

The EDGAR 3.2 Fast Track 2000 dataset (32FT2000)

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1. Introduction

Since making detailed updates of EDGAR is a laborious effort, the EDGAR consortium decided to initiate a new so-called 'Fast Track' action to estimate recent global emissions at country level based on readily available data¹. It is the aim to produce an annual update of the Fast Track emissions.

The [Fast Track 2000 dataset](#) comprises global anthropogenic emissions for the year 2000 of Kyoto Protocol greenhouse gases CO₂, CH₄, N₂O, and F-gases (HFCs, PFCs and SF₆) and of the air pollutants CO, NMVOC, NO_x and SO₂. The emissions data are presented as country/sector tables and as 1x1 degree grid files at the same level of detail as the EDGAR 3.2 emissions data have been published on the internet.

2. Data sources and methodology for the year 2000 dataset

In general activity data for the year 2000 has been included following the [EDGAR 3.2 method](#) (Olivier and Berdowski, 2001; Olivier et al., 2002). Selection of emission factors is based on the assumption of unchanged control technologies compared to the year 1995, resulting in application of the emission factors as included in version 3.2. However, to take into account emission reduction that has occurred due to control measures implemented since 1995, ('implied') emission factors have been used for those countries for which information on emission reduction was available (mainly OECD'90 countries; here shortly referred to as "OECD"). Implied emission factors are constructed by division of annual emissions by activity selected for the extrapolation. In general these emission factors have been taken from the CRF emission data files which are part of the [National Inventory Reports](#) ('NIR') to the UNFCCC (Olivier et al., 2005).

The gridded emissions all use the same grid maps for the within-country distributions as in EDGAR 3.2, except for large-scale biomass burning for which the GFED data were used (see Section 2.5). For the latter also monthly emissions and effective emission heights are provided as auxiliary datasets.

2.1 Fossil fuel production and use (EDGAR category F; IPCC sector 1)

Activity data for fossil fuel production and use for 136 countries are taken from IEA statistics for OECD (IEA/OECD, 2003a) and non-OECD (IEA/OECD, 2003b) countries². For another 72 countries, the aggre-

¹ An earlier exercise to construct global total emission trends from the 1995 data have been published annually as part of the Environmental Data Compendium (RIVM/MNP, 2004) and in Part 3 of the annual IEA publication 'CO₂ from fuel combustion' (Olivier, 2004). These estimates do not show any regional or country specific details (for a comparison with the FT approach see Section 4).

² Please note that instead of using aggregated IEA sectoral trend data for extrapolation calibrated to the EDGAR 3.2 data for 1995, we used the full IEA 2004 dataset for 2000. This is likely to have introduced discontinuities between the 2000 FT emissions and the 1995 emissions in EDGAR 3.2, in particular for former USSR countries and specific developing countries.

gated IEA data for the regions ‘Other Latin America’, ‘Other Africa’, and ‘Other Asia’ have been split into country data using population density figures from *FAO (2005a)*.³ For yet another 26 small countries, for which no data is presented in the IEA statistics (mostly very small islands), the EDGAR 3.2 1990-1995 trend has been extrapolated to the year 2000. Data on hard coal and brown coal production have been split into surface and underground mining as included in version 3.2. Discontinuities with the EDGAR 3.2 data will be found due to (i) update IEA energy statistics, in particular for former USSR countries and specific developing countries and (ii) distribution of country data included in the “other regions” of IEA using population statistics instead of data from UN statistics applied in EDGAR 3.2.

Emission factors for 2000 have in general been taken from the EDGAR 3.2 data for 1995, except in OECD countries for which control measures have been included using so-called implied emission factors (exclusion: aviation (F57) and international shipping (F58)). This refers in particular to **non-CO₂ combustion emissions** from road transport (F51), industrial combustion (F10) and power generation (F20) (see *Table 1*).

Exceptions to the above mentioned activity data and emission factors are gas flaring, CH₄ emissions from fossil fuel production and international shipping emissions. Gas flaring emissions (F80) have been calculated by combining the EDGAR 3.2 values for 1995 with the 1995-2000 CO₂ trend from CDIAC (*Marland et al., 2003*). For some countries, for which CDIAC did not report CO₂ flaring emissions in the year 2000 and for which it seems unrealistic that gas flaring did not occur (e.g. Nigeria, Norway and China), constant 1995 emissions have been applied. For **CH₄ emissions from fossil fuel production** coal mining (F70), oil production (F80), and gas production (F91) and gas transport/distribution (F92) country-specific trends reported to the UNFCCC have been used.

For emissions from **international shipping** (F58) two methodologies are presented illustrating the uncertainty in activity data in this sector. The first methodology is the EDGAR 3.2 method with updated IEA bunker statistics, the second method is a detailed emission inventory using fuel use calculated from number of ships, engine types and operating conditions and hours (*Eyring et al., 2005*), which dataset has been labelled “SHIP-EYRING”.

Table 1. Sectors for which implied emission factors have been calculated based on reported emissions to the UNFCCC. If marked x, the compound emission has been constructed using implied emission factor for the specific sector. If marked -, the EDGAR 3.2 emission factor for 1995 has been applied. Blanc boxes are not applicable for these compounds. See Table B.1 for OECD’90 average values for CH₄ and N₂O.

Code	Source category	CH ₄	N ₂ O	CO	NMVOC	NO _x	SO ₂
F10	Industrial combustion	-	-	x	x	x	x
F20	Power generation	-	-	x	x	x	x
F30	Conversion	-	-	x	x	x	x
F51	Road transport	-	x	x	x	x	x
F54	Non-road land transport	-	-	x	x	x	x
F70	Coal production	x	-	-	-	-	-
F81	Oil Production (processes)	x	-	-	-	-	-
F84	Oil production (flaring)	x	-	x	x	x	x
F91	Gas production	x	-	-	-	-	-
F92	Gas Transmission	x	-	-	-	-	-
I30	Adipic Acid + Nitric Acid production	-	x	-	-	-	-
W10	Landfills (incl. recovery)	x	-	-	-	-	-
W20	Wastewater treatment (incl. recovery)	x	x	-	-	-	-

³ Note that this country allocation scheme differs from the one used for the EDGAR 3.2 dataset, and may introduce discontinuities between the 2000 FT emissions and the 1995 emissions in EDGAR 3.2.

2.2 Biofuel production and use (EDGAR category B; IPCC sector 1)

To maintain consistency with the 1995 emissions data, for biofuel consumption in the *residential/commercial sector* (B40), the same trend estimation procedure was used as for EDGAR 3.2: for industrialised countries the total population trend was used; for developing countries the weighted trends of rural and urban population (see *Olivier et al., 2001*). However, for biofuel use in *industry* (B10) and *power generation* (B20) for the year 2000 data from IEA statistics for OECD non-OECD countries were used (*IEA/OECD, 2003b*) countries⁴.

Due to lack of data, for *charcoal production*⁵ and *biofuel use in road transport* (B51) constant 1995 values have been applied. Under the assumption of unchanged control technologies in the production and use of biofuels, emission factors have been assumed to remain constant from 1995 to 2000.

2.3 Industrial processes (excl. F-gases) and solvent use (EDGAR category I; IPCC sectors 2 and 3)

Production data on *iron and steel* (I10; split into different technologies) have been taken from (*IISI, 2004*). Production data of the *non-ferrous industry* (I20; copper, lead, zinc, aluminium) are based on *USGS (2004)*, while for PFCs from primary aluminium production the fractional contribution of different processes from EDGAR 3.2 has been applied. Industrial production data for the *chemical industry* (I30) are from the UN commodity statistics (*UN, 2004*). For those countries where no UN data was available, constant 1995 values are assumed. An exception was made for N₂O emissions from adipic acid (AA) and nitric acid (NA) manufacture from OECD countries. These were extrapolated from 1995 using the country-specific 1995-2000 trends reported to the UNFCCC; for other OECD countries the reported OECD total trend of total AA and NA emissions was used.

For the other industrial source categories the following data sources have been used: *cement* (I40; *USGS, 2004*), *paper and pulp* (I50; *FAO, 2005b*), *food* (I60; *FAO, 2005b*) or constant values for countries with no data in FAO). For *NM VOC from solvents* (I70), the trend in total population was used (*FAO, 2005b*). Emission factors have been assumed to remain constant from 1995 to 2000 except for country-specific trends of N₂O emissions from adipic acid and nitric acid manufacture in OECD countries which showed an average emission decrease of ~50% (see *Table B.1*).

2.4 Agriculture (EDGAR category L; IPCC sector 4)

To calculate N₂O emissions from *fertiliser application* (L10), the IFA nitrogen fertiliser consumption trend (*FAO, 2005b*) and the amount of animal waste used of fertiliser scaled with the livestock numbers from *FAO (2005a)* have been used. CH₄ emissions from *rice cultivation* (L15) and from *ruminants* (L20) are based on total harvest area trends and total cattle trend data, respectively, from *FAO (2005b)*. Nitrous oxide emissions from *confined animal waste* (L30) have also been scaled to total cattle trend data from *FAO (2005b)*. N₂O emissions from *crop production* (L50) and *crop residues* (L60) have been scaled using selected FAO crop data (*FAO, 2005a*). Indirect N₂O emissions from *atmospheric deposition* (L71) and from *leaching and run-off* (L72) are scaled to the trend in the sum of N₂O emissions from fertiliser application (L10), confined animal waste (L30) and crop residues (L60). Emissions from *agricultural waste* burning (L43) are discussed under biomass burning (Section 2.5). All emission factors have been assumed to remain constant from 1995 to 2000.

⁴ Please note that the IEA data for these sources have been updated substantially compared to the datasets released and applied in EDGAR 3.2, which may have introduced discontinuities between the 2000 FT emissions and the 1995 emissions in EDGAR 3.2.

⁵ In future FT updates, these emissions will be scaled to trends in charcoal production as published by the FAO.

2.5 Biomass burning (EDGAR category L; IPCC sector 5)

Biomass burning emissions have been taken from the Global Fire Emissions Database (GFED; *Van der Werf et al., 2003*). The provided CO emissions were scaled with the ecosystem dependent emission factors provided by *Andreae and Merlet (2001)*. For NO_x, the emission factors were taken from a recent update by *Andreae (pers.comm., 2004)* resulting in an 40% lower emission factor for savannah fires. To this purpose, the ecosystem database of *Olson et al. (1983)* was aggregated into five classes: shrub/bush, forest, agriculture and other (e.g. urban regions/deserts). Biomass burning emissions are sub-divided into the following source categories:

- L41 (tropical forest fires; deforestation): GFED
- L42 (savannah and shrubs fires): GFED
- L43 (agricultural waste burning): scaled to trends in selected FAO crops (EDGAR 3.2 method)
- L44 (middle and high latitude forest fires; temperate vegetation fires): GFED
- L45 (indirect N₂O from tropical forest fires, i.e.scaled L41): GFED
- L47 (middle and high latitude grassland fires; new category): GFED

GFED 1.0 data in agricultural regions were attributed to *savannah and grassland fires* (L42 and L47). There is an insignificant overlap with EDGAR category *agricultural waste burning* (L43) which is presented separately with constant 1995 emissions⁶. In addition, for N₂O the *indirect post-burn emissions from tropical forest* fires (L45) have been extrapolated using the calculated 1995-2000 trend in direct N₂O emissions from that source category (L41), which has been estimated in EDGAR 3.2 as a fixed ratio between direct and post-burn emissions.

Given the structural difference in both activity data and emission factors of the GFED based emission dataset and EDGAR 3.2 biomass burning emissions, four variants of large-scale biomass burning are included in the dataset. This allows for comparison with EDGAR 3.2 estimates for earlier years. For all datasets both monthly and yearly total gridded emissions are presented:

1. GFED with actual year 2000 activity data using the *Andreae and Merlet (2001)* and *Andreae (2004, pers. comm.)* for NO_x emission factors (BB-2000-AM).
2. GFED with multi-year (1997-2002) averaged activity data using *Andreae and Merlet (2001)* and *Andreae (2004, pers. comm.)* for NO_x emission factors (BB-AVG-AM).
3. Activity data as in 1 but with EDGAR 3.2 emission factors (BB-2000-EF32).
4. Activity data as in 2 but with EDGAR 3.2 emission factors (BB-AVG-EF32).

Table 2 presents the biomass burning emission factors as taken from *Andreae and Merlet (2001)*, *Andreae (2004, pers. comm.)* and EDGAR 3.2. For easy reference in *Table B.2* the multiplication factors are provided to convert one set into the other (for regional and per country emissions).

⁶ In future FT updates, emissions will be scaled to trends in selected FAO crops, using the same ratios as weight factors for the crop residue to net crop production as used in the last full EDGAR dataset.

Table 2. Large-scale biomass burning emission factors 32 and AM2

Source:	Savannahs	Tropical forests	Extratropical forests	Savannahs	Tropical forests	Extratropical forests
Code:	L42/L47	L41	L44	L42/L47	L41	L44
Dataset:	EF_3.2 ^{a)}			EF_AM2 ^{b)}		
CO ₂				1664	1580	1568
CH ₄	2.2	5.6	5.6	2.3	6.8	4.7
N ₂ O ^{c)}	0.033	0.06	0.06	0.21	0.20	0.26
CO	66.5	111.0	111.0	65	104	107
NO _x ^{b)}	3.6	3.6	3.6	5.98	2.45	4.60
NMVOC	5.5	7.7	40.0	3.4	8.1	5.7
SO ₂	0.7	0.7	0.7	0.35	0.57	1.00
NH ₃	0.93	0.93	0.93	0.82	1.07	1.15

Notes:

a) EF_3.2 = EDGAR 3.2 (Table 4.6.b in Olivier *et al.*, 2001).b) EF_AM2 = Andreae and Merlet (2001) (Table 4.7 in Olivier *et al.*, 2001) updated for NO_x (Andreae, 2004, pers. comm.)c) N₂O: Emission factor excluding post-burn effects for Tropical Forests (6.36 times direct emissions from biomass burning).**Emission heights for biomass burning**

The following emission heights are recommended to take into account the effective injection height of biomass burning emissions into the atmosphere. This recommendation is based on the work of *D. Lavoue (pers. comm., 2003)* for ecosystem specific emission heights. Emissions are injected at the max injection height interval and below. This height table has been used in the 2003/2004 ACCENT-IPCC and AEROCOM experiments.

Table 3. Fractional distribution of effective emission heights (%) in prescribed height intervals of biomass burning emissions.

Cat. code	Source description	0-100 m	100-500 m	500-1000 m	1000-2000 m	2000-3000 m	3000-6000m
L43	Agricultural waste burning	100	0	0	0	0	0
L41, L42	Tropical forest grassland/shrub lands (30S-30N)	20	40	40	0	0	0
L44	Temperate forest (60S-30S; 30N-60N)	20	20	20	40	0	0
L44, L47	Boreal forest wooded savannah/shrub (Eurasia)	10	10	20	20	40	0
L44	Boreal forest (Canada, N. America)	10	10	10	10	20	40

2.6 Waste (EDGAR category W; IPCC sector 6)

Landfill emissions (W10) (net CH₄) from OECD countries and a few EIT countries were extrapolated from 1995 onwards using the country-specific 1995-2000 trends reported to the UNFCCC; for other OECD countries the reported OECD total trend of 9% decrease was used. For other countries (developing and other EIT), where CH₄ recovery is assumed to be insignificant, the 1990-1995 emission trend was extrapolated since annual landfill emissions are less sensitive to recent changes in activity data as they are the sum of emissions from waste which was deposited several decades ago. **Waste water treatment and disposal emissions** (W20 and W30) of net CH₄ have been extrapolated using the 1995-2000 trend of total national population, except for wastewater treatment by OECD countries for which country-specific 1995-2000 trends reported to the UNFCCC were used or the reported OECD total trend of 2% increase. N₂O from **waste water treatment** (W20) from OECD countries and a few EIT countries was extrapolated using the country-specific 1995-2000 trend reported to the UNFCCC; for other OECD countries the reported

OECD total trend of 6% increase was used. For other countries (developing and other EIT the 1995 emissions were extrapolated using the 1995-2000 trend of total national population. N₂O from *waste water disposal* (W30) was extrapolated using the 1995-2000 trend of total national population. Finally, emissions from *uncontrolled waste incineration* (W40) (miscellaneous compounds) were kept constant since these are generally very small and no good indicator is available for this source.

2.7 Fluorinated gases: HFCs, PFCs, SF₆ (EDGAR category H; IPCC sector 2F-G)

Generally, for the largest sources of HFC, PFC and SF₆ emissions, country-specific or OECD-average trends reported to the UNFCCC were used for OECD countries (with some exclusions for exceptional reported country-specific 2000/1995 trends explained in footnotes of *Table B.3*), while using reported global total emissions, production or consumption trends as a proxy for non-OECD countries (*Table 4*). Below, details of the extrapolation of these key F-gas sources are described. The OECD-average and global trend figures mentioned are listed in a separate table (*Table B.3*).

Table 4. Sectors for which country-specific and OECD'90 average emission factors have been calculated based on reported emissions to the UNFCCC. If marked + the global total emission trend have been estimated for that source category, if marked (1), the emissions have been assumed to be constant. See Table B.3 for actual OECD'90 average and global trend values used.

Group	Gas	Source category	OECD	Global
HFC-by-prod.	HFC-23	I91.08a: HCFC-22 production	x	+
HFC use	HFC-134a	H14-HFC Use-Miscellaneous	x	+
	HFC-152a	H14-HFC Use-Miscellaneous	x	see 134a
	HFC-227ea	H14-HFC Use-Miscellaneous	x	see 134a
	HFC-125	H14-HFC Use-Miscellaneous	x	(1)
	HFC-143a	H14-HFC Use-Miscellaneous	x	(1)
PFC-by-prod.	CF ₄	I24: Non-Ferro-Aluminium (pri+sec)	x	
PFC use	CF ₄	H21-PFC Use-Semicond. manuf.	x	+
	C ₆ F ₁₄	H26-PFC Use-Solvents	x	
SF ₆ use	SF ₆	All	x	+

HFC-23 byproduct emissions from HCFC-22 manufacturing (I91) from OECD countries were extrapolated from 1995 using the country-specific 1995-2000 trend reported to the UNFCCC; for other OECD countries the reported OECD total trend was used. For all other countries the global total HCFC-22 production trend reported by RAND of 0% was used. **Emissions from HFC-134a use** (H14) were dealt with in the same way, using a 1995-2000 trend factor of 2.7 for non-reporting OECD countries (including the UK); however, for non-OECD countries the global total HFC-134a emissions trend reported by RAND of a trend factor of 4.3 was used. For emissions from **other HFC use** (HFC-125, 143a, 152a and 227ae) from OECD countries the same procedure was followed. For non-OECD countries, for HFC-152a and 227ae emissions the same factor of 4.3 as for HFC-134a was used, while the relatively small emissions of HFC-125 and 143a emissions from non-OECD countries were assumed to remain constant; the same was done for the very small HFC-23 use emissions. These emissions from the use of HFC-23, 125 and 143a account for 4% of global total HFC emissions in 1995.

PFC byproduct emissions from aluminium production (I24) (CF₄ and C₂F₆) from OECD countries were extrapolated from 1995 using the country-specific 1995-2000 trend for CF₄ reported to the UNFCCC; for other OECD countries the reported OECD total trend was used. For all other countries the 1995 emissions were extrapolated using the 1995-2000 trend of country-specific primary aluminium production reported by USGS. **PFC emissions from semiconductor manufacture** (H21) and from **PFC use as solvent** (H26) from OECD countries were extrapolated from 1995 using the country-specific 1995-2000 trend reported

to the UNFCCC; for all other countries the reported OECD total trend was used. *PFC emissions from all other sources*, which only account for 5% of global PFC emissions, were assumed to remain constant.

SF₆ emissions from *semiconductor manufacture (H36)* and from use in *magnesium production (H45 and H46)* from OECD countries were extrapolated from 1995 using the country-specific 1995-2000 trend reported to the UNFCCC; for other OECD countries the reported OECD total trend of these sources was used. The *other SF₆ sources* were dealt with in the same way (country-specific or the OECD average trend), but for OECD countries the trend for *total* national SF₆ emissions from these countries was used as a proxy. For all other countries the global total consumption trend reported by RAND was used, except for magnesium production where the RAND trend was much lower than the UNFCCC trend for OECD countries and therefore the latter trend as used as a proxy.

3. Format

The format of standard reporting of EDGAR 32FT2000 emissions at source, region, country and grid level is in the same format as was done for the provision of the EDGAR 3.2 datasets at the website. *Table 5* shows the number of standard reporting source categories for each compound. Please note that for some sources multiple datasets have been provided.

Table 5. Number of source categories used for global total trend estimates in the FT method.

Type	Gas	Number of reported sources
Greenhouse gas	CO ₂	15
	CH ₄	30
	N ₂ O	34
	F-gases	34 (9+10+14)
Precursors	CO	24
	NMVOG	28
	NO _x	24
	SO ₂	25

4. Comparison with aggregated global total emission trends published earlier

Until recently, annually estimates for *global total* emissions of greenhouse gases were made by RIVM/MNP for years after 1995 by extrapolation per major source category (see *Table 6*). Global activity trends were used to estimate the source's emissions in more recent years, but were corrected if the 'implied emission factor' – i.e. the division of annual sectoral emissions by the activity data selected as volume indicator and (used for the extrapolation) – of the global 1990-1995 emissions show a significant trend or if substantial changes are known from national submissions to the UN Climate Secretariat (UNFCCC). These more aggregate global total source trends are published annually on the RIVM/MNP website as part of the [Environmental Data Compendium](#), in Dutch abbreviated as 'MNC' (*RIVM/MNP, 2004*) and in Part 3 of the annual IEA publication 'CO₂ from fuel combustion' (*Olivier, 2004*).

Table 6. Number of source categories used for global total trend estimates in the MNC method.

Topic	Gas	Number of sources reported
Greenhouse gas	CO ₂	5
	CH ₄	16
	N ₂ O	18
	F-gases	7 (3+2+2)

Comparison of *Tables 5 and 6* shows that the MNC method, using only half the number of sources compared to the FT method, analyses global trends at a much more aggregated source level than the Fast

Track method. More importantly, the MNC method does not show any regional or country-specific details, so it does not capture the more delicate differences in volume trends by countries with higher and with lower emission factors. For compounds such as methane and nitrous oxide these differences result in strikingly different 1995-2000 trends, for both 5%-points different as shown in *Table 7*: for CH₄ now about 6% vs. 1% and for N₂O now also 6% vs. 1%. This illustrates that apparently the much more aggregated MNC method sometimes does not capture key determining trends. Although the FT method uses another method for estimate large-scale biomass burning emissions, an analysis of total emissions excluding these sources does not alter the main conclusions (the differences are with the MNC trend then for both about 4%-points) (see *Appendix A*).

Table 7. Comparison global total 2000 emissions of CH₄ and N₂O of FT and MNC methods.**

Gas	Method	1990*	1995*	2000	Diff 00/95(Gg)	Diff 00/95(%)	Diff 95/90(%)*
CH ₄	FT	302	302	320	17.9	6%	0%
	MNC	302	302	306	3.8	1%	0%
N ₂ O	FT	11.2	11.5	12.2	0.67	6%	2%
	MNC	11.3	11.5	11.6	0.07	1%	2%

* EDGAR 3.2 data; ** FT BB dataset: AVG-EF32.

Future updates of the *aggregated global* emission trend estimates using the MNC method, which is still useful for the most recent years for which detailed statistics are not yet complete and thus the much more refined FT method is not yet applicable, will therefore be calibrated to the more detailed global total estimate per source category as determined for particular years by the *Fast Track* method.

5. Conclusions

It is concluded that the *Fast Track* method used to estimate recent 5-year emissions trends is a major improvement compared with the MNC method used for greenhouse gases. It uses twice the number of sources of the MNC method and uses actual country-specific trends rather than global trends in the year's prior to the year of extrapolation. The FT method provides more accurate and more detailed trend estimates than the global 'MNC' method:

- More accurate trends: not only at country level but also at regional and global level;
- Available for more source categories and on grid;
- Available for precursor emissions too.

Further analysis, e.g. comparison with the EDGAR 4 data for 1995 and 2000 that are currently under development, may provide quantitative indications of the trend accuracy of the FT method. It should, however, also be concluded that the accuracy of the MNC method for emission trend estimation of periods of five years or more may be limited, in particular when it comprises major sources where the emission intensities are highly regionally stratified.

Not discussed above, but observed when compiling the FT2000 datasets, are the following:

- Official national datasets are often available for OECD country only and these are not always consistent in country intercomparisons.
- Global emission trends are in first instance determined by international statistics as driving variables, but trends in emission factors and/or technology mixes are crucial for determining total trends, since the *main driving variables* are transport and power generation of which in many countries the emission factors change significantly over time, in particular for precursor gases.
- Some other caveats were identified in the dataset (see [online documentation](#) for the latest version).

6. Citation and other key references for the EDGAR 32FT2000 dataset

Please use the following references to cite the EDGAR 32FT2000 datasets or to read details on the construction of the dataset:

- Citation: Olivier, J.G.J., Van Aardenne, J.A., Dentener, F., Ganzeveld, L. and J.A.H.W. Peters (2005). [Recent trends in global greenhouse gas emissions: regional trends and spatial distribution of key sources](#). In: "Non-CO₂ Greenhouse Gases (NCGG-4)", A. van Amstel (coord.), page 325-330. Millpress, Rotterdam, ISBN 90 5966 043 9.
- Technical documentation: Van Aardenne, J.A., F.D. Dentener, J.G.J. Olivier, J.A.H.W. Peters and L.N. Ganzeveld (2005). *The EDGAR 3.2 Fast Track 2000 dataset (32FT2000)*. [[this document](#)]
- General documentation: Olivier, J.G.J. (2005). Part III: Greenhouse gas emissions: 1. Shares and trends in greenhouse gas emissions; 2. Sources and Methods; Greenhouse gas emissions for 1990 and 1995. In: "CO₂ emissions from fuel combustion 1971-2003", 2005 Edition, pp. III.1-III.31. International Energy Agency (IEA), Paris (in prep.)

General documentation on EDGAR 3.2 can be found in: Olivier, J.G.J. and J.J.M. Berdowski (2001). Global emissions sources and sinks. In: Berdowski, J., Guicherit, R. and B.J. Heij (eds.) *The Climate System*, pp. 33-78. A.A. Balkema Publishers/Swets & Zeitlinger Publishers, Lisse, The Netherlands. ISBN 905809 255 0.

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Appendix A: Comparison of CH₄ and N₂O emissions in 2000: the FT and MNC method

Although part of the differences stem from different data sources and assumptions made for large-scale biomass burning, the main conclusion is that a more detailed calculation for a few key sources is largely responsible for the observed differences in the global total trend estimate: coal and gas production for CH₄ and Nitric Acid and Adipic Acid production and animal waste applied to soils for N₂O.

Table A.1. Methane emissions per source category in 2000 (FT dataset: BB-AVG-EF32)

Source	2000-FT	2000-MNC	Diff	Key diff.	Explanation
Biofuel	14.9	15.7	-0.8	6	More detailed calculation
Fossil fuel use	3.4	4.2	-0.8	7	New activity dataset
Coal production	33.9	28.6	5.3	1	More detailed calculation
Oil production	10.5	10.0	0.5		
Gas production	49.4	46.2	3.2	4	More detailed calculation
Industrial processes	0.9	0.8	0.1		
Rice areas	39.3	39.9	-0.5		
Animals	80.0	79.5	0.5		
Animal waste	8.5	8.6	-0.1		
Agric. waste burning	0.8	0.7	0.1		
Savanna burning	9.3	6.0	3.3	3	Diff data source/assump.
Deforestation	9.7	4.5	5.2	2	Diff data source/assump.
Vegetation fires	1.0	1.9	-0.9	5	Diff data source/assump.
Landfills	23.1	23.3	-0.2		
Wastewater	34.8	35.5	-0.6		
Waste incineration	0.2	0.2	0.0		
Total	319.8	305.7	14.1		

Table A.2. Nitrous oxide emissions per source category in 2000 (FT dataset: BB-AVG-EF32)

Source	2000-FT	2000-MNC	Diff	Key diff.	Explanation
Biofuel	0.2	0.2	-0.01		
Fossil fuel use	0.3	0.3	-0.01		
Oil production	0.0	0.0	0.00		
Nitric Acid (NA) production	0.7	0.2	0.39	1	More detailed calculation
Adipid Acid production	see NA	0.1			
Miscellaneous use	0.0	0.0	0.00		
Synth. fertiliser use	2.8	1.5	0.07		
Animal waste as fertiliser	see Synt.	1.2			
Animal waste (stables)	0.6	0.6	0.00		
Agric. waste burning	0.0	0.0	0.00		
Savanna burning	0.1	0.1	0.06		Diff data source/assump.
Deforestation	0.1	0.0	0.05		Diff data source/assump.
Postburn deforestation	0.6	0.3	0.34	2	Diff data source/assump.
Vegetation fires	0.0	0.0	-0.01		
Crop production	1.6	1.6	-0.07		
Animal waste (soil)	2.7	2.8	-0.12	3	More detailed calculation
Atm.Dep. / Leach.Run-Off	2.3	2.4	-0.05		
Wastewater	0.3	0.3	-0.02		
Waste incineration	0.0	0.0	0.00		
Total	12.2	11.6	0.6		

Appendix B: Miscellaneous data tables

Table B.1. OECD'90 average trends 1995-2000 for CH₄ and N₂O from selected fossil fuel and industrial processes as reported to UNFCCC.

Gas	Code	Source category	OECD'90 average trend
CH ₄	F70	Coal production	0.75
	F81	Oil Production (processes)	0.97
	F91	Gas Production (UNFCCC venting and flaring)	0.82
	F92	Gas Transmission	0.96
	W10	Landfills (incl. recovery)	0.92
	W20	Wastewater treatment (incl. recovery)	1.02
N ₂ O	F51	Road transport	1.04
	I30	Adipic Acid + Nitric Acid production	0.53
	W20	Wastewater treatment	1.06

Table B.2. Ratios of large-scale biomass burning emission factors EF_32 and EF_AM2

Source:	EF_32/EF_AM2			EF_AM2/EF_32		
	Savannahs	Tropical forests	Extratropical forests	Savannahs	Tropical forests	Extratropical forests
Code:	L42/L47	L41	L44	L42/L47	L41	L44
CH ₄	0.957	0.824	1.191	1.045	1.214	0.839
N ₂ O	0.157	0.275	0.212	6.364	3.636	4.727
CO	1.023	1.067	1.037	0.977	0.937	0.964
NO _x	0.602	1.469	0.783	1.661	0.681	1.278
NMVOC	1.618	0.951	7.018	0.618	1.052	0.143
SO ₂	2.000	1.228	0.700	0.500	0.814	1.429
NH ₃	1.134	0.869	0.809	0.882	1.151	1.237

Notes:

EF_32 = EDGAR 3.2 (Table 4.6.b in Olivier *et al.*, 2001).

EF_AM2 = Andea and Merlet (2001) (Table 4.7 in Olivier *et al.*, 2001) updated for NO_x (Andreae, 2004, pers. comm.) (see Table 2).

N₂O: Emission factor excluding post-burn effects for Tropical Forests (6.36 times direct emissions from biomass burning).

Table B.3. OECD average trends and global trends 1995-2000 of F-gas sources used for extrapolation when country-specific reported trends were not available (sources in red and BOLD are the largest sources, accounting for 95% of the global total) (trends between brackets are values are copied from values for other sources).

Group	Gas	Source category	OECD	Global	Global trend indicator
HFC-by-prod.	HFC-23	I91.08a: HCFC-22 production	0.77	1.00	total reported HCFC-22 production
HFC use	HFC-134a	H14-HFC Use-Miscellaneous c)	2.68	4.3	emissions total reported HFC-134a uses
	HFC-152a	H14-HFC Use-Miscellaneous d)	1.83	(4.3)	
	HFC-227ea	H14-HFC Use-Miscellaneous d)	13.86	(4.3)	
	HFC-23	H11,12,13-HFC uses		(1)	
	HFC-125	H14-HFC Use-Miscellaneous	3.51	(1)	
	HFC-143a	H14-HFC Use-Miscellaneous	8.55	(1)	
PFC-by-prod.	CF₄	I24: Non-Ferro-Aluminium (pri+sec)	0.62		USGS country-specific production
	C₂F₆	I24: Non-Ferro-Aluminium (pri+sec)	(0.62)		USGS country-specific production
PFC use	CF₄	H21-PFC Use-Semicond. manuf.	1.61	(1.61)	OECD average trend
	C₂F₆	H21-PFC Use-Semicond. manuf.	(1.61)	(1.61)	OECD average trend
	C₆F₁₄	H26-PFC Use-Solvents	(0.83)		Japan trend
	Misc.	H22,23,24,25,27,28-PFC uses a)		(1)	
SF ₆ use	SF ₆	H32-SF₆ Use-GIS: Maint/Leaks e)	0.64	1.10	total reported cons. for Electric Utilities
	SF ₆	H33-SF₆ Use-EQ/UA Unaccounted	(0.64)	(1.10)	
	SF ₆	H34,40,42,48-SF ₆ Uses b)	(0.64)	(1)	total reported consumption
	SF ₆	H36-SF₆ Use-Semiconduct. manuf.	1.21	2.15	total reported consumption
	SF ₆	H38-SF ₆ Use-Car tires	(0.64)	0.30	total reported cons. for Adiabatic Prop.
	SF ₆	H39-SF ₆ Use-Other adiabatic proc.	(0.64)	0.30	total reported cons. for Adiabatic Prop.
	SF ₆	H41-SF₆ Use-Misc. (excl. Al/Cr)	(0.64)	0.34	total reported cons. for All Other Uses
	SF ₆	H43-SF₆ Use-OEM: Manufacture	(0.64)	0.82	total reported cons. for Original Equip.
	SF ₆	H44-SF ₆ Use-OEM: Site erection	(0.64)	0.82	total reported cons. for Original Equip.
	SF ₆	H45-SF₆ Use-Magn.: Prim. prod.	(0.96)	(0.96)	OECD average trend
	SF ₆	H46-SF₆ Use-Magn.: Die casting	0.96	(0.96)	OECD average trend
SF ₆	H47-SF ₆ Use-Windows: production	(0.64)	0.34	total reported consumption	

Notes: a) Specification:

- H22-PFC Use-Refrigeration
- H23-PFC Use-Fire extinguishers
- H24-PFC Use-Accelerators/High Energy Physics (HEP)
- H25-PFC Use-Aerosols
- H27-PFC Use-Foam blowing
- H28-PFC Use-Miscellaneous

b) Specification:

- H34-SF₆ Use-Accelerators (HEP)
- H40-SF₆ Use-Aluminium degassing
- H42-SF₆ Use-Miscellaneous use in China & Russia**
- H48-SF₆ Use-Windows: usage

- c) Exceptions for country-specific HFC-134a emissions of OECD countries: Exclude country-specific trends of UNFCCC if the 2000/1995 index is less than 10 (i.e. exclude Australia, Finland, Portugal and Spain) and/or if the reported emissions in 1995 are more than 5x the EDGAR 3.2 estimate for the country (i.e. exclude also Italy). For these countries also the OECD average trend was used.
- d) Exceptions for country-specific HFC-152a and HFC-227ea emissions of OECD countries: Exclude country-specific trend of OECD countries that show exceptional high reported trends due to relatively very low reported 1995 emissions (HFC-152a: Austria and Sweden; HFC-227ea: Germany). For these countries also the OECD average trend was used.
- e) Total national SF₆ emissions reported by OECD countries reflect primarily the H32 category (GIS maintenance and leakage). These country-specific or OECD average trends were used for this category, but also for the remaining sources (other than H36, H45 and H46, for which separate sectoral trend estimates were used).