels, the spatial distribution is based on population data. • For Wallonia, the spatial distribution is based on energy balance of each municipality distributed on residential building area
Bulgaria	☐ 1 ☒ 2 ☐ 3	Collected by the National Statistical Institute; the Eurostat Energy Balance is incorporated in the inventory of sub-sector 1A4bi - Residential: stationary. The quantities of utilized fuels are used with corresponding net calorific values	Unclear	Yes	Emissions are spatially distributed using proxy data (as population density and CORINE land use classes)
Belarus	☒ 1 ☐ 2 ☐ 3	Taken from official statistics ('Report on fuel remains, supply, and consumption in Belarus for 2020' of National Statistic Committee)	Unclear	Yes	No gridded dataset provided
Switzerland	☐ 1 ☒ 2 ☐ 3	Based on calculations carried out using two models: 'energy model' and 'Energy model for wood combustion'; the fuel consumption in small-scale wood furnaces is not based on sales figures but modelled based on average installation type-specific wood consumption	Yes	Partially	Emissions are spatially distributed using proxy data, mostly population density
Cyprus*	☒ 1 ☒ 2 ☐ 3	Based on fuel consumption data of Cyprus energy balance	No	Yes	Emissions are spatially distributed with a support of a project titled "Development of an emission inventory including formation of a database for atmospheric pollutant emissions and software for simulation and forecast of air quality in Cyprus" in 2010

Country	Method Tier	Source of Activity Data	Includes wood harvested outside formal market activity	Biomass includes condensable components of $PM_{2.5}$ emissions	Spatial distribution of $PM_{2.5}$ emissions from small combustion
Czechia	☒ 1 ☒ 2 ☐ 3	Taken from official statistics provided by Czech Statistical Office (CZSO) to EUROSTAT and other international institutions	Yes	Yes	Emissions are spatially distributed using proxy data (the so-called definition point according to Act 111/2009 Coll., on basic registers representing the central part of the basic territorial unit)
Germany	☐ 1 ☒ 2 ☐ 3	Taken from official statistics (Energy Balance for the Federal Republic of Germany prepared by the Working Group on Energy Balances (AGEB); AGEB, 2021: National energy balance and Satellite balance for renewable energy)	Yes	No	Emissions are spatially distributed using proxy data (e.g. population density, land use classes, etc.); parameters are mainly based on statistical data at district level.
Denmark	☐ 1 ☒ 2 ☒ 3	The activity data is based on modelling; The model input is taken from official statistics, various surveys and research studies.	No	Yes	Emissions are spatially distributed using various proxy data, e.g. population. Spatial distribution of Denmark's emission is done using the SPREAD model.
Estonia	☐ 1 ☒ 2 ☐ 3	Based on non-regular surveys organized by Statistics Estonia over a few years; in the years when the survey does not take place, data are estimated based on the data structure of the previous survey, the data of enterprises selling fuel and the data from the Household Budget Survey; the last survey on household energy consumption took place in 2011; different wood fuel types as wood, pellet, wood chips were covered in the survey;	Yes	No	Emissions are spatially distributed using proxy data, for example distributions of point sources, buildings locations and type data from buildings registry, distribution of population, fuel consumptions.
Spain**	☒ 1 ☐ 2 ☐ 3	Obtained from official statistics and questionnaires from Ministry for the Ecological Transition and the Demographic Challenge (MITECO), Institute for the Diversification and Saving of Energy (IDAE) and Spanish Association for Energy Recovery of Biomass (AVEBOIM)	No	Yes	Emissions are spatially distributed, for community level fuel consumption, such as coal storers, consumption of diesel, fuel oil, LPG and natural gas in the residential sector, and biomass consumption in Spain, by using population statistics as the proxy data.
Finland	☐ 1 ☐ 2 ☒ 3	Wood use statistics are compiled by Nature Resources Institute Finland (Luke); the statistics covers data on fuel wood use in residential buildings by wood species as well as property, building and combustion equipment types and is publicly available since 1970; statistics are based on surveys that have been carried out ten times until now; calculation of annual wood use in years between the surveys is done at Statistics Finland using a specific wood consumption model;	Yes	Yes	Finland uses the following proxy data for spatially distributing emissions: population density and data on all buildings (by count, by floor area, by overall volume, for permanent and temporary residential buildings presented in the National building and dwelling register).
France	☐ 1 ☒ 2 ☐ 3	The fuel consumption of residential installations is taken from “residential” sector of the national energy balance sheet	No	Unknown	The ERT did not find any information on the proxies used for the spatial distribution of $PM_{2.5}$ emissions from small combustion.
United Kingdom*	☒ 1 ☒ 2 ☐ 3	Taken from official statistics (United Kingdom National Energy Statistics)	Yes	Yes	Emissions are spatially distributed using proxy data, i.e. sub-national energy statistics, gas meter data at point level, census data with data from the BEIS National Household Model (NHM), BEIS Residential Wood Survey 9, addresses and other regional statistic.

Country	Method Tier	Source of Activity Data	Includes wood harvested outside formal market activity	Biomass includes condensable components of $PM_{2.5}$ emissions	Spatial distribution of $PM_{2.5}$ emissions from small combustion
Greece	☐ 1 ☒ 2 ☐ 3	Taken from official statistics, i.e. from the national energy balance provided by the Greek Ministry of Environment and Energy	Yes	Yes	Emissions are spatially distributed using land uses defined and available Greek regional energy statistics.
Croatia	☐ 1 ☒ 2 ☐ 3	Taken from the Energy balance - MESD prepared with assistance of Energy Institute Hrvoje Požar; for the residential sector fuel consumption from fuel wood and other biomass are distinguished; data on pellets, briquettes, wood chips and wood waste are included in the energy balance as other biomass	Yes	Yes	Emissions are spatially distributed using different proxy data: number of housing units: distribution by municipalities (for zones: defined for the purpose of air quality assessment and management in the Republic of Croatia, distribution by settlements (for agglomerations: zones where the number of inhabitants exceeds 250 000), distribution by city districts (for the City of Zagreb).
Hungary	☐ 1 ☒ 2 ☐ 3	Joint IEA/Eurostat annual questionnaires serve as activity data consistently for the whole time series; the category "fuelwood, wood residues and by-products" in the IEA/Eurostat dataset is used for the residential sector; this category includes also pellets (0.2 PJ out of 73 PJ in 2020) however these are used in other source categories (e.g., commercial, agriculture, food), for the residential sector no pellet use is estimated (yet) in the IEA statistics	Yes	Yes	The $PM_{2.5}$ emissions from small combustion are spatially distributed using proxy data, taking into account the heating mode (e.g. individual or central) and the different fuel types. The number of inhabitants in each grid cell was also divided according to the above parameters, and the calculations were performed by fuel, weighted by the population.
Ireland	☐ 1 ☒ 2 ☐ 3	Activity data on biomass (chips, wood briquettes, pellets) are provided from the National Energy Balance by the Sustainable Energy Authority of Ireland (SEAI)	Not relevant	Not relevant	Emissions from small combustion are spatially distributed using proxy data from the 2011 census on primary fuel types in households combined with an estimated unit consumption calibrated with the estimated national residential fuel consumption and the emission factors used in the emission inventory.
Iceland	☒ 1 ☐ 2 ☐ 3	Obtained from adjustments to the official statistics from National Energy Authority (NEA); the data for 2020 accounts for activities in gas/diesel oil and LPG consumption; the data provided by the NEA indicates no solid fuel use for category 1A4bi; the wood use for residential combustion is negligible	No	Unknown	Emissions are spatially distributed by using the population density from National Land Survey of Iceland as proxy data.
Italy	☐ 1 ☒ 2 ☐ 3	Based on a survey carried out by the Institute of Statistics (ISTAT) on the final energy consumption of households for residential heating and include the fuel consumption of solid biomass, such as wood and pellets The main source of data on consumption of wood and wood products in the residential sector is the Italian Energy Balance	Yes	Yes	Emissions are spatially distributed using proxy data such as distributions of resident people and fuels sold at NUTS3 level.
Kazakhstan	☒ 1 ☐ 2 ☐ 3	Taken from the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan, Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. According to national statistics for 2020, the main type of fuel consumed in the domestic market in this sector is **coal**	No	No (coal: no)	No gridded dataset provided

Country	Method Tier	Source of Activity Data	Includes wood harvested outside formal market activity	Biomass includes condensable components of $PM_{2.5}$ emissions	Spatial distribution of $PM_{2.5}$ emissions from small combustion
Liechten-stein	☒ 1 ☐ 2 ☐ 3	Taken from the Office of Statistics (OS) as well as other offices and public authorities. e.g. Office of Economic Affairs (OEA); Office of Statistics (OS); Office of Environment (OE); Swiss Federal Office for the Environment (FOEN)	Unclear	No	No gridded dataset provided
Lithuania	☐ 1 ☒ 2 ☐ 3	Taken from the Energy Balance. For the split of wood fuel by appliance type, data from the IIASA GAINS model and the „TSAP 16 Underlying assumptions - GAINS details" database were used	No	No	Emissions are spatially distributed using the population density maps.
Luxembourg	☐ 1 ☒ 2 ☐ 3	For the period 2000-2020, annual fuel combustion data on coal products (such as coke, other bituminous coal, brown coal briquettes and patent fuels), wood, gas oil, LPG and natural gas was extracted from the energy balance established by the national statistics institute	No	yes	Emissions are spatially distributed using proxy data on the location and type of heating appliances is used as primary distribution key for the disaggregation of the total emissions of the sector 1A4bi. Afterwards, the emissions are spatially distributed to suitable land use areas CLC groups 4 and 5.
Latvia	☐ 1 ☒ 2 ☐ 3	Taken from official statistics	Yes	yes	No gridded dataset provided.
Monaco	☒ 1 ☐ 2 ☐ 3	LPG data is obtained from Monaco in Figures-IMSEE; fuel oil is collected from French and Monegasque domestic fuel oil distributors operating in Monaco; natural gas by the Société Monégasque de l' Electricité et du Gaz (SMEG)	Unclear	Yes	Given the territorial specificity of Monaco, it was not considered significant to develop a spatialization of emission sources.
Montenegro	☒ 1 ☐ 2 ☐ 3	Taken from Statistical Office of Montenegro (MONSTAT)	No	Unclear	No gridded dataset provided
Malta	☒ 1 ☐ 2 ☐ 3	Unclear	Unclear	Yes	According to the information derived from the Malta's IIR report, the gridded emissions will be reported in the 2025 submission.
The Netherlands	☐ 1 ☒ 2 ☐ 3	Based on fuel consumption data, taken from Statistics Netherlands	Yes	Yes	Emissions are spatially distributed using proxy data such as population and housing density.
Norway	☐ 1 ☐ 2 ☒ 3	Based on a combination of sources: Statistics Norway's Travel and Holiday Survey, annual survey on consumer expenditure,	Yes	Yes	Emissions are spatially distributed using proxy data. No detailed description.
Poland*	☒ 1 ☒ 2 ☐ 3	Taken from the official statistics of Poland. The largest fuel consumption for 1A4bi has been recorded for hard **coal**	Yes	Yes (**coal:**yes)	Emissions are spatially distributed using proxy data from buildings (area, number of stores and number of heating degree days) and the relevant fuel mixes (coal, wood, gas, fuel oil) at local administrative units (municipalities).
Portugal*	☒ 1 ☒ 2 ☐ 3	Taken from official statistics of Energy Balances from General Directorate of Energy (DGEG)	No	Yes	Emissions are spatially distributed using population by municipality as proxy data.
Romania	☒ 1 ☒ 2 ☐ 3	Taken from the EUROSTAT and N.I.S in the forms of the EUROSTAT ENERGY questionnaires	Unclear	Yes	No gridded dataset provided
Serbia	☒ 1 ☐ 2 ☐ 3	Taken from official statistics (Statistical Office of Serbia)	No	Yes	Emissions are spatially distributed using population density as the proxy.
Russian Federation	☒ 1 ☐ 2 ☐ 3	Taken from the official statistics of the Russian Federation	No	Yes	Not specified
Sweden	☐ 1 ☒ 2 ☐ 3	Ttaken from official statistics (annual energy balances) which, inter alia, are based on three surveys regarding	Yes	Yes	Emissions are spatially distributed using proxy data at municipal level based on several statistics and assumptions.

Country	Method Tier	Source of Activity Data	Includes wood harvested outside formal market activity	Biomass includes condensable components of $PM_{2.5}$ emissions	Spatial distribution of $PM_{2.5}$ emissions from small combustion
		biomass combustion in households (one- and two-dwelling statistics), holiday cottage statistics and multi-dwelling statistics			
Slovenia*	☒ 1 ☒ 2 ☐ 3	Taken from official statistics	Yes	Yes	Emissions were distributed according to the type of heating and fuel used in individual buildings. Precise data on individual level was obtained from Surveying and Mapping Authority of the Republic of Slovenia. Emissions from national emission inventory were distributed according to the share of different heating in each cell grid.
Slovakia	☐ 1 ☒ 2 ☐ 3	Taken from NEIS (National Energy Information System) database and the national energy balance	Yes	Yes	Emissions are spatially distributed using proxy data (as CORINE landcover - inhabited areas, information from census 2011; a type of fuel for households, data from National Emission Information System-NEIS).
Turkey	☒ 1 ☐ 2 ☐ 3	Taken from official energy balance tables	No	Yes	No gridded dataset provided
Ukraine	☒ 1 ☐ 2 ☐ 3	Taken from the energy balance of Ukraine	Unclear	Yes	No gridded dataset provided

* uses a mix of Tier 1 and 2 methodology

** uses Tier 1 methodology incl. some Tier 2 emission factors

Summary of the review results for 1.A.3.b.i-iv Road transport exhaust emissions

Table 2: Summary table of 1.A.3.b.i-iv Road transport exhaust emissions

Country	Method Tier	Model used	Source of Activity Data	Includes condensable components of $PM_{2.5}$ emissions
Austria*	☐ 1 ☐ 2 ☒ 3	Austria´s PM transport sector emissions are calculated using a national model NEMO (Network Emission Model) version 5.0.2 which uses emissions factors from HBEFA version 4.1	Taken from official national statistics from the Ministry of Transport, from the periodical inspection database, from traffic counting stations and toll data.	Yes
Belgium	☐ 1 ☐ 2 ☒ 3	Belgium PM transport sector emissions are calculated using COPERT version 5.5.1	Taken from official statistics from the Directorate Registration Vehicles for all regions of Belgium	Yes
Bulgaria	☐ 1 ☐ 2 ☒ 3	Bulgaria PM transport sector emissions are calculated using COPERT 5.5.1	Taken from official statistics and literature, gap-filled by expert judgement. Vehicle stock from 2005 to 2020 is received from the National Institute and Ministry of Internal Affairs, with expert judgement used to estimate the full time series back to 1988. Mileage was obtained from the National statistics institute or average EU15 mileage data from literature and balanced to national energy statistics. In the absence of country specific data, the driving share between urban, rural and motorway roads was taken from road statistics for Slovakia. Traffic speed was taken from a review of literature sources. For other parameters, default values provided by COPERT were used.	Yes

Country	Method Tier	Model used	Source of Activity Data	Includes condensable components of $PM_{2.5}$ emissions
Belarus	☐ 1 ☒ 2 ☐ 3	Not documented transparently in the IIR	Taken from official statistics	Unclear
Switzerland	☐ 1 ☐ 2 ☒ 3	Switzerland's transport sector emissions are calculated using country specific emission factors taken from HBEFA version 4.1	Taken from various official statistics: total fuel sales from the national energy balance, fuel blends from statistics of renewable energies, federal vehicle registration database IVZ, specific mileage by the Swiss Federal Statistical Office, numbers of starts/stops from periodical surveys and "Mikrozensus"	Yes
Cyprus	☐ 1 ☐ 2 ☒ 3	Cyprus PM transport sector emissions are calculated using COPERT version 5.5	Taken from the Statistical Service of Cyprus and the Road Transport Department	Yes
Czechia	☐ 1 ☐ 2 ☒ 3	Czechia calculates particle emissions from the transport sector using COPERT version 5.5.1	Taken from official statistics from Czech Car Registry (CCR) and Database of Technical Control Stations (TCS)	Yes
Germany	☐ 1 ☐ 2 ☒ 3	Germany calculates particle emissions from the transport sector using TREMOD model ("Transport Emission Estimation Model" v6.02)	The fuel consumption is provided by Working Group on Energy Balances (AGEB) and correspond to the Energy Balance data (GEB (2021). The activity data for vehicles category is generated within TREMOD	Yes
Denmark	☐ 1 ☐ 2 ☒ 3	Particle emissions from the transport sector are calculated using emission factors from version 5.4 of COPERT	Taken from official statistics	Yes
Estonia	☐ 1 ☐ 2 ☒ 3	Estonia calculates particle emissions from the transport sector using COPERT version 5.5.1	Taken from official statistics from Statistics Estonia and Estonian Road Administration	Yes
Spain	☐ 1 ☐ 2 ☒ 3	Spanish road transport sector emissions are calculated using a country specific emission calculation tool developed and implemented following the guidelines in the EMEP/EEA Guidebook	Taken from official statistics. Fuel consumption is taken from national energy balances elaborated by MITECO. Vehicle fleets for 2007-2020 are taken from the Spanish Traffic Department and for remaining years these are estimated based on the General Statistical Yearbook from the Spanish Traffic Department. Distances travelled are taken from the General Directorate for Roads (Ministry of Transport, Mobility and Urban Agenda) and studies of road sampling carried out in Madrid.	Yes
Finland*	☐ 1 ☐ 2 ☒ 3	Finland PM transport sector emissions are calculated using emission factors from the EMEP/EEA Guidebook 2019 and a national model LIISA, which is a sub-model of the national model for transport emissions LIPASTO	Taken from official statistics from the Finnish Transport Infrastructure Agency and Statistics Finland	Yes
France	☐ 1 ☐ 2 ☒ 3	French PM transport sector emissions are calculated using COPERT version 5.4	Vehicle fleets in France are calculated using the OPALE model developed by Citepa. Vehicle activity (kilometers travelled) is taken from CCTN, balanced to national energy data. Activity is distributed between urban, rural and highway roads based on estimates from IFSTTAR (French Institute of Science and Technology for Transport, Planning and Networks).	Yes
United Kingdom	☐ 1 ☐ 2 ☒ 3	Particle emissions from the transport sector are calculated using COPERT version 5.4	Taken from official statistics (Traffic activity data in billion vehicle km by vehicle type and road type are provided by DfT and total fuel sales for petrol and diesel are provided in the Digest of United Kingdom Energy Statistics.)	Yes
Greece	☐ 1 ☐ 2 ☒ 3	Greece PM transport sector emissions are calculated using COPERT version 5.5	Taken from official statistics provided by the Hellenic Statistical Authority	Yes
Croatia	☐ 1 ☐ 2 ☒ 3	Croatian PM transport sector emissions are calculated using COPERT version 5.5.1	Taken from official statistics from the Croatian vehicle database and the national energy balances. Additional data required by COPERT are obtained using COPERT default data or expert judgement.	Yes
Hungary	☐ 1 ☐ 2 ☒ 3	Hungarian PM transport sector emissions are calculated using COPERT version 5.5.1	Taken from official statistics provided by the Ministry of Interior (BM), Vehicle Inspection Database, national energy statistics provided by the Hungarian Energy and Public Utility	Yes

Country	Method Tier	Model used	Source of Activity Data	Includes condensable components of $PM_{2.5}$ emissions
			Regulatory Authority (MEKH), the Hungarian Meteorological Service (OSMZ), research studies carried out by the Institute of Transport Sciences (KTI), the Ministry of Economy and Transport, and data purchased from Emisia.	
Ireland	☐ 1 ☐ 2 ☒ 3	Irelands PM transport sector emissions are calculated using COPERT version 5.5.1	Taken from official bulletins of vehicle and driver statistics and the National Roads Authority, with odometer records taken from the National Car Testing and the Commercial Roadworthiness Test Service.	Yes
Iceland	☐ 1 ☐ 2 ☒ 3	Icelands PM transport sector emissions are calculated using the transport model COPERT version 5.5.1	Taken from official statistics for vehicle stock numbers (Icelandic Transport Authority) for years 2017-2020 and total fuel sales from the NEA.	Yes
Italy	☐ 1 ☐ 2 ☒ 3	Italy's transport sector emissions are calculated using emission factors taken from COPERT version 5.5.1	Taken from total fuel sales from the national energy balance and supplementary information and cross-checked with monthly mileage information for LDV and HDV and yearly vehicle registrations.	Yes
Kazakhstan*	☐ 1 ☐ 2 ☐ 3	Kazakhstan´s transport sector emissions are calculated using Guidebook emission factors	Taken from official statistics	Yes
Liechtenstein	☐ 1 ☐ 2 ☒ 3	Liechtenstein calculates emissions from the road transport using HBEFA 2019 emission factors	Taken from official statistics	Yes
Lithuania	☐ 1 ☐ 2 ☒ 3	Lithuania's transport sector emissions are calculated using country specific emission factors taken from COPERT version 5	Taken from the national energy balance for the total fuel sales and fuel types. Traffic intensity is from information given by the national Institute of Transport, fleet data including weight and emission reduction technology from the national Registry of Transport, specific mileage from the Lithuanian Road Administration and a study.	Yes
Luxembourg	☐ 1 ☐ 2 ☒ 3	Luxembourg's transport sector emissions are calculated using country specific emission factors taken from HBEFA version 4.1	The activity data for total fuel sales is taken from the national energy balance.	Yes
Latvia	☐ 1 ☐ 2 ☒ 3	Latvia calculates particle emissions from the transport sector using COPERT version 5.5.1	Taken from official statistics	Yes
Monaco	☐ 1 ☒ 2 ☐ 3	Monaco´s transport sector emissions are calculated using EMEP/EEA 2019 Guidebook emission factors	Taken from official statistics	No
Montenegro	☒ 1 ☐ 2 ☐ 3	Montenegro transport sector emissions are calculated using EMEP/EEA Guidebook emission factors	Taken from National Transport Statistics	No
Malta	☐ 1 ☐ 2 ☒ 3	Malta's transport sector emissions are calculated using country specific emission factors taken from COPERT version 5.5	Taken from various statistics: total fuel sales by Eurostat, fuel specifications (sulphur and lead content) and fuel blends by the Regulator of Energy and Water Services (REWS), vehicle stock and mileage by a model developed by the Energy and Water Agency (EWA)	Yes
The Netherlands	☐ 1 ☐ 2 ☒ 3	The Netherlands' transport sector emissions are calculated using and the VERSIT+ model	Taken from official statistics	Yes
Norway	☐ 1 ☐ 2 ☒ 3	Norway´s PM transport sector emissions are calculated using the HBEFA model version 4.1	Taken primarily from official registers and public statistics from Statistics Norway, the Norwegian Directorate of Public Roads and the Institute of Transport Economics	Yes
Poland	☐ 1 ☐ 2 ☒ 3	Poland´s PM transport sector emissions are calculated using COPERT 5.4	Taken from official statistics and research. The number of vehicles per vehicle category, size and technology is taken from official statistics from Polish Central Vehicle and Driver Register system and Statistic Poland. Annual mileage, vehicle speed and the share in different travel conditions comes from literature and research.	Yes

Country	Method Tier	Model used	Source of Activity Data	Includes condensable components of $PM_{2.5}$ emissions
Portugal	☐ 1 ☐ 2 ☒ 3	Portugal PM road transport sector emissions are calculated using COPERT 5.4	Taken from official statistics and literature	Yes
Romania	☐ 1 ☐ 2 ☒ 3	Romania's transport sector emissions are calculated using country specific emission factors taken from COPERT version 5.5.1	Taken from the total fuel sales from the national energy balance by the National Institute for Statistics, fleet data from the Romanian Automobile Registry and max. and min. temperatures and relative humidity by the National Institute of Meteorology	Yes
Serbia	☐ 1 ☐ 2 ☒ 3	Serbia´s PM transport sector emissions are calculated using COPERT version 5.5 for the period 2016 to 2020 and COPERT 5.2 for the previous years	Taken from official statistics of all registered vehicles in the territory obtained from the Ministry of Internal Affairs of the Republic of Serbia, Traffic Police from 1990 to 2020	Yes
Russian Federation*	☐ 1 ☐ 2 ☐ 3	PM transport sector emissions of the Russian Federation are calculated using a national guidelines methodology	Provided by the State Inspectorate for Road Safety of the Ministry of Internal Affairs of the Russian Federation	No
Sweden	☐ 1 ☐ 2 ☒ 3	Sweden's transport sector emissions are calculated using country specific emission factors taken from HBEFA version 4.1	Taken from various official statistics: total fuel sales by national fuel statistics, fuel specifications and fuel blends by the Swedish fuel quality act, Swedish national vehicle register, national road mileage model	Yes
Slovenia	☐ 1 ☐ 2 ☒ 3	Slovenia's transport sector emissions are calculated using country specific emission factors taken from COPERT version 5.5.1	Taken from various national statistics	Yes
Slovakia	☐ 1 ☐ 2 ☒ 3	Slovakia PM road transport sector emissions are calculated using COPERT 5.5	Derived from odometer data from Transport Directorate (TID) combined with vehicle fleet data from the Police	Yes
Turkey	☐ 1 ☐ 2 ☒ 3	Turkey reports particle emissions from the transport sector using COPERT model	Taken from official statistics of the TURKSTAT together with the data from the EGEDES-Exhaust Emission Electronical Inspection System	Yes
Ukraine**	☒ 1 ☒ 2 ☐ 3	Ukraine's transport sector emissions are calculated using a combination of Tier 1 and Tier 2 methodologies for disaggregating the fleet data and Tier 2 default emission factors	Taken from the total fuel sales provided by State Statistic Service of Ukraine	Yes

* Tier of Methodology not specified

** uses a mix of Tier 1 and 2 methodology

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