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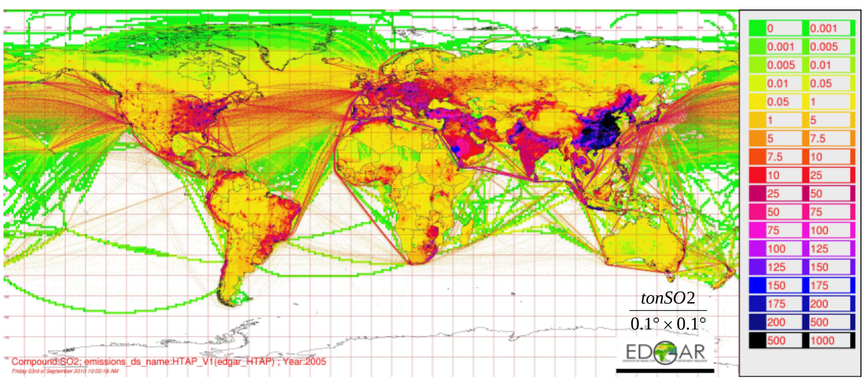

EDGAR-HTAPV1 SO_2 total emissions in ton per 0.1°x0.1°

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EDGAR-HTAP: a harmonized gridded air pollution emission dataset based on national inventories

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Abstract

On the global scale the harmonization and improvement of emission inventories is imperative to get consolidated estimates on formation of global air pollution, and it's influence on human health and climate, and so on the benefit of future policies combating these air pollution aspects. The EDGAR-HTAP project compiled a global emission dataset with annual inventories for CH_4, NMVOC, CO, SO_2, NO_x, NH_3, PM_{10}, $PM_{2.5}$, BC and OC and covering the period 2000-2005 using, to the extent possible, official or scientific inventories at the national or regional scale that are likely to be acceptable for policy makers in each region of the world. This compilation of different official inventories from EMEP, UNFCCC, EPA for USA, GAINS for China and REAS was first gap-filled with global emission data of EDGARv4.1. The IPCC code or UNFCCC's Common Reporting Format, is used as key for harmonizing the data at sector level. Next, the resulting emissions by country and sector were allocated to a 0.1º × 0.1º grid consistently using the EDGARv4.1 proxy data.

The emissions of EDGAR-HTAP were compared with the emission inventory used for the Representative Concentration Pathways for the next IPCC Assessment Report Differences between the national inventories and other bottom-up estimates shows the impact of using higher tier methods and/or country-specific emission factors for compiling a national inventory. Weaknesses in the official emission reports in the EMEP domain were in particular found for diffusive sources.

A paradigm of high quality emission inventories consists in scoring high for IPCC's 'T-A-C-C-C-A' (Transparency –Accuracy- Consistency – Comparability –Completeness) principles. Weaknesses remain in the coherency across borders between different national inventories, in particular when using different datasets applying different inventorying techniques. Therefore the EDGAR-HTAP_V1 can not be considered as a consistent global time series dataset, but can be recommended as a summary with indicative national totals subject to emission reduction policies.

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1. Introduction

Common international understanding of global air pollution, and its influence on human health and climate, is imperative for providing a basis for future international policies and a prime objective for the Task Force Hemispheric Transport of Air Pollution (TF HTAP), www.htap.org. While nowadays many countries and regions report their air pollutant emissions, these emissions may not be readily accessible, their quality may widely differ, and they are presented in various details and formats. On request of the European Commission's DG ENV, the Joint Research Centre (JRC) has, together with a number of international organizations, compiled a harmonized global, gridded, air pollution emission dataset for 2000 to 2005 using, to the extent possible, officially reported inventories at the national scale, complemented with science based inventories where nationally reported data were not available. JRC's team in charge of the Emissions Database for Global Atmospheric Research (EDGAR) named the resulting inventory, EDGAR-HTAP, which is a compilation, as opposed to a globally consistent inventory calculated using activity data and emission factors. In order to provide a complete global picture, this compilation of different official inventories is represented in a harmonized way and gap-filled with global emission data of EDGARv4.1 (http://edgar.jrc.ec.europa.eu, July 2010). The final emission datasets are reported for the years 2000-2005, for 10 aggregated sectors and on a global 0.1º × 0.1º resolution. A separate a 0.5º × 0.5º gridded dataset is available from the US EPA, for the years 2002 and 2005, complementary to the data in EDGAR-HTAP, providing additional details in sectoral, spatial and temporal resolution than EDGAR-HTAP.

EDGAR-HTAP-v1 was completed in October 2010, and partly described in the final report of TF HTAP (HTAP, 2010). Box 1 gives an overview of the different datasets available at the EDGAR-server. This document further describes the contents of EDGAR-HTAP, the assumptions, dataflows and consistency of the data used to create EDGAR-HTAP. A comparison of country and region data between a number of contributing and alternative datasets is also presented.

Box 1: Nomenclature

EDGARv4 is a bottom-up emissions database based on JRC's evaluation of internationally reported activity data (i.e. fuel use, land-use, quantity of industrial products, number of animals), and worldwide consistent assumptions on emission factors associated with these activities for each technology and corrected for end-of-pipe abatement measures. The resulting sector-specific emission trends are publicly available as country totals or on a 0.1°x0.1° grid. EDGARv4.1 can be accessed on http://edgar.jrc.ec.europa.eu/overview.php since July 2010. In the summer 2011 version v4.1 was updated with the release of the EDGARv4.2 version, with some air pollutants to follow in 2012.

EOLO: Both the EDGARv4.1 database and the EDGAR-HTAP emission dataset were included and generated using JRC EOLO webserver http://edgar.jrc.it/eolo*.* Access to EOLO (password protected) is granted on a case-by-case basis.

EDGAR-HTAP uses nationally reported emissions, combined with regional scientific inventories, all gridded with geospatial data from EDGARv4.1, and for countries or sector without reported data, complemented with data directly from EDGARv4.1. EDGAR-HTAP is available from EOLO, both versions HTAP_V1 of October 2010, also used in Chapter 3 of the HTAP report. The static version of the EDGAR-HTAP (EDGAR-HTAP_V1) is currently made available via http://edgar.jrc.ec.europa.eu/national_reported_data/htap.php, and the CIERA server, distribution via the ECCAD server is also foreseen.

2. EDGAR-HTAP Datasets

2.1 Components of EDGAR-HTAP

Currently available global emission inventories differ in the compounds considered, regions, emission sources covered, in short they differ in completeness, spatial and temporal resolution. Lamarque et al. (2010) provides a unique example of comprehensive historical dataset but based on emissions for the baseyear 2000 that is extrapolated in time according Representative Concentration Pathways. Atmospheric modelers, therefore, often compile their own emission inputs, drawing upon different pieces of the available inventories. These compilations, involve sometimes arbitrary choices, and are often not clearly described. For example, the atmospheric modeling groups, who contributed to the HTAP multi-model experiments and described in *HTAP (2010),* used their own best estimates for emissions for the year 2001, resulting in some cases similar global emissions (e.g. NO_x, SO_2), and sometimes large differences (NMVOC emissions). Moreover, in *HTAP (2010)* the consistency with nationally reported emission data is not clear. To serve policymakers, utmost use of well documented national inventories was a prime objective and gapfilling with scientific inventories for completing the global picture a second one. In this way, a global emissions dataset. EDGAR-HTAP was compiled for 2000 to 2005 using, to the extent possible, official or scientific inventories at the national or regional scale and hence mostly consistent with information available on national policy level in each region of the world. With view on the later use in chemical transport models the inventory included all air pollutants and particles as listed in box 2.

Box 2: List of Air Pollutants included in the EDGAR-HTAP inventory

Ozone precursor gases: CH_4, NMVOC, CO, NOx

Acidifying/ Eutrophying gases: SO_2, NH_3 , (and NO_x)

Particulate Matter: PM_{10}, $PM_{2.5}$, BC and OC

The resulting inventory is a compilation, as opposed to a top-down consistent inventory calculated using activity data and emission factors. The name EDGAR-HTAP was chosen to reflect that the database was generated, on request of the Task Force Hemispheric Transport of Air pollution, by the EDGAR team using the EOLO infrastructure, to generate complete, gridded, and gap-filled emission data for further use by modelers. However, as outlined below, a number of other international institutions have significantly contributed provided data to facilitate the generation of EDGAR-HTAP.
The task of the EDGAR team was three-fold: a) collection and selection of official emission inventories, which were mainly provided by other international institutions, b) gapfilling for some regions or for some sectors, c) gridding of the compiled global emission inventory. The third task was preferred to the possible cut-and-paste action of available emission gridmaps because gridding of the global emission inventory with one single proxy dataset ensures single location of multi-pollutant sources and as such chemical reaction of co-emitted substances.

An initial version, EDGAR-HTAP_V0, was generated in 2009, but never released to the public. After several quality improvements, EDGAR-HTAP_V1 was completed in October 2010, and version HTAP_V1 is partly described in *HTAP-report, Chapter 3 of Streets et al (2010)*. Further updates of EDGAR-HTAP are anticipated to further improve known quality and inconsistency issues. This new version (anticipated in 2012) will have a version number 2.
In order to provide a complete global picture of emissions, this compilation of different official inventories needed to be represented in a harmonized way, and gap-filled with global emission data of EDGARv4.1, as made public at http://edgar.jrc.ec.europa.eu by *EC/JRC/PBL (2010)*.

The EDGAR-HTAP inventory for air pollutants has been compiled using the following inventories in descending priority order:

1. UNCLRTAP/EMEP
2. UNFCCC/US EPA
3. GAINS
4. REAS
5. EDGARv4.1 and updates

An overview of the publicly available sources, which were considered for the EDGAR-HTAP inventory is presented in Figure 1. The purpose of this figure is to point to the areas for which given sources of some or all air pollutant emissions were considered as alternative source to complement the official inventories.

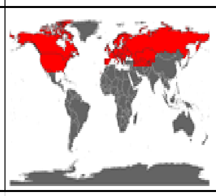
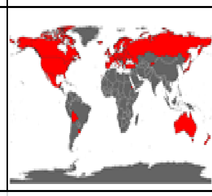
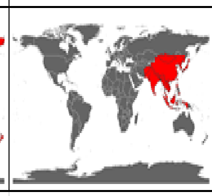
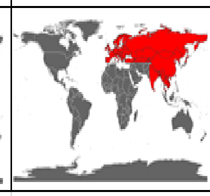
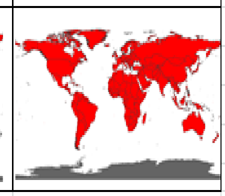
Order of priority	1. EMEP	2. UNFCCC	3. REAS	4. GAINS	5. EDGARv4
CO	x	x	x	x	x
NOx	x	x	x	x	x
SO2	x	x	x	x	x
NMVOC	x	x		x	x
NH3	x		x	x	x
CH4		x	x	x	x
PM2.5	x			x	x
PM10	x			x	x
OC			x	x	x
BC			x	x	x
geocoverage					

Fig.1 Chemical substances and geographical region covered by the EDGAR-HTAP datasets used with decreasing order of priority in the procedure to compile the available data into one global emission dataset.

The Intergovernmental Panel on Climate Change (IPCC) code—defined by the IPCC Guidelines (1996) and conforming the United Nations Framework Convention on Climate Change (UNFCCC) Common Reporting Format, CRF—is used as the key for harmonizing the sector-specific data. A corresponding EDGAR-HTAP coding system is developed to allow aggregation at different levels of detail, using the same CRF structure with three levels represented each by 3 characters[1] and separated with a point. The category number is expressed at first level from 1 to 7, the second level represents the CRF subcategory letter expressed by a letter from A to G and the third level incorporates all further CRF details 1a etc. As an example the power plant industry with CRF code "1A1a" was converted into "yy1.yyA.1ay" or in short " 1. A.1a ". The table with all sectors and corresponding translation to other sector structures are given in Table1 and Annex 1 gives the detailed conversion matrix for all sector specifications between the different datasets used.

It should be mentioned that different levels of detail as present for the different countries are kept to the extent possible in order to keep transparency on the ingredients of sector-specific emission totals. In the exercise to establish a harmonized dataset with uniformly defined sectors, the greatest

[1] A blank is replaced by "y".

common denominator could be selected, avoiding artificial subdivision of country-specific emission data. Obviously, some sectors in EDGAR-HTAP are not as complete as in some individual official datasets, because some other national inventories or EDGAR4.1 miss the estimates of some subactivities, most notably unpaved road dust, road abrasion, brake and tire wear in the road transport sector The resulting emissions by country and sector were allocated to a 0.1º × 0.1º grid using the EDGARv4.1 proxy data (for urban/rural population density, animal density, power, steel and non-ferrous metal industry, coal mines, oil and gas production fields, roads, shipping and aircraft routes, crop- and grasslands, rice fields). The final emission datasets are reported for the years 2000-2005, for 10 aggregrated sectors and on a global 0.1º × 0.1º grid. These data, presented in CF1 compliant NetCDF files, comprise (uncompressed) ca. 10 Gb of data.

Complimentary to EDGAR-HTAP emission data, the US EPA (Vukovich, 2009), provided an additional 0.5º × 0.5º gridded dataset, covering the United States geographical domain, for the years 2002 and 2005 and providing additional sector-specific details than EDGAR-HTAP. *Vukovich (2009)* describes in detail the assumptions, and workflow of the EPA database. The US EPA emission dataset (Vukovich, 2009) is based on a much more accurate regional coverage of activity data, emission factors and abatement measures in the period 2000-2005 and therefore differs in total emission per sector and in geographical distribution. In this document we provide a short overview of the difference of this dataset with EDGAR-HTAP_V1 in section 2.6. Using a sector-specific translation table, given in this report, the EDGAR-HTAP data can be substituted for further model sensitivity analysis.

We further notice that significant parts of preliminary versions of EDGAR-HTAP have been used in the construction of the harmonized emission dataset for the year 2000, commonly know as the RCP database (http://www.iiasa.ac.at/web-apps/tnt/RcpDb/dsd?Action=htmlpage&page=welcome); *Lamarque et al (2010)*, meaning that there is some correspondence of EDGAR-HTAP_V1 and RCP data for the year 2000. Section 2.7 compares the RCP 2000 emissions with those of EDGAR-HTAP_V1.

Box 3: List of Sectors included in EDGAR-HTAP

The EDGAR-HTAP emissions are grouped in 10 sectors, the consistent IPCC reporting format in brackets. Annex 1 provides further details.

- htap_1_Aircraft (1A3a),
- htap_2_Ships (1A3d),
- htap_3_Energy combustion & fuel production/distribution (1A1a-b-c, 1A2, 1B1-2),
- htap_4_Industry processes (2A-B-C-D-G),
- htap_5_Ground transport (1A3b-c-e),
- htap_6_Residential sector (1A4-5),
- htap_7_Solvents (3),
- htap_8_Agriculture (4.A-B-C-D (not 4E, which is Savannah burning)),
- htap_9_Agricultural waste burning (4.F-G) and
- htap_10_Waste (6.A-B-C-D).

Due very incomplete reporting, and the large uncertainties and importance of land-use and forest related emissions of air pollutants ("large-scale biomass burning") emissions, EDGAR-HTAP does not report these emissions. For modelling, we recommend the use of recent, satellite product based inventories, such as GFED3 (*van der Werf, 2010*).

2.2 EMEP: Inventories submitted by parties to the LRTAP convention.

Countries that are parties to the LRTAP Convention provide annual emission inventory data for CO, NH_3, NMVOC, NO_x, SO_x, particulate matter, heavy metals and persistent organic pollutants. These inventories are reported on the national level to the European Monitoring and Evaluation Programme's (EMEP) Centre on Emission Inventories and Projections (CEIP – www.ceip.at). Emissions as reported by Parties, version[2] NFR08 of 2009 for the years 2000-2007 have been kindly provided by CEIP, www.ceip.at/ceip *(Robert Wankmueller, personal communication, July 2009)* and the dataset is documenten by EMEP report of *Mareckova et al (2009)* at http://www.ceip.at/review-process/review-2009.

We did not use the gridded expert data, as used in the EMEP model but the country-specific totals, which are more complete (geographically) and more detailed with regard to the sector-specific breakdown. The sector-specific categories are taken up in Annex 1and for a full description the reader is referred to the *CORINAIR Atmospheric Emissions Inventory Guidebook (2009).* These data have been summed to IPCC source categories using the conversion table from the Nomenclature for Reporting to CRF (see Annex 1 for the conversion table). The results can be found underneath in Table 1.

Table 1: Sector-specific aggregations for EDGAR-HTAP and link with EMEP sectors[3].

EMEP	EDGAR-HTAP sector-specific aggregation	
	for emission subtotals	for gridding
Combustion in energy and transformation industries	1.A.1a, 1.A.1b, 1.A.1c	htap_3
Non-industrial combustion plants	1.A.4, 1.A.5	htap_6
Combustion in manufacturing industry	1.A.2	htap_3
Production processes	2 (2.A., 2.B., 2.C. …, 2.G.)	htap_4
Extraction and distribution of fossil fuels and geothermal energy	1.B.1, 1.B.2	htap_3
Solvents and other product use	3..	htap_7
Road transport	1.A.3b	htap_5
Non-road ground transport (rail, pipeline)	1.A.3c, 1.A.3e	htap_5
Other mobile sources and machinery	1.A.5	htap_6
Agriculture	4.A., 4.B., 4.C., 4.D.	htap_8
Agricultural waste burning	4.F.	htap_9
Waste treatment and disposal	6 (6.A., 6.B., 6.C., 6.D.)	htap_10

It was recognized that the description and breakdown of national emissions data differ significantly in level of detail between the EMEP countries, because not all countries have the same reporting obligations. To illustrate the quality and completeness of the EMEP dataset, Table 2 shows the countries, which did not report for all years. Consultation of other datasets was preferred to interpolation for the temporal and sectoral gapfilling. In order to avoid double-counting for the bunker statistics, these were excluded and only domestic aviation and inland waterways were taken up. The bunker statistics are treated on global scale in the EDGARv4.1 emissions calculations and directly included as global totals.

[2] Data which was only available in NFR02 at this time we converted to NFR08. In the meantime the format changed again to NFR09, which is almost the same as NFR08.
[3] Because the EOLO-system operates with a sector-specific coding composed of groups of tree characters, separated with a point, the "y" was used where needed to complete the three character series.

Table 2: Non-reported emissions in the EMEP domain (with countries: AZE= Azerbaijan, BGR=Bulgaria, BLR=Belarus, CZE= Czech Republic, FIN=Finland, GRC= Greece, HRV= Bosnia-Herzegovina, HUN=Hungary, LIE= Liechtenstein, LTU= Lithuania, MCO=Monaco, MKD= Macedonia, MLT = Malta, POL= Poland, ROU= Romania, RUS= Russia, SRB = Serbia, TUR= Turkey, UKR= Ukraine and USA)

	2000 emissions missing	More years missing emissions
CO	BGR, BLR, CZE, MCO, MKD, POL	AZE, GRC, HRV, HUN, LIE, LTU, ROU, RUS, TUR, UKR, USA
NH3	BGR, BLR, CZE, MCO, POL	HRV, HUN, LIE, LTU, MKD, MLT, ROU, RUS, TUR, UKR, USA
NMVOC	BGR, CZE, MCO, POL	AZE, BLR, GRC, HRV, HUN, LIE, LTU, MKD, MLT, ROU, RUS, TUR, UKR, USA
NOx	BGR, BLR, CZE, MCO, MKD, POL	AZE, GRC, HRV, HUN, LIE, LTU, MLT, ROU, RUS, SRB, TUR, UKR, USA
SOx	BGR, BLR, CZE, MCO, MKD, POL	AZE, GRC, HRV, HUN, LIE, LTU, MLT, ROU, RUS, SRB, TUR, UKR, USA
PM10	CZE, POL	BLR, HRV, HUN, LIE, LTU, ROU, RUS, UKR, USA
PM2.5	POL	BLR,CZE,HRV,HUN,LTU,MLT,RUS, UKR,USA

2.3 UNFCCC

The so-called Annex I countries of the Kyoto Protocol (industrialized countries and economies in transition) report since their base year (for most of them 1990) annual country totals of emissions of greenhouse gases (CO2, CH4, N2O, F-gases) and indirect greenhouse gases pollutants (CO, NMVOC, NOx, and SO2). These data have to follow specific guidelines in reporting and inventory construction. The UNFCCCinventory expert teams have to mandate for a thorough review of all (Kyoto-Protocol) greenhouse gases, but sometimes also air pollutants are subject to such external review. For the EDGAR-HTAP inventory, UNFCCC emissions data were downloaded from the UNFCCC data portal (http://unfccc.int/ghg_data) in the CRF format, in May 2009 for the reported inventory time series from 1990-2007.

Non-Annex I parties submit emission inventory data to the UNFCCC periodically under different reporting requirements than Annex I parties. These data vary in quality and detail, especially regarding air pollutants, and do seldom provide complete time-series. For this reason, non-Annex I data were not used in the EDGAR-HTAP inventory. UNFCCC emissions follow IPCC source classifications, and the EDGAR conversion tables include IPCC source classification.

It should be noted that there are 5 EMEP countries, which are not belonging to Annex I: Cyprus, Malta, Macedonia, Moldova and Turkey. For these countries no officially reported CH4-inventory was available. Malta and Turkey deserve a special note, due to recent negotiations with UNFCCC. Since October 2010 Malta is considered an Annex I Party for the purpose of the Convention but not for the Protocol. But it was not an Annex I Party at the time of the dataset compilation. Turkey ratified the Kyoto Protocol in 2009, and is nowadays an Annex I Party both for the Convention and the Protocol. Turkey began to report regularly in 2007, but the first inventories were not complete.
For the United States, the U.S. EPA National Emission Inventory (NEI) data for the years 2002 and 2005 have not been included in the EDGAR-HTAP database, but the EMEP data for the components NOx, SO2, NMVOC, PM2.5, PM10, NH3, and CO was used instead because of timeseries consistency. The USA inventory for CH4 was taken from UNFCCC.

The UNFCCC and EMEP datasets have been merged for each country and source category, giving priority for the CH4 greenhouse gas to the (internationally reviewed) UNFCCC data, that is in large detail (also at sub-sector level) described by the IPCC Guidelines. The other substances, CO, NMVOC, NOx and SO2 are not reviewed and ranked second order after the EMEP data. Even though it is expected to find for the EMEP countries consistently the same emissions for the substances, differences are found in several countries, mainly because of different reporting organizations. Rarely the emissions of the EMEP countries reported to EMEP are in all details found back in the emissions reported to UNFCCC for each of the substances CO, NMVOC, NOx and SO2. Not all countries report the voluntary substances. No complete dataset (reporting for CO, NMVOC, NOx, SO2 of all years 2000-2005 to UNFCCC) by Bulgaria, Belarus, Canada, Cyprus, Czech Rep., Finland, Greece, Croatia, Hungary, Iceland, Liechtenstein, Lithuania, Luxembourg, Monaco, Moldova, Macedonia, Malta Poland, Roumania, Russia, Turkey, Ukraine and USA. Larger deviations are present due to additional source categories, e.g. Austria reports 60% more NMVOC to EMEP as it included also the 5E category (emissions due to land-use changes for settlements), e.g. The Netherlands reports the double SO2, since they include here also all shipping emissions up to 12 miles from their coastal zone. An overview of a first global comparison is given in Table 3. The purpose of this table is to identify the good matching regions (in function of the chemical substance) and to pave the way for further analysis through identification of where it is necessary to fill the gaps.

Table 3: Ratio of the global emissions for CO, NMVOC, NOx and SO2 reported to UNFCCC to those reported to EMEP. Zero indicates no reported emission inventory for EMEP was available. Green colors are ratios between 0.98 and 1.02, red colors indicate larger deviations.

CO	2000	2001	2002	2003	2004	2005	NMVC	2000	2001	2002	2003	2004	2005	NOx	2000	2001	2002	2003	2004	2005	SO2	2000	2001	2002	2003	2004	2005
AUT	0.84	0.85	0.84	0.85	0.86	0.88	AUT	1.66	1.58	1.54	1.57	1.60	1.70	AUT	1.00	1.00	0.98	0.98	0.97	0.95	AUT	0.99	1.01	1.01	1.01	1.01	0.99
BEL	1.04	1.01	1.06	1.28	1.32	1.78	BEL	1.04	1.04	1.07	1.20	1.20	1.59	BEL	0.88	0.87	0.86	1.14	1.16	1.19	BEL	1.22	1.26	1.20	1.20	1.18	1.20
BGR	0.00	1.06	1.03	1.09	1.11	1.14	BGR	0.00	3.52	3.31	1.38	1.35	1.42	BGR	0.00	1.29	1.38	1.32	1.48	1.47	BGR	0.00	0.86	0.98	0.93	0.93	0.94
BLR	0.00	2.40	0.40	2.59	2.40	1.72	BLR	0.00	0.00	2.00	2.93	2.76	1.53	BLR	0.00	0.98	0.98	1.02	0.98	1.08	BLR	0.00	15.11	14.37	11.99	7.83	5.52
CAN	0.00	0.00	0.00	0.00	0.00	0.00	CAN	0.00	0.00	0.00	0.00	0.00	0.00	CAN	0.00	0.00	0.00	0.00	0.00	0.00	CAN	0.00	0.00	0.00	0.00	0.00	0.00
CHE	0.92	0.94	0.95	0.95	0.95	0.95	CHE	0.93	0.94	0.94	0.94	0.94	0.95	CHE	1.05	1.06	1.07	1.06	1.06	1.03	CHE	1.01	1.01	1.01	1.01	1.00	0.96
CYP	0.00	0.00	0.00	0.00	0.00	0.00	CYP	0.00	0.00	0.00	0.00	0.00	0.00	CYP	0.00	0.00	0.00	0.00	0.00	0.00	CYP	0.00	0.00	0.00	0.00	0.00	0.00
CZE	0.00	0.95	0.94	0.93	0.93	0.93	CZE	0.00	1.00	1.00	1.00	1.03	1.01	CZE	0.00	1.03	1.03	1.03	1.01	1.02	CZE	0.00	1.00	1.00	1.00	1.00	1.00
DEU	0.98	0.98	0.97	0.98	1.00	0.96	DEU	1.10	1.11	1.12	1.13	1.12	1.11	DEU	1.00	1.02	1.02	1.02	1.03	1.00	DEU	1.00	1.00	1.01	1.02	1.01	0.98
DNK	1.03	1.04	1.05	1.06	1.05	1.02	DNK	1.02	1.03	1.02	1.04	1.02	1.01	DNK	1.01	1.01	1.01	1.01	0.99	0.98	DNK	1.01	1.01	1.01	1.01	1.01	1.00
ESP	0.91	0.89	0.92	0.87	0.89	0.92	ESP	1.82	1.87	1.88	1.96	1.92	1.93	ESP	1.01	1.01	1.01	1.01	1.01	1.00	ESP	0.99	0.99	0.99	0.99	0.99	0.99
EST	0.92	0.87	0.89	0.84	0.79	0.75	EST	1.69	1.66	1.63	1.45	1.37	2.81	EST	0.87	0.87	0.87	0.80	0.75	0.69	EST	0.85	0.81	0.81	0.80	0.72	0.65
FIN	0.00	1.04	1.05	1.01	1.01	1.02	FIN	0.00	0.97	0.95	0.96	0.95	0.96	FIN	0.00	0.87	0.99	1.01	0.85	0.84	FIN	0.00	0.80	0.92	0.98	0.82	0.80
FRA	0.93	0.96	0.95	0.93	0.93	0.92	FRA	0.97	0.99	1.00	0.87	0.98	0.94	FRA	0.91	0.90	0.88	0.87	0.87	0.86	FRA	0.96	0.96	0.96	0.95	0.93	0.93
GBR	1.01	1.01	1.01	1.01	1.01	1.02	GBR	1.07	1.07	1.08	1.09	1.10	1.11	GBR	1.00	1.00	1.00	1.00	1.00	1.00	GBR	1.01	1.02	1.02	1.02	1.03	1.02
GRC	0.00	0.00	0.93	0.98	0.56	1.02	GRC	0.00	0.00	0.82	0.89	1.08	1.11	GRC	0.00	0.00	0.57	0.60	0.91	1.01	GRC	0.00	0.00	0.74	0.74	0.98	1.01
HRV	0.00	1.01	1.01	0.00	0.00	1.05	HRV	0.00	1.04	1.04	0.00	0.00	1.03	HRV	0.00	1.00	1.02	0.00	0.00	1.03	HRV	0.00	0.90	0.90	0.00	0.00	0.95
HUN	0.00	0.00	1.08	1.00	1.00	0.98	HUN	0.00	0.00	0.97	0.92	1.00	1.01	HUN	0.00	0.00	0.98	0.85	1.00	1.00	HUN	0.00	0.00	0.98	1.00	0.99	0.88
IRL	1.14	1.16	1.17	1.19	1.20	1.21	IRL	1.04	1.04	1.05	1.06	1.07	1.06	IRL	0.96	0.96	0.96	0.95	0.95	0.94	IRL	1.00	1.00	1.00	1.00	1.00	0.99
ISL	0.00	0.00	0.00	0.00	0.00	0.00	ISL	0.00	0.00	0.00	0.00	0.00	0.00	ISL	0.00	0.00	0.00	0.00	0.00	0.00	ISL	0.00	0.00	0.00	0.00	0.00	0.00
ITA	1.00	1.00	1.00	1.00	1.00	1.00	ITA	1.11	1.11	1.12	1.13	1.13	1.13	ITA	1.00	1.00	1.00	1.00	1.01	1.00	ITA	7.92	6.42	8.38	6.60	5.48	5.76
LIE	0.00	87.60	0.00	0.00	0.00	0.00	LIE	0.00	1.97	0.00	0.00	0.00	0.00	LIE	0.00	0.00	0.00	0.00	0.00	0.00	LIE	0.00	0.00	0.00	0.00	0.00	0.00
LTU	0.00	0.00	1.04	1.01	1.01	1.01	LTU	0.00	0.00	1.10	0.93	0.90	0.93	LTU	0.00	0.00	1.24	1.03	1.03	1.07	LTU	0.00	0.00	1.23	1.02	1.03	1.04
LUX	0.00	0.00	0.00	0.00	0.00	0.00	LUX	0.00	0.00	0.00	0.00	0.00	0.00	LUX	0.00	0.00	0.00	0.00	0.00	0.00	LUX	0.00	0.00	0.00	0.00	0.00	0.00
LVA	1.06	1.06	1.07	1.03	1.05	1.03	LVA	1.03	1.03	1.04	1.00	1.02	1.00	LVA	1.02	1.01	1.02	1.01	1.01	1.02	LVA	1.01	0.99	1.00	1.00	0.99	0.99
MCO	0.00	1.00	1.00	1.00	1.01	1.00	MCO	0.00	1.14	1.11	1.09	1.07	0.99	MCO	0.00	1.01	1.02	0.99	1.03	0.99	MCO	0.00	1.03	1.04	1.12	1.16	1.00
MDA	0.00	0.00	0.00	0.00	0.00	0.00	MDA	0.00	0.00	0.00	0.00	0.00	0.00	MDA	0.00	0.00	0.00	0.00	0.00	0.00	MDA	0.00	0.00	0.00	0.00	0.00	0.00
MKD	0.00	0.00	0.00	0.00	0.00	0.00	MKD	0.00	0.00	0.00	0.00	0.00	0.00	MKD	0.00	0.00	0.00	0.00	0.00	0.00	MKD	0.00	0.00	0.00	0.00	0.00	0.00
MLT	0.00	0.00	0.00	0.00	0.00	0.00	MLT	0.00	0.00	0.00	0.00	0.00	0.00	MLT	0.00	0.00	0.00	0.00	0.00	0.00	MLT	0.00	0.00	0.00	0.00	0.00	0.00
NLD	1.16	1.13	1.12	1.12	1.11	1.14	NLD	1.10	1.10	1.10	1.10	1.10	1.08	NLD	1.38	1.41	1.42	1.43	1.46	1.50	NLD	1.96	1.96	2.09	2.20	2.19	2.10
NOR	1.00	1.00	1.00	1.00	1.00	1.00	NOR	1.00	1.00	1.00	1.00	1.00	1.01	NOR	1.28	1.28	1.23	1.23	1.21	1.27	NOR	1.39	1.51	1.31	1.35	1.31	1.37
POL	0.00	3.74	3.98	4.38	1.00	1.00	POL	0.00	1.94	1.52	1.89	1.10	1.12	POL	0.00	2.04	2.08	2.14	1.00	0.98	POL	0.00	1.33	1.34	1.35	1.00	0.99
PRT	1.05	1.04	1.04	1.07	1.05	1.16	PRT	0.98	0.97	0.97	1.00	0.97	0.99	PRT	1.02	1.05	1.04	1.03	1.00	1.03	PRT	0.93	0.95	0.95	0.91	0.86	0.92
ROU	0.00	0.00	0.00	0.00	0.00	0.95	ROU	0.00	0.00	0.00	0.00	0.00	0.99	ROU	0.00	0.00	0.00	0.00	0.00	0.89	ROU	0.00	0.00	0.00	0.00	0.00	1.53
RUS	0.00	0.00	0.83	0.80	0.96	0.98	RUS	0.00	0.00	0.54	0.58	0.56	0.57	RUS	0.00	0.00	0.56	0.62	0.58	0.61	RUS	0.00	0.00	3.77	3.74	3.36	3.06
SVK	1.00	1.00	1.00	1.00	1.00	1.00	SVK	2.24	1.95	2.14	2.15	1.98	2.07	SVK	0.98	0.98	0.98	0.98	0.98	0.97	SVK	1.00	1.00	1.00	1.00	1.00	1.00
SVN	0.62	0.59	0.60	0.60	0.68	0.71	SVN	0.98	0.97	0.98	0.98	1.00	0.90	SVN	1.21	1.19	1.18	1.17	1.20	1.24	SVN	0.98	0.97	1.00	1.00	1.00	1.01
SWE	0.99	0.99	0.99	0.99	0.99	0.99	SWE	1.00	1.00	1.00	0.99	1.00	1.00	SWE	1.03	1.04	1.05	1.05	1.06	1.09	SWE	1.00	1.00	1.00	1.00	1.00	1.02
TUR	0.00	0.00	0.00	0.00	0.00	0.00	TUR	0.00	0.00	0.00	0.00	0.00	0.00	TUR	0.00	0.00	0.00	0.00	0.00	0.00	TUR	0.00	0.00	0.00	0.00	0.00	0.00
UKR	0.00	0.00	1.69	1.65	1.58	1.82	UKR	0.00	0.00	0.58	0.61	0.74	0.61	UKR	0.00	0.00	0.72	0.62	0.61	0.60	UKR	0.00	0.00	0.93	0.86	0.76	0.84
USA	0.00	0.00	1.11	0.00	0.00	0.00	USA	0.00	0.00	0.96	0.00	0.00	0.00	USA	0.00	0.00	1.00	0.00	0.00	0.00	USA	0.00	0.00	1.03	0.00	0.00	0.00

No sector-specific gapfilling was performed, because the Parties of the UNFCCC are requested to provide complete inventories. In case no emissions are reported for a given sector, the emission sources might be not applicable, not existing, confidential or included elsewhere and as such sector-specific gapfilling requires a dialogue with the national inventory experts to avoid double-counting. Also for CH4, again the bunker statistics were excluded and only domestic aviation and inland waterways were taken up. The CH4 from bunker statistics were directly imported from EDGARv4.1 emissions calculations as one global total.

Data gaps in time series of the EMEP inventory were first gapfilled by using the UNFCCC inventory. If the remaining time series was incomplete for some years in the period 2000-2005, linear interpolation or extrapolation from the last/first year available was performed. Only in case no officially reported data was available for an air pollutant, EDGARv4.1 is used for gap-filling. For the particulate matter (PM10, PM2.5, BC or OC) a preliminary dataset of EDGARv4.2 is used, as was developed by October 2010.

2.4 Asian countries: GAINS and REAS

For China, emissions were provided by IIASA *(Z. Klimont, personal communication, 2009)* taken from the GAINS-China dataset, drawing largely on the GAINS-Asia project from 2006-2008 and documented for selected pollutants in Klimont et al. (2009). Data were available for the years 2000 and 2005 for the IPCC source categories and the years in between were generated by linear interpolation for each subcategory. No gap-filling with EDGARv4.1 was necessary for China. The sector-specific emission sources for each substance are specified in Table 4.

Table 4a: CH_4, NH_3, CO, NMVOC and NO_x Emissions from GAINS for China following the EDGAR-HTAP code reflecting the CRF code with in yellow the energy, fossil fuel and manufacturing industries, in red the transport, in violet the residential sector, in light blue the fugitive from mining, in grey the industrial processes, in green the agricultural sectors and in brown the waste sector. The uncolored one represents the miscellaneous activities.

	kton CH4		kton NH3		kton CO		kton NMVOC		kton NOX	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
1. A.1a	21.82	47.18	0.18	0.32	748.69	702.52	123.25	117.66	3320.95	4528.46
1. A.1b	2.73	5.91	0.04	0.06	30.14	62.30	4.19	8.92	15.57	29.68
1. A.2	80.54	127.97	3.95	3.98	31717.40	49905.20	585.88	734.99	4319.68	7625.07
1. A.3a	0.16	0.28	0.00	0.00	0.00	0.00	2.17	3.81	2.51	4.42
1. A.3b	139.49	119.96	2.67	21.90	19908.40	15580.50	3143.93	2191.64	1711.75	1728.18
1. A.3c	0.54	0.77	0.04	0.06	65.55	92.58	24.91	35.18	136.86	193.30
1. A.3d	3.57	7.17	0.15	0.31	255.25	511.92	96.99	194.52	539.08	1075.62
1. A.4	1734.94	1382.35	89.52	87.91	50966.70	44644.30	13505.80	11274.30	1524.06	1643.99
1. A.5	0.01	0.01	0.00	0.00	1.76	1.76	0.06	0.06	0.02	0.02
1. B.1	12534.30	21273.10	0.00	0.00	667.40	1380.41	0.00	0.00	0.00	0.00
1. B.2	2456.73	2834.75	0.00	0.00	15.47	18.45	898.02	1180.08	49.91	59.53
2. A.	0.00	0.00	0.00	0.00	0.00	0.00	568.34	1020.00	0.00	0.00
2. B.	0.00	0.00	141.68	169.19	25.33	80.87	333.76	599.00	5.89	11.65
2. C.	0.00	0.00	0.00	0.00	10294.50	22899.50	0.00	0.00	0.00	0.00
2. D.	0.00	0.00	0.00	0.00	15.73	25.99	84.69	152.00	0.00	0.00
3. .	0.00	0.00	0.00	0.00	545.67	554.78	2704.06	4853.00	0.00	0.00
4. A.13	3472.70	3685.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. A.1	4375.11	4463.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. A.8	2038.13	2361.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. A.9	68.13	90.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. B.13	0.00	0.00	544.18	588.52	0.00	0.00	0.00	0.00	0.00	0.00
4. B.1	0.00	0.00	1028.19	1049.42	0.00	0.00	0.00	0.00	0.00	0.00
4. B.8	0.00	0.00	2280.52	2643.88	0.00	0.00	0.00	0.00	0.00	0.00
4. B.9	0.00	0.00	1319.79	1731.43	0.00	0.00	0.00	0.00	0.00	0.00
4. C.	7634.54	7672.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4. D.1	0.00	0.00	5150.14	5307.03	0.00	0.00	0.00	0.00	0.00	0.00
4. F.	839.48	797.83	167.90	159.57	5811.78	5523.42	1092.62	1038.40	27.12	25.78
6. A.	5787.35	7100.01	0.00	0.00	0.00	0.00	263.55	473.00	0.00	0.00
6. B.	3587.92	4055.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7. .	1.11	2.23	768.83	781.64	2400.00	2400.00	0.00	0.00	0.00	0.00
TOTAL	**44779**	**56030**	**11498**	**12545**	**123470**	**144385**	**23432**	**23877**	**11653**	**16926**

It should be noted that only totals for China as single country has been taken up and distributed at once, even though GAINS contains emissions at province level. The EDGARv4.1 proxy data on EOLO are structured at country-level regardless the surface area of the country. In updated versions a two-step gridding will be performed, with first split-up of the national total at province level and in a second step the province totals will be distributed with the proxy data. This is not only important for China, but also for other countries with large surface area such as USA, India, Brazil, Russia. For a next version 2 of EDGAR-HTAP this two-step gridding approach will only apply for countries where data at province level are available, i.e. China, India and USA.

Table 4b: PM_{10}, $PM_{2.5}$, BC, OC and SO_2 Emissions from GAINS for China following the EDGAR-HTAP code reflecting the CRF code with in yellow the energy, fossil fuel and manufacturing industries, in red the transport, in violet the residential sector, in light blue the fugitive from mining, in grey the industrial processes, in green the agricultural sectors and in brown the waste sector. The uncolored one represents the miscellaneous activities.

	kton PM10		kton PM2.5		kton BC		kton OC		kton SO2	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
1. A.1a	1745.12	2591.45	630.04	905.49	3.59	1.61	2.40	1.63	9781.62	15376.20
1. A.1b	17.32	19.40	11.99	13.41	0.19	0.22	0.06	0.07	127.02	266.53
1. A.2	6210.44	5918.91	4411.00	4279.59	265.38	302.05	273.45	289.40	7145.23	12061.00
1. A.3a	0.12	0.21	0.11	0.20	0.02	0.04	0.07	0.12	0.87	1.57
1. A.3b	409.80	320.83	381.05	293.43	69.79	76.87	248.18	162.60	65.38	91.71
1. A.3c	8.90	12.56	8.43	11.90	3.84	5.42	2.15	3.04	18.25	25.77
1. A.3d	17.20	30.42	16.29	28.82	6.70	11.85	4.71	8.33	64.86	135.71
1. A.4	6110.38	5066.72	5550.45	4667.73	808.36	735.99	2232.07	1887.48	2118.32	2214.60
1. A.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1. B.1	570.83	943.66	286.36	500.52	63.18	109.47	45.49	78.82	74.52	148.56
1. B.2	7.71	9.20	6.94	8.28	0.01	0.02	0.00	0.00	127.27	142.68
2. A.	124.87	225.36	12.43	22.64	0.00	0.00	0.00	0.00	0.00	0.00
2. B.	3.22	7.16	2.24	5.46	2.23	5.51	0.00	0.00	112.88	217.24
2. C.	663.47	1090.64	565.80	913.84	1.25	1.73	1.16	1.01	313.52	684.98
2. D.	109.92	106.84	36.64	35.61	0.00	0.00	0.00	0.00	83.30	133.77
3. .	160.53	163.21	160.53	163.21	12.79	13.01	56.98	57.93	0.00	0.00
4. B.1	40.87	41.67	9.08	9.27	0.00	0.00	0.00	0.00	0.00	0.00
4. B.8	178.36	206.67	31.71	36.74	0.00	0.00	0.00	0.00	0.00	0.00
4. B.9	179.04	237.10	39.79	52.69	0.00	0.00	0.00	0.00	0.00	0.00
4. F.	916.97	871.47	813.65	773.28	107.20	101.88	338.37	321.59	29.06	27.62
7. .	15.98	19.54	2.56	3.13	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	**17491**	**17883**	**12977**	**12725**	**1345**	**1366**	**3205**	**2812**	**20062**	**31528**

For other countries in Asia (outside China) the REAS inventory as received from *J. Kurokawa (personal communication, 2009)* has been included by country and detailed sector for CH_4, CO, NO_x, SO_2, NH_3, OC and BC emissions. Emissions have been allocated to IPCC source categories (see conversion Table of Annex 1). REAS represents the Regional Emission inventory in Asia, which was developed by the Japanese Frontier Research Centre for Global Change (FRCGC) and documented by Ohara et al. (2007). The period of REAS historical data is from 1980 to 2003. Kurokawa et al. (2009) extended the dataset until 2005 using the new statistics. The latter dataset (2000-2005) was used for the EDGAR-HTAP inventory. The dataset cover a target area of South, Southeast, and East Asia, whose range is from 50°N to 10°S in latitude and from 60°E to 150°E in longitude.

Countries in REAS, include aside China: Japan, South Korea, North Korea, Mongolia, Taiwan, Macau, Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, Afghanistan and the Maldives. It should be noted that from these countries, Japan is the only one that also belongs to the Annex I group. Emissions in Japan have been taken from the official inventory submitted to the UNFCCC, completed with REAS data mainly for NH_3, OC and BC but also for some sectoral gapfilling. A comparison between the UNFCCC and REAS totals for CO, NOx and SO2 are given in Table 5, which shows that REAS mostly concentrates on mobile source and remains incomplete for stationary combustion. Therefore the CO, NOx and SO2 from UNFCCC were preferred for all categories where data existed. The REAS estimates for SO2 from rail and inland waterways were added to complete the UNFCCC estimates for SO2.

More the REAS inventory focused also for all other REAS countries on energy-related activities and not on agricultural activities. Only NOx emissions were reported for the agricultural soils sectors and that not even for all REAS countries. Japan, North and South Korea and Macao did not show agricultural emissions at all. All missing agricultural emissions for all (other) substances and countries) were gapfilled with EDGARv4.1 data. Also for other sectors where REAS emissions were reported to be zero, gaps were filled using inter/extrapolation to complete time series or using EDGARv4.1 data to complete missing compounds or missing sectors (i.e., NMVOC, PM_{10} and $PM_{2.5}$).

Table 5: CO, NOx and SO2 emissions for Japan in 2000 and 2005: comparison of the data reported to UNFCCC and the estimated emissions data in the REAS inventory. The values of the green cells have been included in EDGAR-HTAP_V1. The red cells indicate absence of emission estimates.

		2000			2005		
		UNFCCC	REAS	HTAPv1	UNFCCC	REAS	HTAPv1
CO	1. A.3b	1830	1699	1830	1082	1323	1082
	rest 1	1815	0	1815	1646	0	1646
	4	156	0	176	151	0	172
	6	109	0	109	106	0	106
	total	**3910**	**1699**	**3930**	**2985**	**1323**	**3006**
NOx	1. A.3b	634	660	634	547	602	547
	rest 1	1300	0	1300	1294	0	1294
	2	74	0	74	71	0	71
	4	0	0	23	0	0	22
	6	93	0	93	83	0	83
	total	**2102**	**660**	**2125**	**1995**	**602**	**2017**
SO2	1. A.3b	97	24	97	78	12	78
	1. A.3c	0	0.2	0.2	0	0.2	0.2
	1. A.3d	0	45	45	0	42	42
	rest 1	740	0	740	707	0	707
	2	47	0	47	49	0	49
	4	0	0	1	0	0	1
	6	47	0	47	41	0	41
	total	**931**	**69**	**977**	**875**	**54**	**918**

2.5 Gap-filling and gridding: EDGARv4.1

The Emission Database for Global Atmospheric Research (EDGAR) is hosted at the European Commission, Joint Research Centre, Institute for Environment and Sustainability (EC JRC IES) and continuously maintained and further developed by IES in collaboration with the Dutch Environment Assessment Agency (PBL)[4]. EDGAR provides historical (1970-2005) global anthropogenic emissions of greenhouse gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, of precursor gases CO, NOx, NMVOC and SO_2 and the aerosols BC and OC per source category both at country and region levels as well as on grid. Emissions are calculated by taking into account activity data such as fuel consumption by sector, different technologies with installed abatement measures, uncontrolled emission factors and

[4] The EDGAR database was originally developed by Olivier (2002), and since 2008 run by JRC/EC

emission reduction effects of control measures. Emissions are calculated for all world countries (246 entities) for the emission source (sub)groups; (i) combustion/conversion in energy industry, manufacturing industry, transport and residential sectors, (ii) industrial processes, (iii) solvents and other product use, (iv) agriculture, (v) large scale biomass burning, (vi) waste and (vii) miscellaneous sources. A detailed overview of the EDGAR emissions database with its sectors is found at edgar.jrc.ec.europa.eu.

The EDGARv4 inventory aims at a transparent and consistent comparison between non-Annex I and Annex I countries. Therefore default emission factors and default uncertainty ranges, following the 2006 IPCC guidelines and the CORINAIR EMEP/EEA guidebook (2009) are combined with globally consistent use of international statistics for the fuel consumption, choice of technology mix, and underlying assumptions such as livestock characteristics, vehicle mileage of cars, fraction of total waste deposited in landfills to derive emission inventories for all individual countries. Differences between EDGARv4.1 and UNFCCC reports of Annex I identify strengths and weaknesses from the recommended IPCC 2006 guidelines, Tier 1 or 2 for GHG, as consistently used by EDGARv4.1. National inventories are normally more detailed and as such the difference might also indicate the impact of higher Tier or country-specific emission estimates. For the air pollutants the differences between EDGARv4.1 and EMEP reports indicate where shortcomings and improvements are largest. Moreover verification with inverse modelling of atmospheric measurements helped to improve the quality of the EDGARv4.1 dataset. For this EDGAR-HTAP inventory the EDGARv4.1, released on the edgar.jrc.ec.europa.eu in July 2010 was used, for gap-filling for all air pollutants. The v4.1 dataset did not include yet an officially published version for the particulate matter, black and organic carbon (PM, BC, OC). Thereto a preliminary version of EDGARv4.2 was the only available one and used with its development status of October 2010.

For the spatial distribution of the EDGAR emissions data, the EOLO system disposes over an extensive set of global proxy data that are representative for major source sectors. Emission sources are, depending on the source sector or subsector, considered either as diffuse or as point source. The diffuse sources are distributed over the grid cells with the proxy data covering the globe entirely or partially, whereas the point sources are allocated to points within a grid cell. In order to make both additive, the point sources are smeared out over the corresponding grid cell and their value is corrected by a geographical fraction such that the sum of the discrete grid cell values for a given (sub)sector corresponds to the country-specific total of that sector.

A key proxy dataset is the gridded population of the world (total, urban or rural) from Center for International Earth Science Information Network (CIESIN) of the Columbia University (2005) that was modified such to exactly match the country area and population taking into account also the fraction of country-data in the cells with an intersection of country borders. Permanent ice and large lakes have been merged with neighbouring polygons to make a layer more appropriate for cartographic visualization of the data. Industrial activities are well localised and mainly distributed on point source gridmaps, allocating the industrial activities to their plant location coordinates. For the point sources in the combustion sector, point source maps for power and industrial plants, oil refineries, coal mines, oil and gas fields, road network, shipping and aircraft routes are applied. A combination of proxy data grid maps was needed for sectors, such as in the road transport (based on population density and the road network). For the diffusive agricultural emission sources, different types of grid maps were applied, ranging from agricultural land use and soil type maps, such as grassland and cropland cover data sets, rice cultivation area and animal density maps from FAO and other references. All proxy datasets applied for the gridding of the different sector-specific sources are given in Annex 3.

2.6 US EPA dataset for 2002 and 2005

A separate 0.5º × 0.5º gridded dataset in NetCDF is available from the US EPA, for the years 2002 and 2005, complementary to the data in EDGAR-HTAP, providing additional sectoral-specific and spatial emissions data. It should be noted that the sectoral, temporal resolution and the spatial resolution (incl. cell definition) of these NetCDF gridmaps differ from those of EDGAR-HTAP. Whereas the global gridmaps have 0.1ºx0.1º grid cells that are left bottom corner centered, the US

EPA gridmaps cover the USA with 0.5ºx0.5º grid cells, that are centered at the .25 and 0.75 degree lines.

The emissions dataset was developed from a very detailed emissions inventory that is maintained by the US EPA, and that is compiled from reports from the individual industrial plants, and the 50 US states. Lee Tooly of the US EPA assigned each of the 10000 subcategories to one of the major NFR categories. *Vukovich et al. (2009)* documented the procedure followed to generate these emissions.

Table 6 correlates the sectors of USEPA with EDGAR-HTAP. It is worth to mention that the USA EPA dataset includes resuspended dust: (i) "R-Other" includes fugitive dust from paved and unpaved roads, as well as some other miscellaneous fugitive sources and (ii) "P-Agricultural, Other" includes the dust from the grain elevators, dust from tilling, and ammonia from fertilizers. Moreover the field burning of agricultural waste, under "Q-Agricultural, Waste" is restricted, but mainly the restrictions limit what times of year that it can be done. It is prevented in only a few regions of the country.

Table 6: correlation table of US EPA and EDGAR-HTAP sectors.

US EPA	**EDGAR-HTAP**	Remarks
A - Public Power	htap_3	
B - Industrial Combustion	htap_4	
C - Small Combustion Sources	htap_6	Includes residential commercial/institutional sources, off-highway, LPG engines, commercial and government waste disposal, space heaters
D - Industrial Processes	htap_4	does not generally include the fuel combustion in boilers at the facilities. That is in category “B – Industrial Combustion”
E - Fugitive Emissions	htap_3	
F – Solvents	htap_7	
G - Road and Rail Emissions	htap_5	
H – Shipping	htap_2	coastal and inland waterways.
I - OffRoad Mobile Sources	htap_5	Includes fuel combustion from recreational vehicles, construction equipment, industrial equipment (such as cranes), lawn and garden equipment, agricultural equipment, commercial motors, mining equipment, and forestry equipment.
J - Civil Landings and Takeoffs	htap_1	Different treatment in 2002 and 2005: include in point sources in 2005
L - Other Waste Disposal	htap_10	
M - Wastewater Treatment	htap_10	
N - Waste Incineration	htap_10	
O - Agriculture, Livestock	htap_8	
P - Agriculture, Other	htap_8	
Q - Agriculture, Wastes	htap_8	
R – Other	Not included	Most diffusive emissions from agriculture, mainly of importance for PM2.5 and PM10
S - Natural Emission Sources	Not included	Include (non-prescribed) forest fires. Non-fire biogenic emissions

Table 7a and b give an overview of the 2002 and 2005 emissions of US EPA emissions. More details can be found in *Vukovich et al. (2009)*.

Table 7a: USA total emissions for the year 2002 by US EPA

	2002 emissions (kton)						
Emission Category	NO_x	SO_2	VOC	$PM_{2.5}$	PM_{10}	NH_3	CO
A - Public Power	4709	10436	49	506	620	30	657
B - Industrial Combustion	2045	1787	152	178	340	16	1264
C - Small Combustion Sources	786	590	1680	603	674	26	5775
D - Industrial Processes	587	807	815	655	2028	126	1889
E - Fugitive Emissions	355	254	2009	14	19	2.9	345
F - Solvents	6.9	0.2	4278	6.8	8.1	0.3	1.7
G - Road and Rail Emissions	8989	321	4968	177	234	294	60719
H - Shipping	1086	234	25	41	44	0.5	182
I - OffRoad Mobile Sources	2197	189	2929	219	231	1.9	21794
J - Civil Landings and Takeoffs	110	9.0	56	18.3	25.0	0.0	582
L - Other Waste Disposal	5.1	4.2	69	3.5	6.3	11.1	18
M - Wastewater Treatment	0.6	1.8	133	0.1	0.2	14	0.4
N - Waste Incineration	105	20	194	264	282	0	1576
O - Agriculture, Livestock	0.0	0.0	42	19	104	2189	0.0
P - Agriculture, Other	2.8	2.4	1.5	539	2231	1140	15
Q - Agriculture, Wastes	62	19	175	225	265	23	2005
R - Other	0.0	0.0	1.9	965	5169	0.0	0.0
S - Natural Emission Sources	176	48	387	686	800	37	8224
TOTAL	**21224**	**14723**	**17965**	**5121**	**13079**	**3915**	**105044**

Table 7b: USA total emissions for the year 2005 by US EPA

	2005 emissions (kton)						
Emission Category	NO_x	SO_2	VOC	$PM_{2.5}$	PM_{10}	NH_3	CO
A - Public Power	3801	10428	48	516	627	25	642
B - Industrial Combustion	1895	1730	133	195	351	20	1226
C - Small Combustion Sources	777	593	1099	580	648	26	5556
D - Industrial Processes	625	795	817	594	2055	122	1690
E - Fugitive Emissions	358	194	1972	17	21	1.7	338
F - Solvents	4.4	0.2	4245	7.4	8.3	0.4	2.5
G - Road and Rail Emissions	7610	221	4163	165	224	299	48667
H - Shipping	2705	1241	82	170	184	0.4	307
I - OffRoad Mobile Sources	2136	200	2745	201	212	2.0	19866
J - Civil Landings and Takeoffs	74	6.7	31	10.0	12.6	0.0	497
L - Other Waste Disposal	6.4	6.0	67	5.1	8.6	11.1	30
M - Wastewater Treatment	0.3	0.7	131	0.5	0.7	16	0.6
N - Waste Incineration	139	22	193	260	279	0	1523
O - Agriculture, Livestock	0.0	0.0	42	11	104	2189	0.0
P - Agriculture, Other	2.8	2.5	1.4	335	2230	1140	15
Q - Agriculture, Wastes	62	19	175	225	265	23	2005
R - Other	0.0	0.0	1.9	479	5170	0.0	0.0
S - Natural Emission Sources	176	48	1883	686	800	37	8224
TOTAL	**20372**	**15507**	**17832**	**4457**	**13198**	**3915**	**90588**

The USA emissions of the EDGAR-HTAP_V1 dataset are compared at the detail available with the US-EPA dataset in Table 8a for NMVOC, NH_3 and CO. Please note that only the years 2002 and 2005 are compared, because only those years are available in the US-EPA dataset. Major differences are found for air pollutant emissions of the waste sector (missing waste incineration in the EDGAR-HTAP_V1 dataset), in the agricultural sector (NH3 emissions of agriculture are found in EDGAR-HTAP_V1 under "Agricultural waste", but in the US EPA inventory they are found under "Other agricultural sectors") and in the shipping sector (US EPA seems to lack NMVOC and CO emissions from domestic and coastal shipping). The inconsistency with the latter sector might be caused by applying in EDGAR the UNFCCC definition of domestic shipping which is not restricted to the 12 miles coastal zone (and which considers for USA also e.g. the trajectories to Hawaii). The large discrepancy with EDGAR-HTAP_V1 showing e.g. 34 times higher NMVOC emissions in 2002 is becoming smaller (factor less than 10) in 2005 because the US-EPA shipping emissions increase from 2002 to 2005 with a factor 3.5 for NMVOC and almost 2 for CO).

Table 8b summarizes the EDGAR-HTAP_V1 and US EPA dataset for NO_x, SO_2 and particulate matter emissions of USA. Largest discrepancies are found for particulate matter, for which the emissions of EDGAR-HTAP_V1 sum up to not even one quarter of the reported US EPA PM totals. PM10 from industrial processes and agriculture contribute in the US EPA inventory to 28% and respectively 32% of the PM10 emission total and are missing in EDGAR-HTAP_V1. Also the PM emissions of road transport and off-road mobile sources – in particular the latter sector includes so-called superemitters on unpaved roads - are underestimated in EDGAR-HTAP_V1 with a factor ½. Reasons for these discrepancies can be found in the diffusive emission sources such as pave dust & tyre / brake dust, construction dust, which are not taken up in many inventories: nor in many national inventories reported to EMEP, neither in the EDGARv4.1 inventory.

Table 8a: Comparison of US EPA data for NMVOC, NH_3 and CO with the EDGAR-HTAP_V1 dataset for USA at the sectoral split of USEPA. Color index: Green = agreement within 25% margin between US EPA and EDGAR-HTAP_V1. Yellow = EDGAR-HTAP_V1 emissions (for coastal shipping & for agricultural waste) are 5 - 90 times larger than in US EPA. Red = EDGAR-HTAP_V1 lacks emissions, which the US EPA inventory includes (several sectors are small, except waste & agriculture).

		NMVOC (kton)				NH3 (kton)				CO (kton)			
Emission Category		2002		2005		2002		2005		2002		2005	
		US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA
A - Public Power	A	49	0.92	48	0.92	30	0.76	25	0.83	657	0.90	642	0.94
B - Industrial Combustion	B	152	0.91	133	0.96	16	1.48	20	1.44	1264	0.91	1226	0.91
C - Small Combustion Sources	C	1680	0.83	1099	1.25	26	0.03	26	0.03	5775	0.56	5556	0.56
D - Industrial Processes	D	815	2.50	817	2.31	126	0.27	122	0.26	1889	0.92	1690	1.02
E - Fugitive Emissions	E	2009	0.27	1972	0.27	3	0.02	2	0.04	345	0.94	338	0.95
F - Solvents	F	4278	0.91	4245	0.91	0	1.00	0	1.00	2	1.00	3	1.00
G - Road and Rail Emissions	G	4968	0.91	4163	0.91	294	0.70	299	0.83	60719	0.91	48667	0.93
H - Shipping	H	25	34.04	82	9.45	1	0.00	0	0.00	182	9.23	307	4.85
I - OffRoad Mobile Sources	I	2929	0.72	2745	0.70	2	0.00	2	0.00	21794	0.91	19866	0.90
J - Civil Landings and Takeoffs	J	56	0.40	31	0.66	0	1.00	0	1.00	582	0.37	497	0.38
L - Other Waste Disposal	L	69	0.95	67	0.94	11	0.33	11	0.39	18	0.35	30	0.21
M - Wastewater Treatment	M	133	0.37	131	0.37	14	0.26	16	0.27	0	1.00	1	1.00
N - Waste Incineration	N	194	0.00	193	0.00	0	1.00	0	1.00	1576	0.00	1523	0.00
O - Agriculture, Livestock	O	42	0.00	42	0.00	2189	0.50	2189	0.52	0	1.00	0	1.00
P - Agriculture, Other	P	2	0.00	1	0.00	1140	0.01	1140	0.02	15	0.00	15	0.00
Q - Agriculture, Wastes	Q	175	0.00	175	0.00	23	87.69	23	89.18	2005	0.35	2005	0.43
TOTAL		17576	0.89	15944	0.91	3875	0.88	3875	0.92	96823	0.87	82366	0.88

Table 8b: Comparison of US EPA data for NO_x, SO_2, PM_{10} and $PM_{2.5}$ with the EDGAR-HTAP_V1 dataset for USA at the sectoral split of USEPA. Color index: Green = agreement (within 25% margin) between US EPA and EDGAR-HTAP_V1 emission estimates. Redish = EDGAR-HTAP_V1 lacks data, in particular for PM emitted by industrial processes (D), Off-road mobile sources (I), Waste incineration (N) and Agriculture (O,P,Q), for which the US EPA inventory provides a much more complete inventory.

	NOx (kton)				SO2 (kton)				PM10 (kton)				PM2.5 (kton)			
	2002		2005		2002		2005		2002		2005		2002		2005	
	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA	US EPA	HTAPv1 /USEPA
A	4709	0.91	3801	0.91	10436	0.91	10428	0.91	620	1.06	627	0.76	506	0.47	516	0.36
B	2045	0.90	1895	0.91	1787	0.91	1730	0.90	340	0.17	351	0.14	178	0.26	195	0.24
C	786	0.85	777	0.85	590	0.89	593	0.87	674	0.48	648	0.65	603	0.53	580	0.71
D	587	0.91	625	0.83	807	1.05	795	1.00	2028	0.02	2055	0.02	655	0.05	594	0.06
E	355	0.90	358	0.88	254	0.92	194	1.10	19	0.08	21	0.07	14	0.10	17	0.08
F	0	1.00	0	1.00	0	1.00	0	1.00	8	0.00	8	0.00	7	0.00	7	0.00
G	8989	0.85	7610	0.84	321	0.88	221	0.85	234	0.60	224	0.55	177	0.79	165	0.73
H	1086	0.55	2705	0.21	234	0.72	1241	0.11	44	0.05	184	0.02	41	0.06	170	0.02
I	2197	0.88	2136	0.86	189	1.32	200	1.01	231	0.01	212	0.01	219	0.01	201	0.01
J	110	0.39	74	0.55	9	0.88	7	0.90	25	0.48	13	0.96	18	0.66	10	1.25
L	5	0.36	6	0.30	4	0.00	6	0.00	6	0.00	9	0.00	4	0.00	5	0.00
M	0	1.00	0	1.00	0	1.00	0	1.00	0	1.00	1	1.00	0	1.00	0	1.00
N	105	0.00	139	0.00	20	0.03	22	0.03	282	0.00	279	0.00	264	0.00	260	0.00
O	0	1.00	0	1.00	0	1.00	0	1.00	104	0.00	104	0.00	19	0.00	11	0.00
P	0	1.00	0	1.00	0	1.00	0	1.00	2231	0.00	2230	0.00	539	0.00	335	0.00
Q	62	0.53	62	0.62	19	0.00	19	0.00	265	0.57	265	0.66	225	0.20	225	0.23
	21036	0.85	20188	0.77	14670	0.91	15456	0.85	7111	0.20	7231	0.18	3469	0.24	3291	0.27

3. Results

3.1 HTAP_V1 emission inventory

3.1.1. Sector-specific annual emission totals for 2000-2005

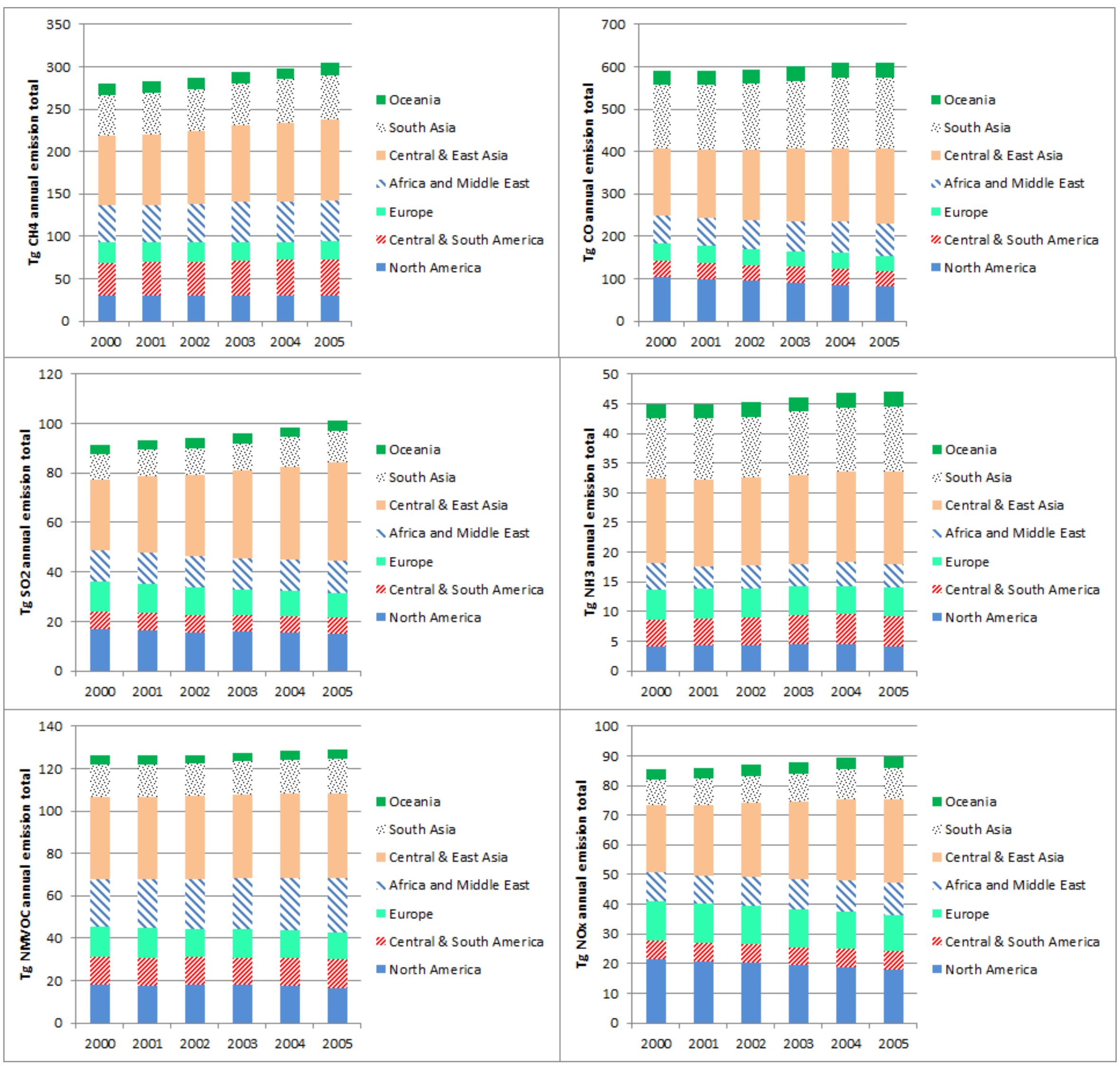
Table 9: Global totals of HTAP_V1 for 2000-2005 and aggregated sectors

Process Group in HTAP_V1	Gg Substance	2000	2001	2002	2003	2004	2005
1 fuel production & combustion	NMVOC	9.15E+04	9.07E+04	9.05E+04	9.07E+04	9.16E+04	9.15E+04
1 fuel production & combustion	NOx	9.42E+04	9.39E+04	9.54E+04	9.65E+04	9.93E+04	1.00E+05
1 fuel production & combustion	SO2	9.11E+04	9.23E+04	9.27E+04	9.46E+04	9.79E+04	1.00E+05
1 fuel production & combustion	CH4	1.03E+05	1.04E+05	1.07E+05	1.11E+05	1.14E+05	1.18E+05
1 fuel production & combustion	PM10	5.24E+04	4.98E+04	4.88E+04	4.98E+04	5.11E+04	5.19E+04
1 fuel production & combustion	OC	1.37E+04	1.37E+04	1.37E+04	1.39E+04	1.41E+04	1.42E+04
1 fuel production & combustion	PM2.5	3.46E+04	3.37E+04	3.34E+04	3.39E+04	3.44E+04	3.47E+04
1 fuel production & combustion	CO	5.15E+05	5.11E+05	5.12E+05	5.14E+05	5.18E+05	5.16E+05
1 fuel production & combustion	NH3	2.58E+03	2.62E+03	2.67E+03	2.75E+03	2.79E+03	2.83E+03
1 fuel production & combustion	BC	4.50E+03	4.47E+03	4.48E+03	4.53E+03	4.59E+03	4.57E+03
2 industrial processes	PM2.5	1.20E+03	1.28E+03	1.30E+03	1.31E+03	1.41E+03	1.63E+03
2 industrial processes	CO	2.59E+04	2.84E+04	3.10E+04	3.37E+04	3.72E+04	3.98E+04
2 industrial processes	OC	1.16E+00	1.13E+00	1.10E+00	1.07E+00	1.04E+00	1.01E+00
2 industrial processes	CH4	3.06E+02	2.92E+02	2.93E+02	3.06E+02	3.23E+02	3.16E+02
2 industrial processes	PM10	2.43E+03	2.58E+03	2.48E+03	2.82E+03	3.00E+03	3.19E+03
2 industrial processes	NMVOC	7.57E+03	7.71E+03	8.24E+03	8.28E+03	8.38E+03	8.47E+03
2 industrial processes	NH3	1.03E+03	3.63E+02	4.07E+02	4.11E+02	4.23E+02	4.23E+02
2 industrial processes	BC	3.48E+00	4.24E+00	4.98E+00	5.74E+00	6.48E+00	7.24E+00
2 industrial processes	NOx	1.34E+03	1.35E+03	1.23E+03	1.23E+03	1.24E+03	1.20E+03
2 industrial processes	SO2	6.61E+03	6.93E+03	7.59E+03	7.50E+03	7.57E+03	8.15E+03
3 solvent application and use	NMVOC	2.24E+04	2.30E+04	2.28E+04	2.33E+04	2.39E+04	2.43E+04
3 solvent application and use	PM10	1.86E+02	1.85E+02	1.86E+02	1.86E+02	1.88E+02	1.87E+02
3 solvent application and use	SO2	9.45E+00	9.53E+00	9.55E+00	1.06E+01	1.05E+01	1.03E+01
3 solvent application and use	PM2.5	1.80E+02	1.80E+02	1.81E+02	1.81E+02	1.82E+02	1.82E+02
3 solvent application and use	CO	5.74E+02	5.73E+02	5.76E+02	5.90E+02	5.91E+02	5.93E+02
3 solvent application and use	BC	1.28E+01	1.28E+01	1.29E+01	1.29E+01	1.30E+01	1.30E+01
3 solvent application and use	NH3	4.48E+00	4.55E+00	4.59E+00	4.53E+00	4.61E+00	4.65E+00
3 solvent application and use	NOx	2.96E+00	2.99E+00	3.15E+00	5.40E+00	5.31E+00	4.91E+00
3 solvent application and use	OC	5.70E+01	5.72E+01	5.74E+01	5.76E+01	5.77E+01	5.79E+01
4 agriculture: land and cattle	NH3	3.69E+04	3.74E+04	3.77E+04	3.84E+04	3.91E+04	3.91E+04
4 agriculture: land and cattle	NOx	2.75E+03	2.80E+03	2.81E+03	2.88E+03	2.93E+03	2.94E+03
4 agriculture: land and cattle	SO2	2.04E+02	2.09E+02	2.05E+02	2.18E+02	2.18E+02	2.18E+02
4 agriculture: land and cattle	BC	4.46E+02	4.56E+02	4.48E+02	4.66E+02	4.74E+02	4.75E+02
4 agriculture: land and cattle	CO	4.75E+04	4.86E+04	4.77E+04	5.06E+04	5.08E+04	5.11E+04
4 agriculture: land and cattle	OC	1.96E+03	2.01E+03	1.97E+03	2.06E+03	2.10E+03	2.11E+03
4 agriculture: land and cattle	NMVOC	5.34E+03	5.39E+03	5.38E+03	5.60E+03	5.54E+03	5.36E+03
4 agriculture: land and cattle	PM2.5	2.85E+03	2.89E+03	2.85E+03	2.97E+03	2.99E+03	2.99E+03
4 agriculture: land and cattle	CH4	1.30E+05	1.31E+05	1.31E+05	1.33E+05	1.34E+05	1.36E+05
4 agriculture: land and cattle	PM10	8.83E+03	9.01E+03	8.95E+03	9.35E+03	9.46E+03	9.37E+03
6 waste treatment & disposal	CO	1.57E+03	1.59E+03	1.50E+03	1.37E+03	1.66E+03	1.50E+03
6 waste treatment & disposal	PM2.5	1.61E+02	1.50E+02	1.38E+02	1.22E+02	1.15E+02	1.03E+02
6 waste treatment & disposal	BC	5.35E-01	4.77E-01	4.18E-01	3.60E-01	3.01E-01	2.40E-01
6 waste treatment & disposal	NMVOC	1.42E+03	1.47E+03	1.53E+03	1.58E+03	1.63E+03	1.69E+03
6 waste treatment & disposal	OC	1.53E-02	1.36E-02	1.20E-02	1.03E-02	8.59E-03	6.86E-03
6 waste treatment & disposal	NOx	1.29E+02	1.29E+02	1.25E+02	1.22E+02	1.21E+02	1.18E+02
6 waste treatment & disposal	CH4	4.78E+04	4.81E+04	4.89E+04	4.99E+04	5.04E+04	5.12E+04
6 waste treatment & disposal	SO2	5.91E+01	5.98E+01	5.63E+01	5.50E+01	5.34E+01	5.46E+01
6 waste treatment & disposal	NH3	1.09E+02	1.08E+02	1.12E+02	1.10E+02	1.13E+02	1.16E+02
6 waste treatment & disposal	PM10	2.32E+02	2.18E+02	1.96E+02	1.74E+02	1.61E+02	1.45E+02
7_Other_sources	PM10	9.17E+01	8.79E+01	8.20E+01	9.42E+01	9.23E+01	7.18E+01
7_Other_sources	NMVOC	2.16E+03	2.14E+03	2.11E+03	2.48E+03	2.16E+03	2.25E+03
7_Other_sources	PM2.5	4.94E+01	4.68E+01	4.10E+01	5.02E+01	4.78E+01	2.97E+01
7_Other_sources	CO	2.75E+03	2.73E+03	2.59E+03	2.77E+03	2.74E+03	2.52E+03
7_Other_sources	CH4	1.80E+00	2.01E+00	2.21E+00	2.45E+00	2.69E+00	2.91E+00
7_Other_sources	NH3	4.31E+03	4.36E+03	4.41E+03	4.46E+03	4.49E+03	4.53E+03
7_Other_sources	NOx	1.91E+01	1.84E+01	1.70E+01	1.90E+01	2.09E+01	1.55E+01
7_Other_sources	SO2	4.15E+02	4.16E+02	4.16E+02	4.19E+02	4.18E+02	4.15E+02

The first public version of EDGAR-HTAP, Version HTAP_V1 is described in Chapter 3.2.1 of the HTAP report by Streets et al. (2010). EDGAR-HTAP_v1 does not include Savannah burning (4. E), nor biogenic emissions from the land use change and forestry sector (5), where only very incomplete reporting was available, and objectives satellite based alternatives exist. The EDGAR v4.1&v4.2 global estimates for yy4.yyE and yy5 are based on the GFEDv2 database by G. van der Werf et al. (2006), which provide directly the inventory on gridmap in detail. Alternatively GFEDv3 http://www.falw.vu/~gwerf/GFED/ can be used.

The global totals are for the period 2000-2005 at highest aggregated level represented in Table 9. Even though the time series are less consistently built over a relative small time period, it can be seen that over these 6 years in the waste sector (yy6) the emission sources for BC and OC decrease 40%, for PM2.5 and PM10 30%, and for SO2 and NOx 10%. Moreover NOx emissions decrease also in the industry sector with another 10%. The overview figure 2 summarizes the regions-specific totals. Country-specific totals are given in Annex 2, and colored according the reference source.

Fig. 2a: Regional totals for the air pollutants (ozone precursors and acidifying substances) CH4, CO, SO2, NH3, NMVOC and NOx from the EDGAR-HTAP_V1 database for the period 2000-2005



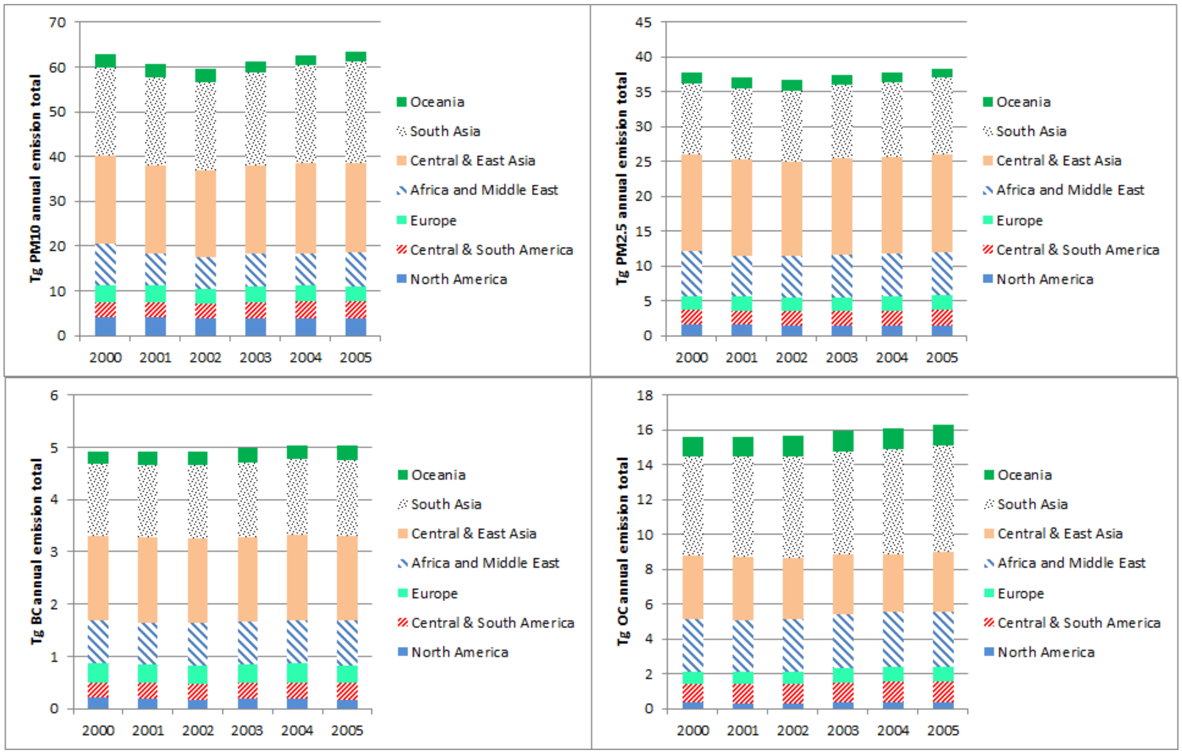


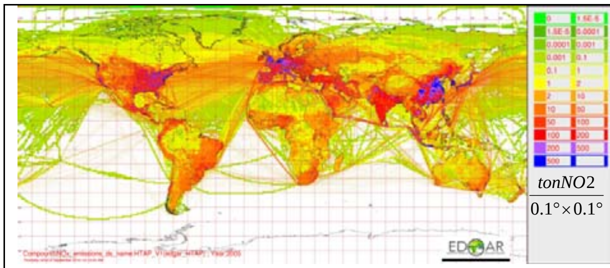
Fig. 2b Regional totals for the particulate matter PM10, PM2.5, BC and OC from the EDGAR-HTAP_V1 database for the period 2000-2005

3.1.2. Geospatial distribution on gridmaps of 0.1°x0.1°

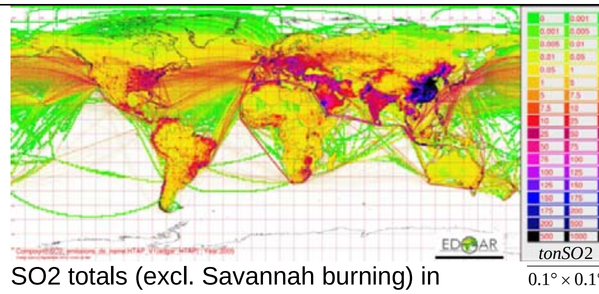
All the emissions are gridded allocating the EDGAR proxy datasets to each sector or subsector so that no information is lost, even at highest level of detail. Applying consistently the EDGAR proxy data allows (i) a geocoverage of all world-countries and (ii) representation of single multi-pollutant sources. The results are presented in an aggregated manner, because of discontinuities in level of reporting and because of differences in allocation to subsectors.

The global gridmaps show all a fine resolution with 0.1ºx0.1º grid cells that are left bottom corner centered. In addition USA EPA provided for the HTAP project additional gridmaps, which cover only the USA with 0.5ºx0.5º grid cells, that are centered at the .25 and 0.75 degree lines. Fig. 3 and 4 illustrate the global outcome for the emission totals of each substance and more sector-specific gridmaps are made available on the CIERA webserver: http://ciera-air.org/services.

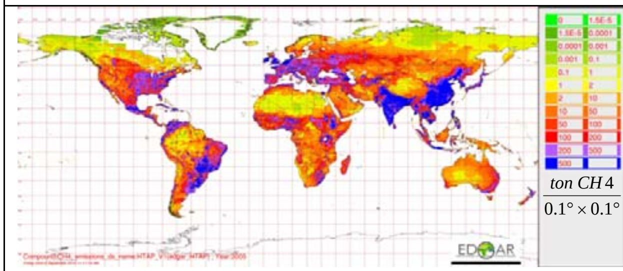
All documentation is made available on the http://www.htap.org website and summarized at EDGAR's homepage http://edgar.jrc.ec.europa.eu under "Other activities", national reported data.



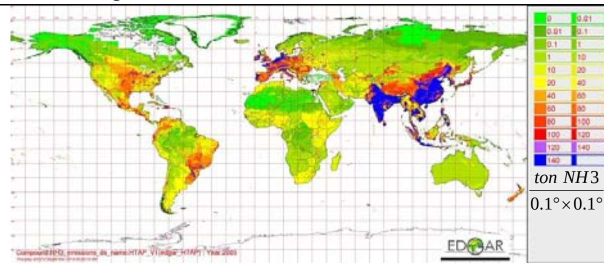
NOx totals (excl. Savannah burning) in ton NO2/grid cell



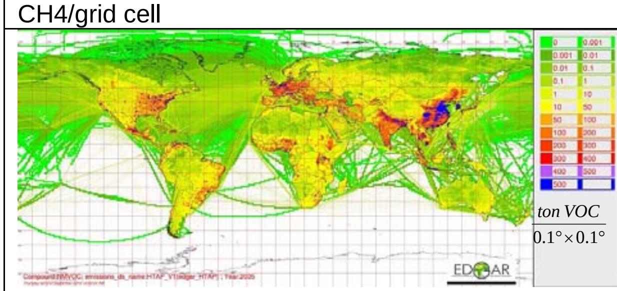
SO2 totals (excl. Savannah burning) in ton SO2/grid cell



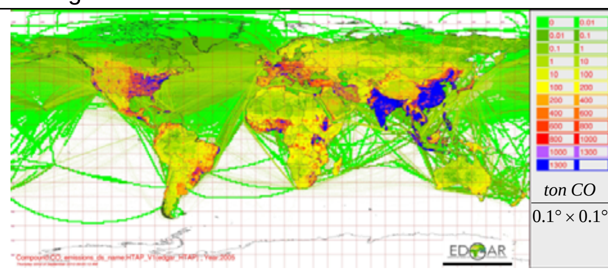
CH4 totals (no land-use change & forestry)in ton CH4/grid cell



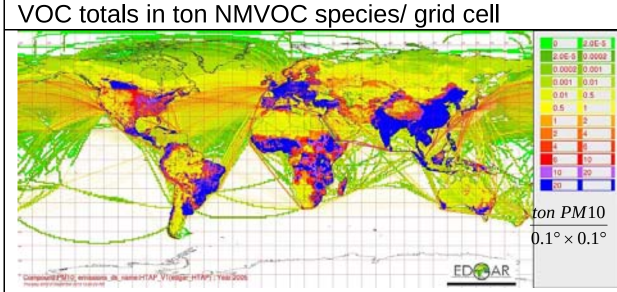
NH3 totals (no land use change & forestry) in ton NH3/grid cell



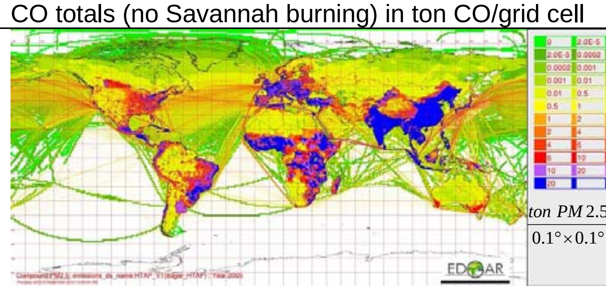
VOC totals in ton NMVOC species/ grid cell



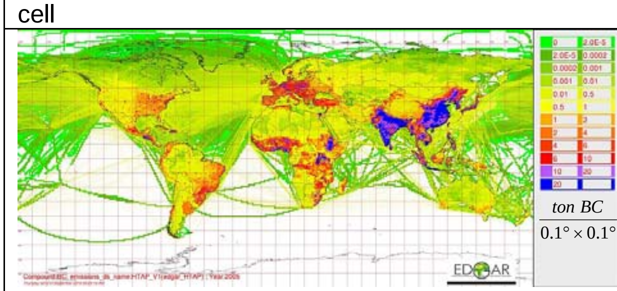
CO totals (no Savannah burning) in ton CO/grid cell



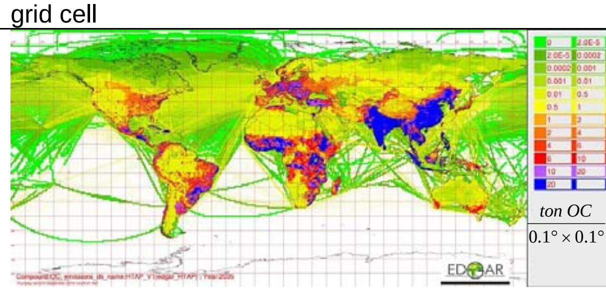
PM10 totals (no Savannah burning) in ton species/grid cell



PM2.5 totals (no Savannah burning) in ton species/ grid cell

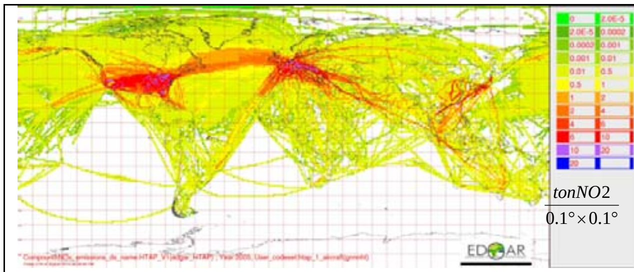


BC totals (no Savannah burning) in ton C/ grid cell

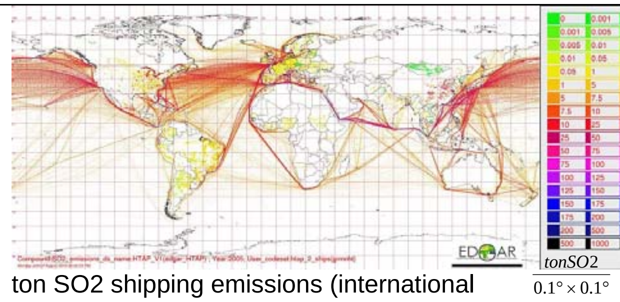


OC totals (no Savannah burning) in ton species/ grid cell

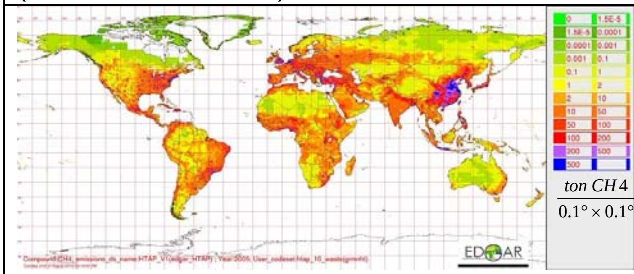
Fig. 3 Gridded maps of anthropogenic emission totals in 2005 for each compound in the EDGAR-HTAP emissions database on a 0.1° × 0.1° grid (in tons of species/grid cell). (Biomass is included but neither biogenic emissions from land use change and forestry nor savannah burning.)



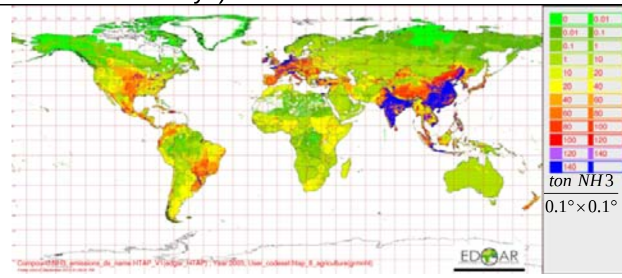
ton NO2 emissions from aviation (international+domestic) /cell



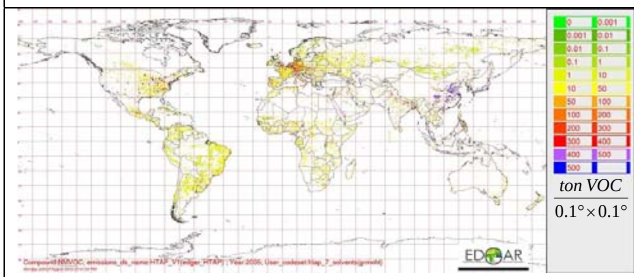
ton SO2 shipping emissions (international +inland waterways) /cell



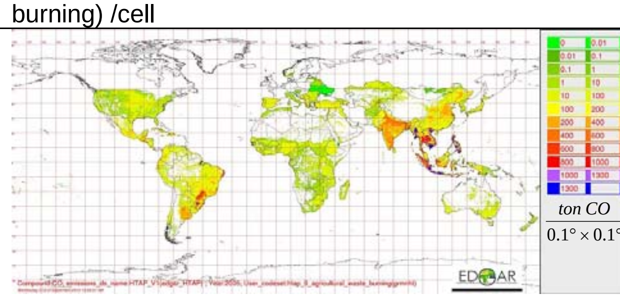
ton CH4 emissions for the waste sector per cell



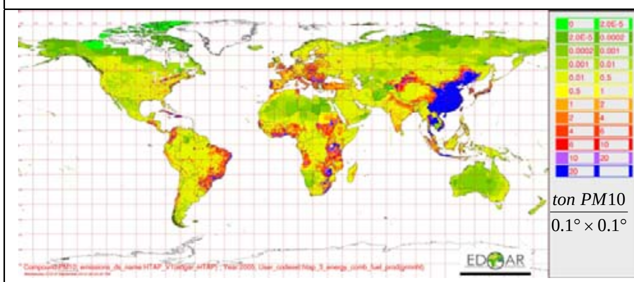
ton NH3 emissions for agriculture (no savannah/waste burning) /cell



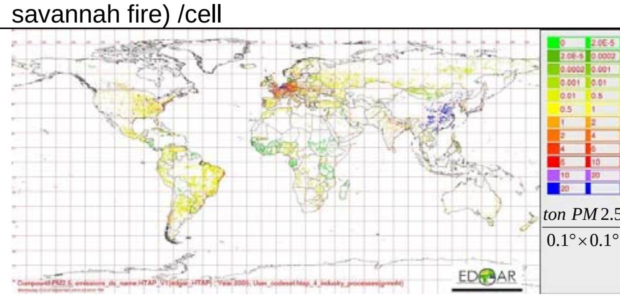
ton NMVOC emission from solvent industry per cell



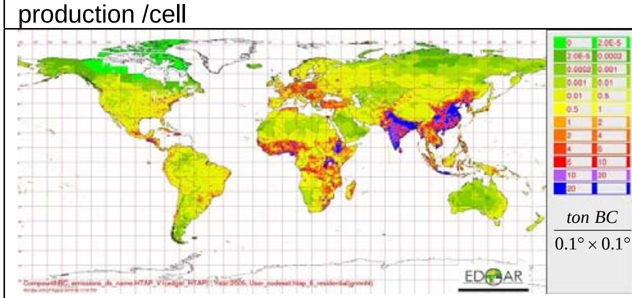
ton CO emission of agricultural waste burning (no savannah fire) /cell



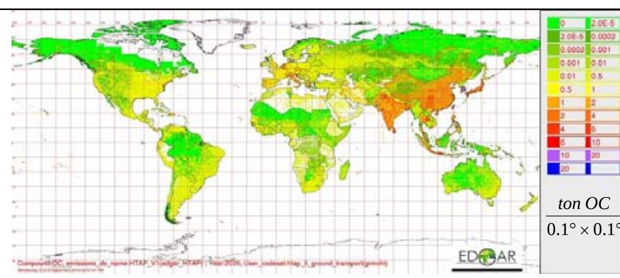
ton PM10 emission of energy combustion & fuel production /cell



ton PM2.5 process emissions from industry per cell



ton BC emissions from residential sector per cell



ton OC emissions from ground transport (road – rail) per cell

Fig. 4. Gridmaps for 2005 for significant sectors-specific contributions to the emissions, as used in the EDGAR-HTAP emissions database on a 0.1° × 0.1° grid (in tons of species/grid cell). (Biomass is included.)

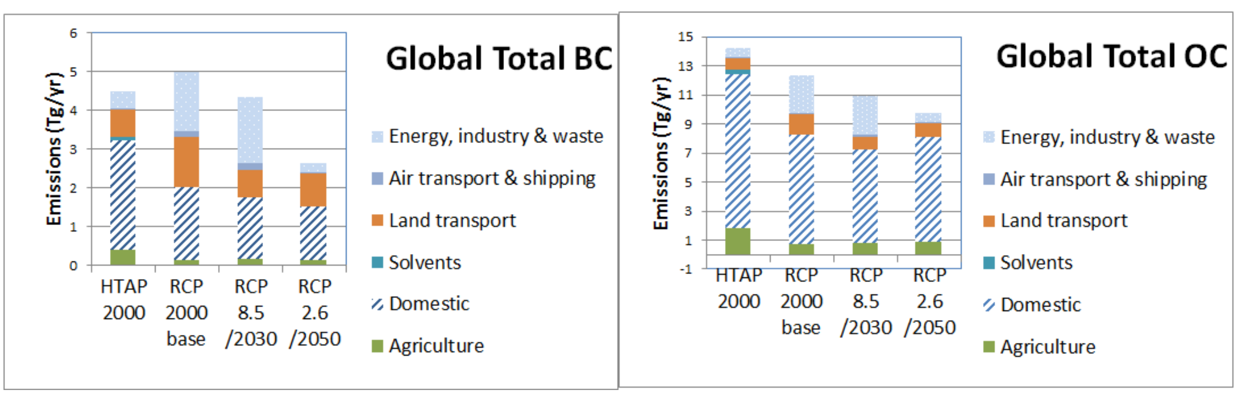
3.4 Intercomparison of HTAP_V1 2000 inventory with RCP data and EDGARv4.2

Comparing the EDGAR-HTAP_V1 with other datasets was done on global scale, in the HTAP (2010) report (Figures 3.3, 3.8 – 3.15). Fig. 3.5 of the HTAP(2010) report compared the 2000 EDGAR-HTAP inventory to the emission inputs used in the SR1 run of the HTAP multi-model experiments representing 2001. The comparison is presented for the global total and each of the four HTAP source regions. For the SR1 inputs, the HTAP_V1 inventory tends to underestimate the ensemble of emissions currently used in global models, in particular for BC (for the northern hemisphere) and OC (for all regions).

Focusing on the Representative Concentration pathways chosen for AR5 and described by Moss et al (2010) and Lamarque et al (2010), the HTAP (2010) report (Figures 3.11 – 3.17) compares the EDGAR-HTAP_V1 inventory to only the lower emissions of the RCP2000 (base), RCP8.5 (2030) and RCP2.6 (2050) for all compounds and all regions except for NH_3 in East and South Asia, and for BC and OC in South Asia. It should be noted that the RCP scenarios include Savannah burning (4. E sector) and land use change emissions (5 sector) whereas EDGAR-HTAP_v1 does not. The comparison is repeated here for all scenarios but with the same composition of sectors.

In the figures 5 and 6 below a comparison with equal inclusion of sectors (omission of 4. E and 5 sectors) is represented: first at global level in figures 5a and b for particulate matter and air pollutants CH4, CO, SO2, NH3, NOx, NMVOC respectively. Figure 6 then presents the regional totals, following the definition of the TF HTAP source-receptor regions: North America (NA), Europe (EU), South Asia (SA) and East Asia (EA).

Fig. 5a: Comparison of the EDGAR-HTAP_V1 global inventory for 2000 with the RCP 2000 base inventory per sector for the aerosols: BC and OC



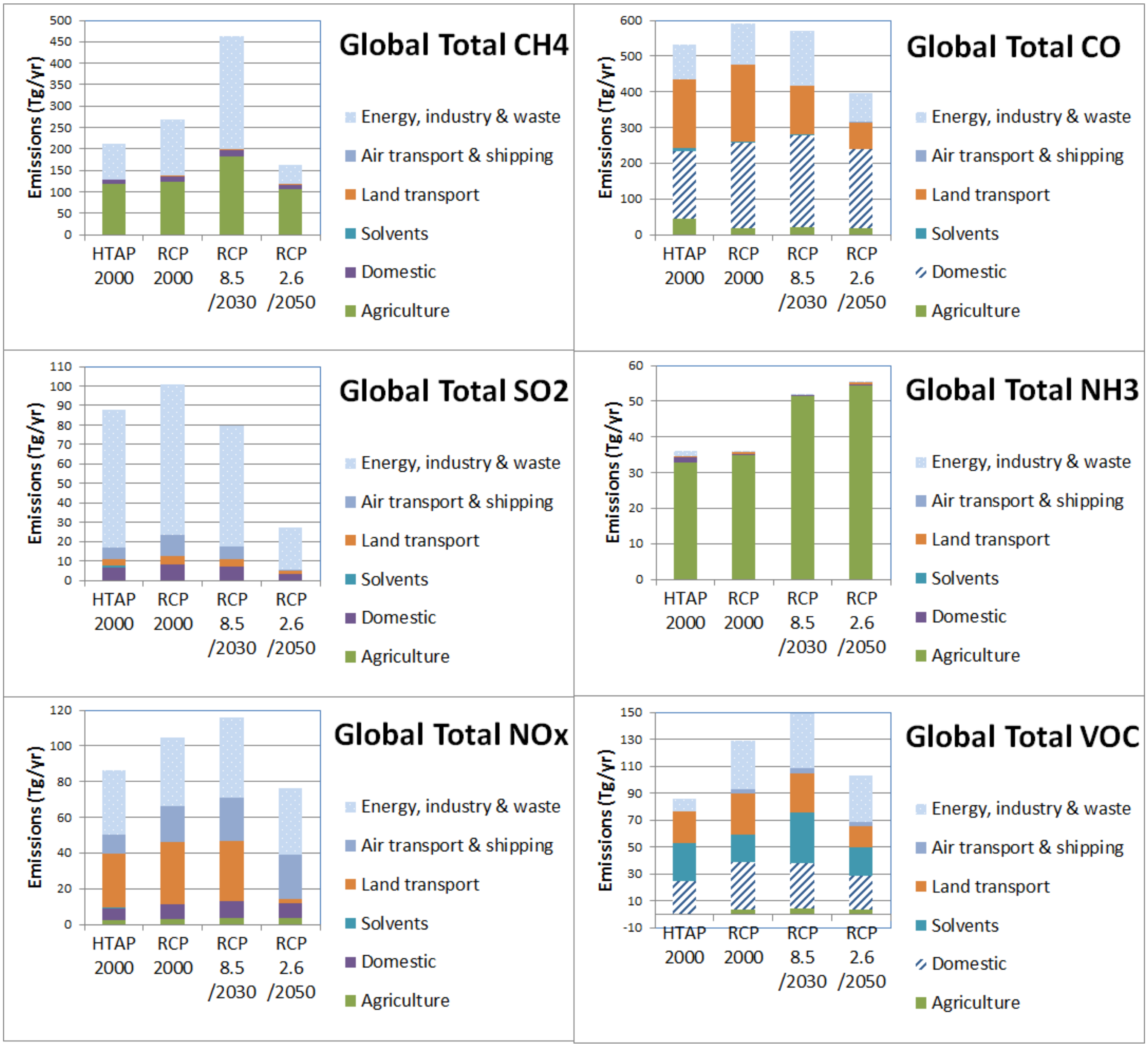


Fig. 5b: Comparison of the EDGAR-HTAP_V1 global inventory for 2000 with the RCP 2000 base inventory per sector for the air pollutants CH4, CO, SO2, NH3, NOx, NMVOC

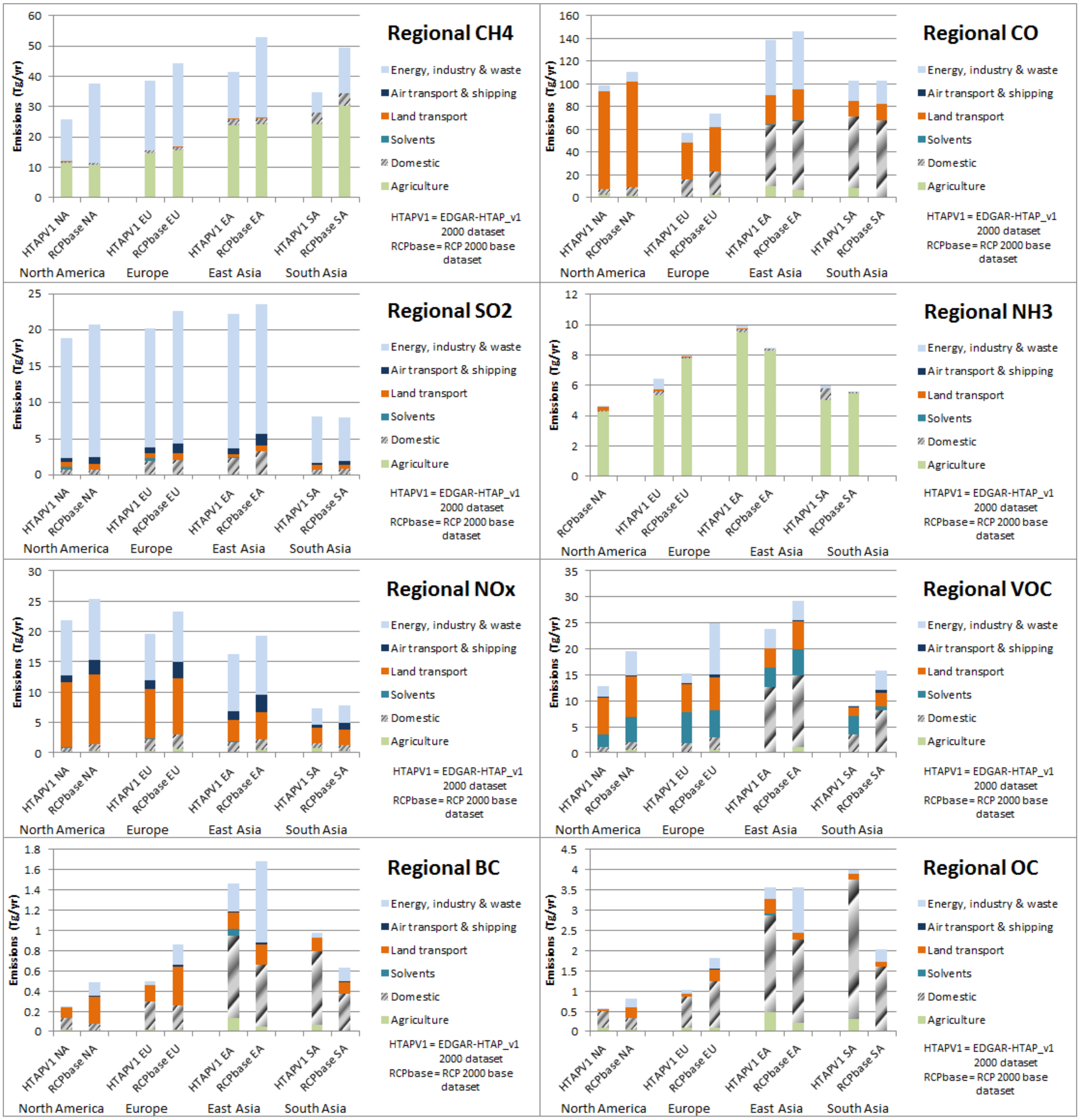


Fig. 6: Comparison of the EDGAR-HTAP_V1 inventory for 2000 with the RCP 2000 base inventory per sector and per region for the air pollutants (CH4, CO, SO2, NH3, NOx, NMVOC) and the aerosols (BC, OC). The regions are not covering the globe but are defined as the TF HTAP regions: North America (NA), Europe (EU), East Asia (EA) and South Asia (SA)

4 Concluding discussion and lessons learned for the future

4.1 Concluding remarks

To setup a world emission inventory that represents the officially reported emissions by individual countries and regions, proved a difficult task full of compromises. In addition to UNFCCC's principles of transparency-accuracy-completeness-comparability-consistency, this exercise provided also some insights on how much "official" inventories are coherent across countries. Groups of countries with similar characteristics could be identified and alternative emission sources could be appreciated in completeness and accuracy. Different official sources can be publicly accessed, such as UNFCCC and EMEP, but do not cover the globe. Complementary sources, GAINS, REAS are available but limited concerning comprehensiveness in time or types of human activities.

At disaggregated level inconsistencies are encountered for several reasons: (i) application of slightly different definition of the emission sources and corresponding different allocation to emitting subsector (e.g. the not estimated sources, or included elsewhere sources); (ii) different focus: EMEP focuses on reactive chemical substances for the pollution of the atmosphere, whereas UNFCCC focuses on GHGs and their warming climate effect; (iii) different methodology for the bottom-up emission calculations (Even though UNFCCC has standardised the methodology with the IPCC guidelines and standards for emission factors, it collects national inventories with a Tier 1 aside inventories with Tier 2 or even Tier 3 approach), (iv) the inventories published are not the most recent, and not for the whole time period 2000-2005 developed, and as such they are prone to updates and extrapolations. It seemed that aggregation tends to result in more equilibrated emission inventories, which might be caused by compensation of underestimates in one sector with overestimates in another. Of course common biases across different sources of emission inventories are not detected this way but could be found when confronted to real in-situ measurements, via inverse modelling techniques.

The resulting inventory tries to harmonize the official data, but the six annual inventories should not be considered as consistent time series. The harmonisation includes (i) taking out scarcely reported sectors, (ii) gapfilling agricultural emission sources where energy-related ones only are reported and completing with full inventories for countries with no officially reported data 2000-2005. The set of sector-specific emission-sources is stripped off (i) diffusive dust sources from unpaved roads, tires and brakes (in IPCC sector 1A3b) and dust from construction demolitions, (ii) Savannah burning (IPCC sector 4E) conform GFED3, (iii) large-scale biomass burning (5A and 5F), and (iv) the rest of the land-use change and forestry emissions (rest of IPCC sector 5).

For the afore mentioned sector-specific emission source a global geo-coverage is obtained and the geospatial distribution is consistently performed with the EDGAR proxy datasets only. As such the resulting dataset has advantages above a patchwork of gridmaps delivered by different sources and is consistently represented for multi-pollutant emission sources on a 0.1°x0.1° gridmap[5]. However also the proxy datasets have their limitations and point sources might be erroneously positioned or absent. It should be also noted that some proxy data, such as rural/urban population data of CIESIN are for some countries (e.g. Egypt, Western Sahara) of poor quality, which is directly reflected in EDGAR proxy gridmaps.

The emission inventory was set up in several steps.

1. Version HTAP_v0: for 2000-2005 country and sector-specific totals for CH4, SO2, NOx, CO, NMVOC, NH3, PM10, PM2.5, BC, OC, http://edgar.jrc.it/eolo, May '10. This was a draft version, internally distributed, but not publicly released
2. Version HTAP_V1: for 2000-2005 country and sector-specific totals for CH4, SO2, NOx, CO, NMVOC, NH3, PM10, PM2.5, BC, OC, on http://edgar.jrc.it/eolo (username: edgar_HTAP,

[5] Each grid cell is defined by its left corner coordinates.

passwd: htap), November 2010. This is the corrected V0 version without Savannah Burning (IPCC – 4E) and without pave and construction dust. This is a compilation of various inventories (UNFCCC, REAS, GAINS, EMEP, EPA) gridded and gapfilled with EDGAR4.1. The emission gridmaps (totals for each substance) were provided to AER and documented in the HTAP (2010) report, Ch 3 of Streets et al. (2010) and all these files (in total 6X10=60) are currently available via the CIERA webportal on http://ciera-air.org/services.

Remaining known issues are in EDGAR-HTAP_V1 are related to the use of inconsistent and incomplete datasets, gridding using EDGAR4.1 proxy data, and inconsistencies in time-series. The current choice of sectors is too much disaggregrated, which potentially may lead to confusion. The geospatial distribution on 0.1°x0.1° is not in line with the EPA data provided on 0.5°x0.5°.

4.2 Outlook

It is proposed to enhance the existing HTAP_V1 dataset towards a new version EDGAR-HTAP_V2 by:

- Extending the time period with 2006-2008, guaranteeing backward compatibility 2000-2005 (update). Note that the HTAP database is a compilation of official data (or at least authoritative where no official data are available). Official emissions are reported with a delay of at least 2 years, and often more.
- Updating the whole time series by (i) downloading the most recent UNFCCC and EMEP data, (ii) consulting IIASA for the latest estimates of GAINS for China and India, and consulting with Tsinghua University in China, (iii) consulting EPA for the most recent USA data, and (iv) consulting FRCGC of Japan for most recent East-Asian data. The REAS inventory seems frozen, but other, more recent datasets might be taken up when considered official and being more up-to-date.
- Redo gapfilling with EDGARv4.2.
- Completing with other chemical substances: CO2 & N2O (for quality check and GHG-AP interactions), Hg.

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Annex 1: Relationship between UNFCCC, EMEP, GAINS, EDGAR and HTAP emission categories.

Table 10: Cross-correlation between the codings of EMEP, UNFCC, EDGAR and GAINS.

SNAP	SNAP_NAME	NFR09	NFR Longname	CRF	IPCC_NAME	EDGAR	GAINS/ RAINS
010100	Public power	1 A 1 a	Public electricity and heat production	1A1a	Public Electricity and Heat Production	ENE.PEL.fuel.tech.eop, ENE.AEL.fuel.tech.eop	PP_EX_OTH, PP_EX_WB, PP_IGCC, PP_NEW
010200	District heating plants	1 A 1 a	Public electricity and heat production	1A1a	Public Electricity and Heat Production	ENE.DHE.fuel.tech.eop, ENE.AHP.fuel.tech.eop	PP_EX_OTH
010300	Petroleum refining plants	1 A 1 b	Petroleum refining	1A1b	Petroleum refining	REF.CMB.fuel	CON_COMB
010400	Solid fuel transformation plants	1 A 1 c	Manufacture of solid fuels and other energy industries	1A1c	Manufacture of Solid Fuels and Other Energy Industries	TRF.ECK.fuel, TRF.ELQ.fuel, TRF.ELN.fuel	CON_COMB
010500	Coal mining, oil / gas extraction, pipeline compressors	1 A 1 c	Manufacture of solid fuels and other energy industries		Manufacture of Solid Fuels and Other Energy Industries	TRF.EMI.fuel, TRF.EOG.fuel	CON_COMB
020100	Commercial and institutional plants	1A4a	Commercial / institutional: Stationary	1A4a	Other Sectors-Commercial/Institutional	RCO.COM.fuel.tech	DOM
020200	Residential plants	1 A 4 b i	Residential: Stationary plants	1A4b	Other Sectors-Residential	RCO.RES.fuel.tech	DOM
020300	Plants in agriculture, forestry and aquaculture	1 A 4 c i	Agriculture/Forestry/Fishing: Stationary	1A4c	Other Sectors-Agriculture/Forestry/Fishing	RCO.AGR.fuel.tech	DOM
030100	Combustion in boilers, gas turbines and stationary engines	1 A 2	Industrial stationary combustion	1A2	Manufacturing Industries and Construction	IND.IRO.fuel, IND.CHE.fuel, IND.PAP.fuel, IND.FOO.fuel, IND.TEX.fuel, IND.WOO.fuel	IN_BO, IN_OC, PR_SINT
030200	Process furnaces without contact	1 A 2 a	Stationary combustion in manufacturing industries and construction: Iron and steel	1A2a	Industry-Iron and steel	IND.IRO.fuel	IN_BO, IN_OC
030300	Processes with contact	1 A 2 a	Stationary combustion in manufacturing industries and construction: Iron and steel	1A2a	Industry-Iron and steel	IND.IRO.fuel	IN_BO, IN_OC
030304-10	Primary lead production	1 A 2 b	Stationary Combustion in Manufacturing Industries and Construction: Non-ferrous Metals	1A2b	Industry-Non-ferrous metals	IND.NFE.fuel	IN_BO, IN_OC
030311-20	Cement	1 A 2 f i	Stationary combustion in manufacturing industries and construction: Other	1A2f	Industry-Other	IND.NMM.fuel, IND.MAC.fuel, IND.TEQ.fuel, IND.CON.fuel, IND.INO.fuel	PR_CEM, PR_LIME, PR_GLASS
040100	Processes in petroleum industries	1 B 2 a iv	Refining / storage	1B2aiv	Fugitive emissions from Fuels Refining / storage	PRO.OIL.fuel.tech	PR_REF
040200	Processes in iron and steel industries and collieries	2 C 1	Iron and steel production	2C1	Industrial Processes-Metal Production-Iron&steel	IRO.PIG.TOT, IRO.CSP.TOT.tech, TRF.TBF.fuel, TRF.TCK.fuel	PR_COKE, PR_PIGI
040301	Aluminium production (electrolysis)	2 C 3	Aluminum production	2C3	Industrial Processes-Metal Production-Aluminium	NFE.ALP.AL1.tech, NFE.ALP.AL2	OTHER_SO2
040302	Ferro alloys	2 C 2	Ferroalloys production	2C2	Industrial Processes-Metal Production-Ferroalloys	IRO.FEA.TOT	OTHER_SO2
40303-9	Processes in non-ferrous metal industries	2 C 5	Other metal production	2C5	Industrial Processes-Metal Production-Other	NFE.PBP.PB1, NFE.PBP.PB2, NFE.ZNP.ZN1, NFE.ZNP.ZN2, NFE.AUP.TOT, NFE.CUP.CU1, NFE.CUP.CU2, NFE.HGP.TOT, NFE.MGP.MGS, NFE.MGP.MGP	PR_OT_NFME
040400	Processes in inorganic chemical industries	2 B 5 a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	2B5	Industrial Processes-Chemical Industry/Other	CHE.AAP.TOT, CHE.CLP.TOT, CHE.GXA.TOT, CHE.GXY.TOT, CHE.SLC.TOT, CHE.SPC.TOT, CHE.TTN.TOT	OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040401	Sulfuric acid	2 B 5 a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	2B5	Industrial Processes-Chemical Industry/Other	CHE.SAP.TOT	PR_SUAC
040402	Nitric acid	2 B 2	Nitric acid production	2B2	Industrial Processes-Chemical Industry-Nitric Acid	CHE.NAP.TOT	PR_NIAC
040403	Ammonia	2 B 1	Ammonia production	2B1	Industrial Processes-Chemical Industry-Ammonia	CHE.AMP.TOT	INORG, OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040407	NPK fertilisers	2 B 5 a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	2B5	Industrial Processes-Chemical Industry/Other	CHE.NFP.TOT	OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040408	Urea	2 B 5 a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	2B5	Industrial Processes-Chemical Industry/Other	CHE.BLK.CUA, CHE.BLK.CUR	OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040412	Calcium carbide production	2 B 4	Carbide production	2B4	Industrial Processes-Chemical Industry-Carbide	CHE.CLC.TOT	OTHER_SO2
040500	Processes in organic chemical industries (bulk production)	2 B 5 a	Other chemical industry (Please specify the sources included/excluded in the notes column to the right)	2B5	Industrial Processes-Chemical Industry/Other	CHE.BLK.chem	OTH_ORG_PR, OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040601-4	Proc. in wood, paper pulp	2 D 1	Pulp and paper	2D1	Industrial processes-Other Production-Pulp and Paper	PAP.PLP.TOT, PAP.PPR.TOT	PR_PULP
040605-9	Proc. in food, drink and other industries	2 D 2	Food and drink	2D2	Industrial processes-Other Production-Food and Drink	FOO.subst.TOT	OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040612-24	Cement, Glass, Lime (decarbonizing)	2 A 1,2,7d	Cement, lime, other mineral products production	2A1-2-7	Industrial processes-Mineral Products-Cement, Lime, Other mineral products	NMM.CMN.TOT, NMM.LMN.TOT, NMM.GLS.TOT, NMM.BRK.TOT,	OTHER_SO2, OTHER_VOC, OTHER_NOx, OTHER_CH4
040800	Production of halocarbons and sulphur hexafluoride	2 E	Production of POPs	2E	Indust. Processes.-Production of HFC and SF6-By-products	PRU.chem.PRO, PRU.chem.SF6	HFCFC22, OTHER_SO2, OTHER_Nox, OTHER_N2O, OTHER_CH$
050100	Extraction and 1st treatment of solid fossil fuels	1 B 1 a	Fugitive emission from solid fuels: Coal mining and handling	1B1a	Coal mining and handling	PRO.HDC.fuel.tech, PRO.HDC.REC, PRO.BRC.fuel.tech	MINE_BC
050200	Extraction, 1st treatment and loading of liquid fossil fuels	1 B 2 a i	Exploration, production, transport	1B2a	Fugitive Emissions from Furels Oil-Exploration, Production, Transport	PRO.OIL.transport	EXD_LQ, EXD_LQ_NEW
050300	Extraction, 1st treat. and loading of gaseous	1 B 2 b	Natural gas	1B2b	Fugitive Emissions from Fuels- Natural gas	PRO.GAS.PIP, PRO.GAS.NGS	CON_LOSS
050600	Gas distribution networks	1 B 2 b	Natural gas	1B2b	Fugitive Emissions from Fuels- Natural gas	PRO.GAS.DIS	CON_LOSS, EXD_GAS, EXD_GAS_NEW
060100	Paint application	3A	Solvent and other product use-Paint application	3A	Solvent and other product use-Paint application	SOL.GLA.TOT, SOL.GRA.TOT, SOL.PAI.TOT	AUTO_P, DECO_P, COIL, IND_P, VEHR_P, COIL, WIRE
060200	Degreasing, dry cleaning and electronics	3 B	Degreasing and Dry cleaning	3B	Solvent and other product use-Degreasing and dry cleaning	SOL.DRC.TOT, SOL.HHP.TOT, SOL.IDG.TOT	DEGR, DEGR_NEW, DRY, DRY_NEW
060300	Chemical products manufacturing or processing	3 C	Chemical products	3C	Solvent and other product use-Chemical products	SOL.CHI.TOT	PVC_PR, PLSTYR_PR, PHARMA, SYNTH_RUB, TYRES
060400	Other use of solvents and related activities	3 D	Product uses	3D	Solvent and other product use-Other	SOL.LTH.TOT, SOL.OTH.TOT, SOL.PST.TOT, SOL.RBP.TOT	IND_OS, FATOIL, VEHTR, PRT, GLUE, DOM_OS
060500	Use of HFC, N2O, NH3, PFC and SF6	2 F - G	Consumption, storage, transportation or handling of bulk products (Please specify the sources included/excluded in the notes column to the right)			PRU.FEX.chem, PRU.FPD.chem. PRU.ACC.SF6, PRU.chem.CON, PRU.HEP.chem, PRU.HFC.chem, PRU.HWP.chem, PRU.N2O.chem, PRU.REF.chem, PRU.SOL.chem,	VEHTR, AIRCONN, COMM
070000	Road transport	1 A 3 b	Road transport	1A3b	Road transportation	TRO.ROA.fuel.vehicle.standard, TRO.EVP.MOG	TRA_RD
080200	Railways	1 A 3 c	Railways	1A3c	Transport-Railways	TNR.RAI.fuel	TRA_OT_RAI
080300	Inland waterways	1 A 3 d ii	National navigation (Shipping)	1A3d	Transport-Navigation, National navigation	TNR.ILW.fuel	TRA_OT_INW
080404	International sea traffic (international bunkers)	1 A 3 d i	International shipping	1A3d	Transport-Navigation / International marine(bunkers)	TNR.SEA.fuel.ship.port/sea	
080501-3-5	Domestic airport traffic (LTO cycles - <1000	1 A 3 a ii	Civil aviation (Domestic)	1A3aii	Transport-Civil aviation (Domestic)	TNR.DAT.fuel.height	TRA_OT_AIR
080502-4-6	International airport traffic (LTO cycles - <1000 m)	1 A 3 a i (i)	International aviation	1A3ai	Transport-Civil aviation (International)	TNR.IAT.fuel.height	TRA_OT_AIR
090200	Waste incineration	6 C	Municipal and Industrial waste incineration	6C	Waste-Incineration	SWD.INC.TOT	WASTE_RES
090203	Flaring in oil refinery	1 B 2 c	Venting and flaring	1B2c	Fugitive emissions from fuels-Oil and natural gas/Flaring	PRO.OIL.VAF	WASTE_FLR
090400	Solid Waste Disposal on Land	6 A	Solid waste disposal on land	6A1-3	Waste-Solid waste disposal	SWD.LDF.TOT.tech	WASTE_VOC
091000	Other waste treatment	6 B	Waste-water handling	6B	Waste-Wastewater treatment/Industrial+Domestic&commercial	WWT.DOM.tech, WWT.IND.tech	
100100	Cultures with and without fertilizers, incl. rice fields	4 D 1 a	Synthetic N-fertilizers	4D1-4C	Agricultural soils-Direct soil emission & Rice cultivation	AGS.animals.TOT, AGS.RIC.TOT, AGS.HIS.TOT, AGS.LMN.TOT, AGS.NFE.TOT	FCON_OTHN, FCON.UREA, AGR_ARABLE_SUBB
100300	On-field burning of stubble, straw,...			4F	Agriculture-Field burning of agricultural	AWB.CRP.croptype	WASTE_AGR
100400	Enteric fermentation	-	-	4A	Agriculture- Enteric fermentation	ENF.animal.management	
100500	Manure management regarding Organic compounds	4 B	Animal manure management	4B	Agriculture-Manure management	MNM.animal.TOT.tech	AGR_BEEF, AGR_COWS, AGR_PIG, AGR_OTANI

Annex 2: Country total emissions.

Table 11: Country-specific emissions totals (Tg species) for the year 2005 from the EDGAR-HTAP_V1 dataset.

Table 11a: legend and notes

HTAP_V1	**available on http://edgar.jrc.it/eolo, username: edgar-HTAP, passwd: htap**	
Unit	kton species /yr	
Colour coding		UNFCCC and TFEIP data for EMEP domain
		EDGAR v4.1 data as online since July 2010
		EPA data for USA
		REAS inventory (which does not include the agricultural sector)
		REAS with major impact from the gapfilling with EDGARv4.1
		GAINS inventory for China
Note 1	This inventory considers the period 2000-2005 and for each year using the same source of data,	
	with the 2005 data underneath shown as example	
Note 2	The EDGAR v4.1 inventory did not provide Savannah burning data (IPCC sector 4E), because the data and grid maps are from GFED of G. van der Werf	
Note 3	The REAS inventory did not provide data for the agricultural sector, which was then gapfilled by EDGARv4.1	
Note 4	For the sake of comparability amongst the different data sources, some subcategories of some sectors, e.g. automobile road abrasion	
	e.g automobile road abrasion are omitted.	
Note 5	The land use land-use change and forestry (IPCC sector 5) is not included, because of	
	the important short cycle carbon, which can not be reflected in annual inventories on the one hand	
	the forest fires and deforestation, which are treated by the GFED of G. van der Werf	

Table 11b: 2005 EDGAR-HTAP_V1 inventory for EMEP domain

Country		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
UNFCCC (EMEP)											
Australia	AUS	*4301.86*	1667.702	2522.8832	*791.0423*	*5136.589308*	*571.4648946*	*20.28864582*	*68.93641914*	292.9929171	141.1118008
Austria	AUT	868.0991	245.337	27.1044	303.45093	337.092776	66.0757509	*9.153347159*	*24.59045379*	44.23023	24.13069
Belgium	BEL	836.303643	284.294326	85.987	201.5042	346.4862169	74.00813334	*4.770251791*	*4.549159244*	37.55971	25.34961
Bulgaria	BGR	650.916	152.471	144.37809	310.817977	555.33089	77.11209	*5.888555314*	*17.97796443*	*420.9568947*	*136.7273663*
Belarus	BLR	327.408	155.485	988.886	208.581	609.84486	140.514	*4.402914372*	*12.6914678*	40.517	29.623
Canada	CAN	9374.54	2378.49	2065.6	2256.33	4862.87806	554.66	*18.1686132*	*48.11546004*	2501.31	570.85
Switzerland	CHE	331.3571	88.42054	68.21059	97.83763	168.701584	59.4031322	*2.976023112*	*7.888932129*	19.618822	8.5485543
Cyprus	CYP	25.658	19.561	39.0881	11.7713	*29.32265402*	5.59	*0.504526235*	*0.24675152*	4.03149	2.47676
Czech Republic	CZE	513.833504	283.93852	219.179701	182.62149	553.233629	68.411451	*11.58028335*	*21.69932714*	34.5507123	20.981541
Germany	DEU	3816.496	1402.906668	21.983041	1334.878128	2269.27162	621.23719	*35.61709132*	*75.44094239*	207.20047	109.56149
Denmark	DNK	453.414232	185.6101	120.237746	114.6540381	268.4614981	78.549807	*4.063489321*	*10.68761958*	38.2440131	27.7582631
Spain	ESP	2555.09246	1530.5766	70.9607	990.12076	1780.97835	406.034328	*29.12801324*	*34.25250397*	178.56265	138.31605
Estonia	EST	162.91234	40.4817	485.55875	38.81319	95.162648	9.36	*1.691203169*	*7.516639133*	26.365	20.007
Finland	FIN	524.883194	178.653	509.80501	131.69468	213.485692	36.2621	*5.399633637*	*14.88522505*	51.269	34.062
France	FRA	5629.248	1458.03	552.241	2754.137	2706.73138	745.7952	*44.96319662*	*107.441478*	504.41368	330.972655
United Kingdom	GBR	2385.35	1616.951	152.02428	1083.44	2367.88659	305.0526316	*15.2477316*	*16.21513718*	156.415	89.2111
Greece	GRC	1050.55095	329.2867	39.3109	318.745815	393.2580057	*73.62300607*	*4.922994517*	*12.39497698*	74.73545255	44.32374958
Croatia	HRV	329.903043	74.59271	69.894	101.11563	141.1264	43.00149	*3.659211354*	*6.064136471*	8.84211	9.09526
Hungary	HUN	587.40571	213.12741	401.1587	176.44071	375.62007	80.7403	*7.611297914*	*18.05681363*	51.55452	31.01742
Ireland	IRL	192.292	124.189	917.4952563	58.719	631.360446	110.36	*3.542363516*	*4.558718226*	16.045	10.617
Iceland	ISL	22.1751	33.606	4.610243	9.28656	20.867357	*4.460015063*	*0.045431898*	*0.020149572*	*1.056514266*	*0.562922703*
Italy	ITA	3521.271	1228.855	0.0508	1414.885198	1886.2278	413.703359	*23.47139262*	*27.14951505*	167.97299	135.94677
Japan	JPN	3018.298936	2017.518374	43.761884	2117.175381	*2107.066522*	*440.2319809*	*66.66788319*	*43.66539936*	254.4891804	167.3047553
Liechtenstein	LIE	1.5966	0.3035	1.721525	0.47273	0.666031175	0.1752			0.053644	
Lithuania	LTU	190.5592	54.9281	124.355	90.09079	158.654084	39.4892949	*2.680322468*	*8.260414358*	10.764991	8.712511
Luxembourg	LUX	12.25	14.6662	17.71418	9.592849	22.39816343	4.88079	*1.091886619*	*0.316107389*	*3.258413915*	*2.35481029*
Latvia	LVA	319.6724746	42.5959413	12.676	60.090283	85.5396288	14.3835927	*3.744306975*	*12.99574562*	14.843492	13.282467
Monaco	MCO	1.30845	0.3527	0.0559953	0.379314	0.029599	0.005554			0	0
Moldova, Republic of	MDA	140.299	30.996	63.713205	38.401	*156.9990276*	26.661	*0.92015423*	*2.35065352*	7.551	6.161
Macedonia, the forme	MKD	126.068	35.04	84.3797	119.58	*64.20897421*	8.12	*1.082454056*	*147.4340395*	23.59448507	10.24734859
Malta	MLT	0.470129	11.765616	23.805216	3.257157	*8.03879007*	1.910500857	*0.086351947*	*0.025608237*	2.19879	1.45048
Netherlands	NLD	556.5833	323.12778	1259.8	171.7524	802.28206	133.285957	*4.839844939*	*4.516746862*	37.3976225	20.84989617
Norway	NOR	448.724768	192.21844	605.4373	231.451486	218.16145	22.959042	*17.605624*	*37.16057961*	56.479219	49.815159
New Zealand	NZL	615.872	165.0527	474.12418	166.3027	1300.31731	*190.9625782*	*3.174242461*	*4.254863269*	*12.27301841*	*10.54479269*
Poland	POL	3364.1206	827.2522	2532.8	1013.29	1764.561173	325.97	*48.19843432*	*92.1369235*	288.5946	137.5102
Portugal	PRT	641.27122	263.8599	89.0145122	286.7694	582.272103	471.8005442	*7.127680065*	*15.0445988*	140.145003	107.9220209
Romania	ROU	1480.5969	337.3043	41.27	321.176	1357.825322	*205.4383141*	*15.25430482*	*55.15534905*	449.5066063	193.9648098
Russian Federation	RUS	11928.706	4582.47	1266.6365	4494.52	22365.4277	1098	*65.32148238*	*281.5644456*	590.6067	350.7045
Slovakia	SVK	299.33562	97.99609	37.213513	79.7976	220.426508	26.921931	*2.243526155*	*4.105566725*	44.99836	39.91628
Slovenia	SVN	116.836	46.656	17.8141498	47.868	104.4035288	18.13	*1.725048829*	*5.451651135*	7.9162	5.9844
Sweden	SWE	581.6657	177.0476	1423.23	182.14046	266.45656	52.585047	*4.739835859*	*13.25109709*	44.40991	31.86722
Turkey	TUR	5042.277	1183.4	1444.692679	1075.44	*2987.043443*	0.006	*49.18819716*	*136.3795345*	472.556376	269.040296
Ukraine	UKR	1923.9088	891.791	686.55308	606.663844	3536.73514	261.079125	*16.56120939*	*33.0268327*	131.748777	125.247134
United States	USA	*90588.124*	*20372.189*	*15507.285*	*17831.725*	25113.543	*3914.682*	*156.9187195*	*296.4268229*	*13198.062*	*4456.928*

Table 11c: 2005 EDGAR-HTAP_V1 inventory for Asian domain REAS – GAINS

Country REAS		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
Afghanistan	AFG	646.6693886	29.77	7.979084125	64.85659436	383.328467	96.51084847	10.73917008	59.44994348	26.44736981	23.5911989
Bangladesh	BGD	6469.489372	233.53	136.1231264	525.4276581	3715.585065	711.2816391	78.33664778	310.3483503	468.5156183	412.6988835
Brunei Darussalam	BRN	46.24758668	24.4501	7.47068516	74.79705732	129.5793127	3.318443484	0.311181901	0.805652563	0.560118146	0.499057285
Bhutan	BTN	216.7695935	8.235	5.088041691	41.76174435	25.85303792	7.65076666	2.088371864	9.941343842	38.58414555	37.70733574
Indonesia	IDN	29705.71236	2163.9	1401.569115	3001.330259	7189.912685	1733.981878	235.3576681	1096.934868	1981.613868	1145.206036
India	IND	93031.49372	6016.65	7920.753833	7935.772365	26781.50596	6688.875939	853.1015605	3523.631715	17317.07354	7571.844516
Cambodia	KHM	1576.569567	56.82	34.0760834	150.8602373	734.0555231	91.75055683	14.71774189	71.2726469	224.6551623	142.0689741
Korea, Republic of	KOR	5019.716613	1582.17	666.5704635	5015.468021	1247.433668	184.5304478	31.04429956	46.07882366	118.6884352	96.21324754
Lao People's Democra	LAO	690.040461	22.96	13.35460926	73.36904216	286.5653589	54.90546693	5.63945326	27.4930586	104.6490736	73.3650028
Sri Lanka	LKA	1886.119695	130.16	113.8349986	154.7548509	430.3995731	76.03335803	18.21037259	71.29873878	52.57906183	51.34269466
Maldives	MDV	15.82140904	5.46562	3.091223514	4.878213651	0.45825875	0.34512975	0.232110568	0.190094011	0.257604533	0.224758937
Myanmar	MMR	6674.223818	138.21	404.9690387	602.8148873	2930.623009	422.741559	59.27802914	294.4594421	791.5340925	513.9056369
Mongolia	MNG	298.310186	49	76.59204429	27.4585092	359.738647	58.44697113	3.373526397	13.50686534	98.61554322	31.8722991
Malaysia	MYS	3816.270562	523.31	332.9550451	1387.797956	1215.257808	201.4551575	16.61870172	43.26162125	102.2417324	72.94879429
Nepal	NPL	3042.9203	55.27	27.29199954	155.5010054	1008.299988	137.3600868	32.6947021	165.6690168	177.403775	141.6435318
Pakistan	PAK	10890.07681	815.16	1190.112246	804.8111168	5409.167226	672.9640595	124.568623	511.3660241	406.0945759	354.0965368
Philippines	PHL	9100.864695	571.07	673.9905244	970.7892393	2279.27645	380.005286	42.12636026	168.2792987	527.6669554	295.74714
Korea, Democratic Pe	PRK	5748.314413	233.7725089	259.9901069	191.2298882	667.6957153	119.1042296	43.98368263	123.8058735	489.8646425	211.6884601
Singapore	SGP	1059.770367	191.285	205.8600016	811.8702616	117.4562939	12.16434705	13.70000275	60.07001317	16.71447568	11.72871653
Thailand	THA	15680.47881	833.56	1240.181228	1648.777774	3472.018522	587.4088133	59.76684631	200.4876266	908.1610351	553.8801853
Taiwan_Province of Cl	TWN	2812.25	793.53	284.7	1512.313684	336.1368561	78.66660537	10.2	10.33	104.8769872	50.90747396
Viet Nam	VNM	12996.72673	579.01	323.4244869	930.2026058	3350.852684	790.0459046	123.2800524	569.5196395	1402.68895	793.2117929
Country GAINS		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
China	CHN	144383.97	16925.78	31527.74	23876.24	56029.63	12545.16	1365.67	2812.04	17883	12725.22

Table 11d: 2005 EDGAR-HTAP_V1 inventory bunkerfuel and the rest of the world (EDGAR-gapfilled)

bunkerstatistics EDGAR		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
Int. Aviation	AIR	195.2572826	1833.244558	146.819688	63.65381983	2.935069511		5.485372595	1.645613997	26.78446882	13.80392685
Int. Shipping	SEA	1263.487222	12978.63287	7872.240593	4692.819753	439.5350823		30.73349867	103.786587	1297.239169	1297.239169
Country EDGAR		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
Aruba	ABW	0.173644172	0.146156654	0.14243554	26.55636173	0.930700058	0.022429365	0.001128132	0.001311437	0.087031153	0.075445433
Angola	AGO	794.3375037	64.19468388	30.37157559	412.3109478	616.0059165	29.16252443	7.124673787	33.8308061	67.02525416	64.368016
Anguilla	AIA	0.0159047	0.009817114	0.000509019	0.001023938	0.052336026	0.000878458	8.72159E-05	0.000121527	0.010217089	0.00879977
Albania	ALB	99.43228283	26.67525982	13.9861224	38.25163695	109.2120427	26.21420923	1.265600146	3.521513014	10.13365953	7.958168629
Andorra	AND				0.00864661	0.547254					
Netherlands Antilles	ANT	37.80277856	23.002944	32.69038804	212.2716789	6.030104828	0.174857437	0.32851907	0.115315198	0.629563669	0.608617129
United Arab Emirates	ARE	787.8022553	209.9616747	129.2650224	961.7844919	1106.925452	13.91953249	1.542680356	1.205184189	7.075401699	5.624394756
Argentina	ARG	2882.493778	450.3156802	205.5673455	1079.21803	4768.727758	496.4103229	20.67965672	77.90435735	313.080924	119.977654
Armenia	ARM	38.58238582	5.405192347	1.806754756	100.6477927	140.7660293	16.52522673	0.045767846	0.216076068	0.78544587	0.326241396
American Samoa	ASM	0.000695473	0.065620941	2.17841E-06	7.325711007	0.533434834	0.828283257	9.28489E-06	3.90362E-05	9.74437E-05	6.42682E-05
Antigua and Barbuda	ATG	4.414632649	3.595534386	1.866109905	31.54555837	1.884713753	0.254940474	0.016476912	0.014813887	0.133761672	0.115972256
Azerbaijan	AZE	194.9256774	75.76540192	134.7186195	316.1056038	1742.357565	64.26343182	0.850646805	1.211225576	5.186645714	2.826548327
Burundi	BDI	548.6268964	8.50806163	2.591268526	111.8204716	85.04471125	4.144951601	9.715384788	39.17865075	73.54191208	72.46207573
Benin	BEN	605.0382947	26.55506325	9.388165877	92.78271223	150.8084697	19.12783944	7.696571229	32.02012186	61.65053679	59.18925121
Burkina Faso	BFA	839.8820102	22.97295658	6.308791379	118.7917981	484.821814	66.91894206	14.19754455	57.45627013	109.6291859	105.544489
Bahrain	BHR	173.6244216	21.55722974	7.177534858	320.5100349	131.5575424	0.787809548	0.125787999	0.076903519	2.779671084	1.428513522
Bahamas	BHS	29.1519858	31.01658691	27.76830684	212.9712542	9.306031128	1.111236551	0.129994907	0.127130071	0.81047627	0.693536977
Bosnia and Herzegovi	BIH	289.1111466	56.66724417	161.079827	55.50843046	120.908268	24.21791888	3.234727354	5.774718642	71.49549296	26.3056324
Belize	BLZ	56.13654783	8.631558265	2.464987818	8.3976504	8.793271788	1.579721493	0.443517768	1.730952432	4.428485955	3.14848677
Bermuda	BMU	4.53541917	5.530252528	2.729835955	3.547354106	1.341514852	0.072736548	0.026769267	0.01506342	0.14104116	0.129312186
Bolivia	BOL	444.0749885	78.53272893	43.32849747	109.8199023	900.071069	60.41825859	4.624590189	17.41868838	48.30141253	33.35282004
Brazil	BRA	17454.13815	2069.69615	1317.218926	4480.973531	18533.67581	2352.374017	142.3636616	525.3824965	1877.451346	1043.965244
Barbados	BRB	13.34216564	12.30091075	10.08097475	17.05676883	4.914170747	1.420992754	0.055653858	0.15351946	0.848153738	0.453588921
Botswana	BWA	142.1700831	21.15500796	16.08907359	27.70707307	176.8973737	20.7839824	1.940776979	4.776459576	9.078558915	8.819772683
Central African Repub	CAF	156.0479351	5.544186645	0.971012485	106.0363665	195.1034436	25.18304266	2.469925257	10.08366899	19.25247301	18.48919286
Chile	CHL	1242.993681	308.1735009	424.1396892	334.646961	852.2213954	177.8251224	15.14328343	50.42439686	148.3208688	120.760955
Cote d'Ivoire	CIV	991.317981	33.22931073	14.72676317	261.7395921	277.171806	26.67736373	12.82686043	56.21545156	111.2346118	104.6921286
Cameroon	CMR	789.4437641	43.11726561	12.8380464	664.9081209	739.9180478	51.5922893	11.66623869	46.45222977	89.24683316	85.83498925
Congo_the Democrati	COD	4501.503292	55.91221403	18.91071776	531.5624855	640.5001623	5.673197685	80.69904444	324.8590048	611.5432713	599.9306626
Congo	COG	184.8742705	10.85767931	1.515548282	85.68462345	168.574346	15.4321575	2.115058806	9.297758339	18.18944779	17.4410892
Cook Islands	COK	0.041744482	0.008487134	0.000130755	0.003693034	0.16703433	0.171604395	0.000557308	0.002343075	0.005848862	0.003857579
Colombia	COL	1655.230279	245.369968	153.5791875	637.1552679	2723.941252	354.575889	14.82720324	55.7982637	190.3041638	114.8986423
Comoros	COM	5.419784706	0.525024569	0.224562366	3.490402594	8.673344904	0.437020593	0.028581308	0.147847945	0.332384838	0.276100907
Cape Verde	CPV	5.614948572	1.303919137	0.433306462	3.179254118	6.170849745	1.369947811	0.031118425	0.13197532	0.313084275	0.246021052
Costa Rica	CRI	212.6979328	43.76887014	18.32497899	55.48253664	122.2191748	34.45484162	1.488508459	4.022822848	12.2715927	7.86536254
Cuba	CUB	509.592617	106.8196569	406.9293098	126.6732108	447.0966553	49.37728231	4.951423656	19.12415927	61.68787353	45.4910299
Cayman Islands	CYM	3.231470306	3.720659325	1.392881574	2.251214281	1.1643519	0.027786487	0.022173216	0.009533548	0.099696517	0.091311894
Djibouti	DJI	14.4251408	18.14934588	19.50202357	5.625101236	24.2903737	2.156956665	0.054187201	0.142920313	0.387034469	0.361516214
Dominica	DMA	7.096528992	1.386605705	0.355463418	4.690925613	1.827526036	0.296872361	0.005970582	0.008567854	0.095699297	0.078276293
Dominican Republic	DOM	639.2905167	151.6608378	152.6829884	127.102413	289.1896723	48.00747718	5.120231116	19.4832744	54.67969066	41.77053171
Algeria	DZA	992.3294714	196.0253207	85.19579814	801.4790638	2559.017614	54.62937311	10.56014754	34.89621917	68.93186987	68.3023934
Ecuador	ECU	541.966427	182.4025868	167.2555031	310.5251502	809.1644751	104.1428147	4.58822871	15.65151632	42.60406063	29.75137295
Egypt	EGY	1908.793249	449.8777774	739.9464655	922.5701208	2197.888459	357.2247265	23.6402099	78.51119868	160.3676836	156.5016476
Eritrea	ERI	203.5081833	10.99563542	6.195650324	33.21821281	117.1376478	11.74648965	3.095347064	13.04792609	24.83157245	24.27793301
Western Sahara	ESH	3.262139011	1.830047823	1.687856458	1.133635902	13.0079931	1.18489624	0.021212121	0.049604918	0.121562047	0.116602488
Ethiopia	ETH	6308.339192	152.1857918	27.44765277	673.9944703	2269.078977	243.9062703	112.1286003	448.9124953	858.9577161	823.551973

Table 11d (continued): 2005 EDGAR-HTAP_V1 inventory for bunker fuel and the rest of the world (EDGAR-gapfilled)

Country		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
EDGAR											
Fiji	FJI	33.8765946	8.676455426	2.636481443	8.744521342	33.17786144	7.104047649	0.193438896	0.65407409	1.683829105	1.256129801
Falkland Islands (Malv	FLK	0.30622974	0.641231374	0.171167379	0.222814364	3.87656718	0.427500065	0.003360686	0.001303807	0.011437709	0.010843775
Faroe Islands	FRO	0.006972177	0.027258953	0.003796786	0.0164292	1.735498204	0.068812502	1.01155E-05	1.20665E-05	0.002229005	0.001437263
Micronesia, Federate	FSM	0.043690448	0.017541387	0.00013685	0.008553606	1.336332344	0.297597457	0.000583287	0.002452298	0.006121515	0.004037403
Gabon	GAB	67.7510855	25.61966092	14.25601978	61.35289962	372.3572734	2.276251261	0.698447561	2.478267839	7.678885287	7.131737632
Georgia	GEO	164.9704129	16.78654533	5.202811575	68.31788217	196.5646024	38.97990931	2.177657701	8.333214784	16.23816775	15.15136852
Guernsey	GGY				0.0212504	1.34496					
Ghana	GHA	1763.275821	74.00175288	53.26278137	272.2337316	343.1546392	22.4640163	25.37422694	104.8216506	199.8366404	194.9400473
Gibraltar	GIB	3.122432227	3.914935992	2.342194493	0.717840014	0.287766862	0.027536827	0.042300808	0.011123263	0.069237767	0.068648911
Guinea	GIN	789.0301349	24.46113224	11.42368094	98.34816849	287.5072791	20.70957348	13.54827861	54.61578723	103.4068816	100.6734055
Guadeloupe	GLP	30.0885964	16.26700006	11.23632747	8.335346908	11.02216801	2.417836905	0.229565141	0.827571678	2.610850274	1.752156351
Gambia	GMB	57.59044385	3.137457705	0.702584976	9.999348777	26.53757052	2.271783867	0.784655675	3.182710813	6.064228962	5.884945258
Guinea-Bissau	GNB	44.39416927	3.624312949	2.092401408	7.961107532	40.61902242	5.126049691	0.594993689	2.448991876	4.89870004	4.462328418
Equatorial Guinea	GNQ	40.62744923	2.73078186	0.529523519	56.67671332	286.1919888	0.183687947	0.517737664	2.071929614	3.939650417	3.868613016
Grenada	GRD	8.683750843	2.718748927	0.777386919	2.080245659	1.425901525	0.142219715	0.014511821	0.015841284	0.150022987	0.121313815
Greenland	GRL	0.00335374	0.01118087	0.00191642	0.685313721	0.385267027	0.013837313	3.8568E-06	1.10194E-07	0.00110194	0.000718659
Guatemala	GTM	1169.886368	133.0395031	86.59053202	143.0674967	277.1442246	50.46998832	16.01760323	62.7122093	139.8857617	117.8498609
French Guiana	GUF	12.03280449	9.142419522	8.659543969	3.647824523	4.021319589	0.335176294	0.149134448	0.513117671	1.218089882	1.124243904
Guam	GUM	0.04653097	0.005065489	0.000145747	5.357423381	3.040645126	0.080806571	0.000621209	0.002611735	0.006519518	0.004299902
Guyana	GUY	107.8155767	23.14633209	12.20416234	13.75715001	52.87886701	10.20027679	1.342512429	5.333779688	13.90314987	9.564259334
Hong Kong	HKG	28.18361751	165.281246	287.3429471	57.83622441	134.067834	0.344354797	0.862409057	0.227290608	161.5166104	43.53845592
Honduras	HND	492.2427866	117.8384944	66.0760551	69.2324003	239.1715352	37.36863015	6.053350904	23.08745934	51.75771665	44.32579521
Haiti	HTI	407.4208285	30.66873801	8.891870726	55.29743504	190.1060555	23.22211229	5.523091294	22.29181322	47.05944143	43.56086184
Isle of Man	IMN				0.0287191	1.81766					
Iran, Islamic Republic	IRN	8526.846871	1448.868715	1365.588419	3593.809454	5444.989665	385.6244178	12.37679634	19.31346242	54.36478504	52.10877392
Iraq	IRQ	2382.989052	580.9124858	806.1280084	1095.664822	757.8110064	31.13355638	3.44343975	5.866527818	21.6487968	12.09167019
Israel	ISR	320.0852347	245.4676533	245.3989992	282.67866	166.955769	24.2081711	0.648979358	0.640367502	7.159207829	3.857891857
Jamaica	JAM	297.8970672	88.2974639	685.4663058	57.63423391	62.01746754	9.149382121	1.261876476	4.622595295	12.23994265	9.89790317
Jersey	JEY				0.0295314	1.86907					
Jordan	JOR	178.2386948	91.32011278	134.7264066	117.2336787	84.33389814	9.103149073	0.492843088	0.557267137	2.142001237	1.828142248
Kazakhstan	KAZ	652.1757826	540.3970197	1223.19935	522.1427355	2102.829525	105.3480855	1.976158601	7.913726321	31.90944992	15.87184285
Kenya	KEN	2553.356825	124.2220386	58.97481668	454.8791726	1055.830986	116.4094586	30.67390849	139.7747792	273.0952476	266.2807458
Kyrgyzstan	KGZ	71.89278405	19.14368693	21.24023315	37.37019614	169.9396019	21.1178312	0.164759476	0.714156813	14.80935126	4.109018992
Kiribati	KIR	0.687765076	0.176508006	0.03333905	0.324848078	0.651484871	0.066831838	0.002987689	0.009714121	0.026255537	0.018302223
Saint Kitts and Nevis	KNA	3.02946186	1.309967167	0.414656368	0.638563313	1.63681499	0.268620036	0.027556357	0.096707631	0.304156229	0.196609825
Kuwait	KWT	336.6286701	190.5540148	881.4551269	1176.05351	683.3740749	4.834594695	0.688434012	0.330036201	3.94732455	3.089593896
Lebanon	LBN	192.5337255	68.8104766	184.5907758	65.59924598	47.80407356	14.15550429	0.590565112	2.176269935	5.078243242	4.480022536
Liberia	LBR	367.9738918	8.674801646	3.879113359	44.55268702	45.34814567	2.395953363	6.522612869	26.1652839	48.97794194	48.43465043
Libyan Arab Jamahiriy	LBY	795.6697381	242.793401	298.9976016	687.5844376	698.2784375	17.66054685	2.319245654	3.588384476	9.472995609	9.132092958
Saint Lucia	LCA	6.437755552	4.283263418	1.52028842	15.78558406	1.94107122	0.41103642	0.030357366	0.038754231	0.273947328	0.222925016
Lesotho	LSO	134.8513661	3.286076632	1.035426691	17.80670947	43.5640324	4.375892295	2.311543815	9.305518651	17.36348745	17.2350029
Macao	MAC	7.257851842	4.571630163	20.52127601	3.727924215	6.040305833	0.061695613	0.027637924	0.016657437	0.203553172	0.162123849
Morocco	MAR	144.4401552	153.328387	480.6094254	161.9772935	499.3875783	95.04777763	0.892495433	2.93319675	36.413013	16.44804571
Madagascar	MDG	836.4840725	31.7348586	9.86659184	112.3689547	680.1212016	65.70290094	13.49070519	54.66402755	104.6286684	100.4742444
Mexico	MEX	5062.183906	1300.118832	1889.737754	2525.116028	5936.949175	750.4347704	37.32384927	131.6970835	369.9658154	259.9570622
Marshall Islands	MHL				0.0038072	0.317936891					
Mali	MLI	438.6921878	17.33457226	2.413012599	67.48087604	553.8811574	61.73457169	6.721552371	27.67758183	54.5523386	50.317152
Northern Mariana Isla	MNP					0.124973073					
Mozambique	MOZ	1359.692227	31.6795276	11.64175962	172.1311313	328.9635677	19.13825859	20.87664646	85.99613217	167.9131553	159.3898556
Mauritania	MRT	212.1831933	42.91395875	23.27261715	36.37703275	241.4164353	24.51190059	1.997216055	7.903168475	15.07929193	14.74839297
Montserrat	MSR	2.744185943	0.753426201	0.20258178	0.486311057	0.691698215	0.109897018	0.004625146	0.002960032	0.016632238	0.015531964
Martinique	MTQ	19.4121539	24.7757526	15.98484793	8.070273264	9.039692498	1.622115904	0.100294968	0.171775035	0.997906465	0.695254722
Mauritius	MUS	47.45732074	23.57913029	23.3753988	26.83988122	12.80102474	32.45341731	0.536777124	0.9572554	2.242938541	1.874535139
Malawi	MWI	443.7326653	13.43757828	2.701710339	59.33057363	134.9219962	40.21745075	6.903063684	28.3411012	56.39411114	51.58219055
Mayotte	MYT				0.00315666	0.560777505					
Namibia	NAM	69.98728621	19.17625364	3.85173159	14.44597492	195.926321	24.3795438	0.242353389	0.617422439	2.222304563	1.642089068
New Caledonia	NCL	18.34837158	13.82955912	17.63371506	5.422861861	9.84329773	1.286838871	0.030025385	0.025608154	0.475754533	0.21311721
Niger	NER	676.542995	17.44854844	6.307563215	81.9750002	215.6036447	20.78744624	11.2945042	45.46264795	89.49591068	83.22869469
Norfolk Island	NFK					0.0040734					
Nigeria	NGA	7046.879299	442.6257435	144.3267701	1689.644577	6131.603175	203.2620403	79.83361217	323.6238083	637.2377785	592.5717614
Nicaragua	NIC	428.3187507	49.9889812	43.34255849	64.40390173	281.298922	38.82716435	6.21057764	24.280133	52.4714692	46.02758847
Niue	NIU	0.003094871	0.000727267	9.69396E-06	0.000388664	0.04476415	0.015111767	0.000041318	0.000173712	0.000433627	0.000285996
Nauru	NRU		0.00056539		0.47062296	0.135051204	0.015434577				
Oman	OMN	177.0776415	48.99417764	29.0806737	292.9598064	849.9299113	6.153337307	0.160028842	0.305263354	1.054952849	0.960623315
Panama	PAN	230.4454431	60.20140405	54.89035525	37.08837508	153.5738044	20.13718505	2.465061395	7.880723847	18.37618535	15.44480233
Pitcairn	PCN					0.001030196					
Peru	PER	926.0250539	191.4392668	188.6368226	290.7694442	799.8751182	168.7158393	11.22671498	39.41382388	105.1995826	77.29377439
Palau	PLW				0.00200827	0.189412032					
Papua New Guinea	PNG	376.6572975	39.49664907	29.99877374	63.02644936	69.1007207	5.479882983	6.178074998	24.34760765	46.03863398	45.44734078
Puerto Rico	PRI	0.46890752	0.379304079	0.002038729	24.95388669	105.7570841	6.415980289	0.003516801	0.016819533	0.06626582	0.019883952
Paraguay	PRY	622.2598455	53.35476716	10.36212556	117.8957706	643.2533665	67.6687502	8.345085011	33.29064325	84.94217778	65.84152532
Palestinian Territory	PSE				0.109195	6.91107					
French Polynesia	PYF	14.70869322	9.122450728	4.703404853	5.901963038	4.239470643	0.481909823	0.02624153	0.018634345	0.113700249	0.106279142

Table 11d (continued): 2005 EDGAR-HTAP_V1 inventory for bunker fuel and the rest of the world (EDGAR-gapfilled)

Country		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
EDGAR											
Qatar	QAT	111.7323273	50.59706214	4.846191563	273.6774832	747.408718	4.885371378	0.31942993	0.156261854	1.120000975	1.082520636
Reunion	REU	32.31407305	14.34761195	8.997295851	12.2458682	12.29808108	4.346248456	0.156140618	0.405902289	1.02714301	0.866960641
Rwanda	RWA	366.1954482	9.621075819	3.653464221	48.64855352	104.0744709	9.488555757	6.070002027	24.69466385	47.2792349	45.48073894
Saudi Arabia	SAU	2080.601492	1360.866489	2049.704899	3692.442417	2286.053293	107.5690169	4.277256881	4.744196455	24.38487255	16.06865462
Serbia and Monteneg	SCG	1067.387858	171.8903254	354.3793899	211.4769144	332.6353227	90.43903736	7.749438032	21.20150523	255.7191546	95.10849193
Sudan	SDN	2725.782217	165.6082298	85.21360294	588.9092718	2487.584811	275.9168099	30.02297245	138.9240609	273.435383	259.9544576
Senegal	SEN	531.5382289	46.56611443	45.38450827	108.0595076	296.9571322	31.36944072	7.188966764	29.98798952	58.6163062	56.58021433
Saint Helena	SHN	0.01694412	0.000972111	2.61949E-05	0.017736576	0.09132618	0.01000054	0.000106008	0.000685133	0.001373883	0.001306133
Solomon Islands	SLB	12.24266811	5.874615643	0.352037919	4.600659304	68.64445977	22.66783127	0.164337123	0.631519966	1.206952945	1.184482655
Sierra Leone	SLE	363.0561988	14.59499303	6.673418617	47.78500744	81.97291132	4.057063305	6.260665814	25.20632023	47.64167687	46.59584256
El Salvador	SLV	446.9296209	70.89077105	47.46121918	70.68462191	150.082519	23.99414634	6.145878686	23.23446108	51.31661331	44.70795912
San Marino	SMR				0.00394554	0.249718					
Somalia	SOM	688.5566169	16.29347798	3.297734405	80.85807597	677.4757259	58.08254047	12.19343645	49.02356842	91.48366444	90.68150734
Saint Pierre and Miqu	SPM	9.86671E-05	0.000628327	0.00023962	0.000847705	0.074337584	0.009346414	6.7587E-06	1.93106E-07	0.00193106	0.00129677
Sao Tome and Princip	STP	2.677981589	0.877217401	0.256108265	2.251624413	1.249626837	0.137026978	0.009543708	0.02929521	0.07087169	0.062377945
Suriname	SUR	25.66803013	24.84514558	16.05464221	7.938033215	27.76399186	3.057665334	0.15477347	0.449593843	1.822014709	1.150952529
Swaziland	SWZ	74.04452076	5.821565841	6.103108646	11.1160586	53.87557423	5.535673845	1.12104993	3.43581823	8.288980962	6.75990709
Seychelles	SYC	3.838887735	7.342719991	4.586184996	13.90796041	1.031441321	0.226220742	0.038059575	0.028837629	0.131246537	0.124501518
Syrian Arab Republic	SYR	488.1979365	242.8197886	417.2089825	382.1740138	596.4993227	75.3382749	3.968237932	12.82164668	35.53608222	22.50792579
Turks and Caicos Islan	TCA	0.033339354	0.020575135	0.001073118	0.004077403	0.218397829	0.001840853	0.00018282	0.000254933	0.021410922	0.018440849
Chad	TCD	467.3042583	11.1668053	1.40959101	86.84573896	414.8533195	42.61062964	7.944022891	32.32940287	62.09059391	59.23037154
Togo	TGO	524.3599426	12.57610004	3.171647645	76.89600616	98.74552465	8.525084324	7.396898692	31.53645598	60.36035742	58.66519337
Tajikistan	TJK	563.294693	10.9868361	6.340170756	115.0462776	184.9164012	28.54631238	0.485663444	1.444284974	4.477259765	2.743917803
Tokelau	TKL	0.00597725	0.000478838	1.87223E-05	0.000528793	0.011391482	0.006388899	0.000079799	0.000335497	0.00083748	0.000552355
Turkmenistan	TKM	194.5559117	42.69736347	14.33186125	246.0231674	1330.285813	58.10579156	0.322122703	1.444847864	5.68375736	2.263055257
Timor-Leste	TLS	23.88731841	1.076746242	0.092091751	2.770910989	32.40487454	4.367090407	0.23682313	1.053869391	3.33625187	1.510840374
Tonga	TON	0.08179667	0.040410266	0.000256209	3.042386566	2.457696492	0.66899107	0.001092023	0.004591157	0.01146063	0.007558782
Trinidad and Tobago	TTO	72.07246759	30.73796127	3.482260219	188.0105704	479.365749	14.38840943	0.422782247	1.400863351	4.138065222	2.800096345
Tunisia	TUN	296.6525438	52.70301864	253.0919984	115.7363481	389.2087435	32.91916281	3.687121056	13.44470654	26.88915092	26.23784843
Tuvalu	TUV		0.003360276		0.269716932	0.15574277	0.0906304				
Tanzania_United Repu	TZA	2682.167065	95.31025164	25.51445571	426.6084361	1116.403152	116.6362092	33.63332442	151.9466453	301.5689959	281.934663
Uganda	UGA	2417.499228	42.75239804	9.701175905	278.7518293	582.302432	62.36399126	42.47936815	171.1734869	323.2128906	315.6953113
Uruguay	URY	175.7074273	34.74211225	32.86064236	61.48064633	932.4170492	92.73478366	2.03498384	7.134173809	19.57471333	13.29263421
Uzbekistan	UZB	511.812999	121.9446193	193.5672394	337.8970585	1879.333049	171.5324419	1.822064593	4.443013761	15.26746304	9.341466554
Holy See (Vatican City	VAT				0.000174985	0.011075					
Saint Vincent and the	VCT	3.550898792	2.363479354	0.801752752	1.123536158	1.672904521	0.32530394	0.020591882	0.047644403	0.244445961	0.184744878
Venezuela	VEN	1525.615307	398.1437656	406.3427753	1878.712342	2782.467805	198.1153492	5.422526799	19.47830026	56.4473569	37.12353885
Virgin Islands_British	VGB	0.840314755	0.682163705	0.246595529	0.39429184	0.853212195	0.076217177	0.003751922	0.001879751	0.02927344	0.026151648
Virgin Islands_USA	VIR	3.32889	0.145601423	0.0144734	1.0160021	1.984067886	0.137223369	0.0249667	0.119406	0.470387	0.141116
Vanuatu	VUT	7.969533895	0.814591997	0.180071854	1.968530574	12.49395362	1.650878903	0.115438216	0.450869464	0.879654649	0.833988336
Wallis and Futuna	WLF	0.029149383	0.00905297	9.13037E-05	0.002578781	0.229687474	0.156567114	0.000389158	0.001636131	0.004084164	0.002693681
Samoa	WSM	8.711272427	1.075689723	0.192621008	1.906688775	6.00329822	1.334697407	0.081402602	0.311259982	0.591142808	0.586952232
Yemen	YEM	544.7220096	176.4572839	168.0043681	240.2562164	318.5894495	25.11380831	1.537187124	5.265765838	12.58649092	10.40337282
South Africa	ZAF	4679.820096	1631.974983	2143.199876	1113.287339	2889.686554	214.7045398	62.95832849	139.1475557	710.5370382	389.4500257
Zambia	ZMB	863.8244816	24.2625373	23.5635931	151.5335684	233.4406557	21.12620131	10.46855358	47.66262544	94.43386934	90.8034888
Zimbabwe	ZWE	778.3437902	262.2554129	611.8839663	82.35017451	399.1633462	43.52264224	20.80706851	56.64336639	692.1101826	233.9822393
		CO	NOx	SO2	NMVOC	CH4	NH3	BC	OC	PM10	PM2.5
World	**Tg species**	**630.015588**	**109.4755327**	**111.0050606**	**136.9428999**	**304.849066**	**46.70698101**	**5.069718332**	**16.39583513**	**76.7793979**	**43.2466439**

Annex 3: Proxy datasets.

All EDGAR-HTAP_V1 gridmaps (with exception of the US-EPA gridmaps for Northern America) have been consistently produced with a single proxy dataset: the spatial distribution proxies of EDGARv4.1 (2010). An overview is given in the Table 12. More details, preview of the map and link to data source are available at http://edgar.jrc.it/eolo (login: edgar_HTAP, passwd: htap. Go to "system info" and select "spatial datasets"

Table 12: EDGARv4.1 proxy datasets with spatial distribution and sector allocation, as applied to the EDGAR-HTAP_V1 emission inventory.

category of emission source (level as used for gridmap aggregation)	IPCC code (cfr. UNFCCC/ IPCC 1996 GL)	EDGAR-HTAP-source code	gridmap used for the EDGAR-HTAP sources	ref. http://edgar.jrc.it/eolo go to system info, spatial datasets
htap_1_aircraft	1.A.3.a.i	yy1.yyA.3ah	f_cruise	AERO2K project
htap_1_aircraft	1.A.3.a.ii	yy1.yyA.3ai	f_cruise	AERO2K project
htap_1_aircraft	1.A.3.a	yy1.yyA.3ay	f_cruise	AERO2K project
htap_2_ships	1.A.3.d	yy1.yyA.3dy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_2_ships	1.A.3.d.i	yy1.yyA.3di	Ships_2007	http://coast.cms.udel.edu/GlobalShipEmissions/Inventories/
htap_2_ships	1.A.3.d.ii	yy1.yyA.3dm	Urb_pop_perc	CIESIN - with urban pop. profile
htap_3_energy_comb_fuel_prod	1.B.1	yy1.yyB.1yy	coal_Lignite_undergrnd	coal mine point source map of USGS
htap_3_energy_comb_fuel_prod	1.A.2	yy1.yyA.2yy	steel	steel map (composed of blastfurnace map, and 4 methods of iron making maps)
htap_3_energy_comb_fuel_prod	1.B.2	yy1.yyB.2yy	urban_D_total_pop_I	CIESIN - elaborated with urban population profile for Annex I & rural population profile for rest
htap_3_energy_comb_fuel_prod	1.A.1.b	yy1.yyA.1by	oil_refineries	refineries point source map PBL
htap_3_energy_comb_fuel_prod	1.A.1.a	yy1.yyA.1ay	PP_CARMA_2000	powerplants point source map CARMA 2007
htap_3_energy_comb_fuel_prod	1.A.1.c	yy1.yyA.1cy	coal_Lignite_undergrnd	coal mine point source map of USGS
htap_4_industry_processes	2.C.1	yy2.yyC.1yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.G	yy2.yyG.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.D	yy2.yyD.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.C.5	yy2.yyC.5yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.C.4	yy2.yyC.4yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.	yy2.yyy.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.C.2	yy2.yyC.2yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.C	yy2.yyC.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.B.5	yy2.yyB.5yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.B.1	yy2.yyB.1yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.B	yy2.yyB.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.A.1	yy2.yyA.1yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.A	yy2.yyA.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_4_industry_processes	2.C.3	yy2.yyC.3yy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_5_ground_transport	1.A.3.b	yy1.yyA.3by	Roads	road network x inhabitants
htap_5_ground_transport	1.A.3.c	yy1.yyA.3cy	pop_01x01_LO	CIESIN global population
htap_5_ground_transport	1.A.3.e	yy1.yyA.3ey	pop_01x01_LO	CIESIN global population
htap_6_residential	1.A.5.a	yy1.yyA.5yy	pop_01x01_LO	CIESIN global population
htap_6_residential	1.A.4	yy1.yyA.4yy	pop_01x01_LO	CIESIN global population
htap_7_solvents	3.B	yy3.yyB.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_7_solvents	3.C	yy3.yyC.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_7_solvents	3.D	yy3.yyD.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_7_solvents	3	yy3.yyy.yyy	Urb_pop_perc	CIESIN - with urban pop. profile
htap_7_solvents	3.A	yy3.yyA.yyy	Urb_pop_perc	CIESIN - with urban pop. profile

Table 12 (continued): EDGARv4.1 proxy datasets with spatial distribution and sector allocation, as applied to the EDGAR-HTAP_V1 emission inventory.

category of emission source (level as used for gridmap aggregation)	IPCC code (cfr. UNFCCC/ IPCC 1996 GL)	EDGAR-HTAP-source code	gridmap used for the EDGAR-HTAP sources	ref. http://edgar.jrc.it/eolo go to system info, spatial datasets
htap_8_agriculture	4.C	yy4.yyC.yyy	rice	http://www.sage.wisc.edu:16080/iamdata/
htap_8_agriculture	4.B.13	yy4.yyB.13y	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.B.3	yy4.yyB.3yy	sheeps_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.B.4	yy4.yyB.4yy	goats_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.B.5	yy4.yyB.5yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.B.6	yy4.yyB.6yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.B.7	yy4.yyB.7yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.B.9	yy4.yyB.9yy	poultry_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.B.1.b	yy4.yyB.1by	cattle_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.D	yy4.yyD.yyy	gc_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.D.1	yy4.yyD.1yy	gc_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.D.2	yy4.yyD.2yy	grass	FAO Geonetwork 2007
htap_8_agriculture	4.D.4	yy4.yyD.4yy	gc_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.B.8	yy4.yyB.8yy	pigs_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.03	yy4.yyA.3yy	sheeps_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.01	yy4.yyA.1yy	cattle_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.01.a	yy4.yyA.1ay	cattle_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.B.2	yy4.yyB.2yy	buffalo_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.02	yy4.yyA.2yy	buffalo_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.B.1.a	yy4.yyB.1ay	cattle_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.04	yy4.yyA.4yy	goats_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.05	yy4.yyA.5yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.A.06	yy4.yyA.6yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.A.07	yy4.yyA.7yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.A.08	yy4.yyA.8yy	pigs_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.09	yy4.yyA.9yy	poultry_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.13	yy4.yyA.13y	Rur_pop_perc	CIESIN - with rural pop. profile
htap_8_agriculture	4.B.1	yy4.yyB.1yy	cattle_01x01_LO	FAO Geonetwork 2007
htap_8_agriculture	4.A.01.b	yy4.yyA.1by	cattle_01x01_LO	FAO Geonetwork 2007
htap_9_agricultural_waste_burnin	4.G	yy4.yyG.yyy	crop_01x01_LO	FAO Geonetwork 2007
htap_9_agricultural_waste_burnin	4.F.1	yy4.yyF.1yy	crop_01x01_LO	FAO Geonetwork 2007
htap_9_agricultural_waste_burnin	4.F.2	yy4.yyF.2yy	crop_01x01_LO	FAO Geonetwork 2007
htap_9_agricultural_waste_burnin	4.F.3	yy4.yyF.3yy	crop_01x01_LO	FAO Geonetwork 2007
htap_9_agricultural_waste_burnin	4.F.3.1	yy4.yyF.yyy	crop_01x01_LO	FAO Geonetwork 2007
htap_9_agricultural_waste_burnin	4.F.4	yy4.yyF.4yy	crop_01x01_LO	FAO Geonetwork 2007
htap_10_waste	6.B.1	yy6.yyB.1yy	pop_01x01_LO	CIESIN global population
htap_10_waste	6.D	yy6.yyD.yyy	pop_01x01_LO	CIESIN global population
htap_10_waste	6.B.2	yy6.yyB.2yy	pop_01x01_LO	CIESIN global population
htap_10_waste	6.B	yy6.yyB.yyy	pop_01x01_LO	CIESIN global population
htap_10_waste	6.A.1	yy6.yyA.1yy	Rur_pop_perc	CIESIN - with rural pop. profile
htap_10_waste	6.A	yy6.yyA.yyy	pop_01x01_LO	CIESIN global population
htap_10_waste	6	yy6.yyy.yyy	pop_01x01_LO	CIESIN global population
htap_10_waste	6.C	yy6.yyC.yyy	pop_01x01_LO	CIESIN global population

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