EDGAR v4.3.2 Global Atlas of the three major Greenhouse Gas Emissions for the period 1970-2012.

Supplementary Information

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1   EDGARv4 geographical data

All countries of the world are taken up in the EDGAR database, except South and North Sudan (grouped together), Liechtenstein (grouped with Switzerland), Monaco (grouped with France), Andorra (grouped with Spain) and Vatican/San Marino (grouped with Italy). The countries are clearly defined with names recognized by the European Commission and present each a Party for the UNFCCC. All countries can be uniquely allocated to one of the three groups that were present at the creation of the UNFCCC: the 24 countries of the OECD in 1990, the 16 countries with Economies in Transition (EIT) (both form the Annex I countries of 1992) and the rest are the non-Annex I countries. Detailed information is not for each country available in the global database and neighbouring countries are assumed to show e.g. similar technologies. As such 24 geographical groups of countries have been defined and are used for e.g. the allocation of the type of vehicles. These 24 groups are also used in IPCC AR6 scenarios run with the IMAGE land-use model. Finally, for the temporal distribution, only three groups of countries are considered, depending on the temperate zone they are located: northern zone, equator and southern zone. All these characteristics of the countries are summarized in Table S1.

Table S1: List of countries with their ISO_A3 codes and characteristics w.r.t. historical group (24OECD(1990) or 16EIT(1990) or non-Annex I), w.r.t temperate climatic zone (determining the temporal profile) and w.r.t. the geographical 24 groups of neighbouring countries that are assumed to use similar technologies.

Name	ISO_A3 code	geographical group	temperate zone	historical group
Afghanistan	AFG	18:_India +	01:_Northern Temperate Zone	Non-Annex_I
Albania	ALB	12:_Central Europe	01:_Northern Temperate Zone	Non-Annex_I
Algeria	DZA	07:_Northern_Africa	01:_Northern Temperate Zone	Non-Annex_I
American Samoa	ASM	24:_Oceania	02:_Equator	Non-Annex_I
Angola	AGO	10:_Southern_Africa	02:_Equator	Non-Annex_I
Anguilla	AIA	04:_Rest Central America	02:_Equator	Non-Annex_I
Antigua and Barbuda	ATG	04:_Rest Central America	02:_Equator	Non-Annex_I
Argentina	ARG	06:_Rest South America	03:_Southern Temperate Zone	Non-Annex_I
Armenia	ARM	16:_Russia +	01:_Northern Temperate Zone	Non-Annex_I
Aruba	ABW	04:_Rest Central America	02:_Equator	Non-Annex_I
Australia	AUS	24:_Oceania	03:_Southern Temperate Zone	24 OECD (1990)
Austria	AUT	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Azerbaijan	AZE	16:_Russia +	01:_Northern Temperate Zone	Non-Annex_I
Bahamas	BHS	04:_Rest Central America	02:_Equator	Non-Annex_I
Bahrain	BHR	17:_Middle_East	02:_Equator	Non-Annex_I
Bangladesh	BGD	18:_India +	02:_Equator	Non-Annex_I
Barbados	BRB	04:_Rest Central America	02:_Equator	Non-Annex_I
Belarus	BLR	14:_Ukraine +	01:_Northern Temperate Zone	16 EIT (1990)
Belgium	BEL	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Belize	BLZ	04:_Rest Central America	02:_Equator	Non-Annex_I
Benin	BEN	08:_Western_Africa	02:_Equator	Non-Annex_I
Bermuda	BMU	04:_Rest Central America	02:_Equator	Non-Annex_I
Bhutan	BTN	18:_India +	02:_Equator	Non-Annex_I
Bolivia	BOL	06:_Rest South America	02:_Equator	Non-Annex_I
Bosnia and	BIH	12:_Central Europe	01:_Northern Temperate Zone	Non-Annex_I

Herzegovina				
Botswana	BWA	10:_Southern_Africa	02:_Equator	Non-Annex_I
Brazil	BRA	05:_Brazil	02:_Equator	Non-Annex_I
Brunei Darussalam	BRN	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Bulgaria	BGR	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Burkina Faso	BFA	08:_Western_Africa	02:_Equator	Non-Annex_I
Burundi	BDI	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Cambodia	KHM	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Cameroon	CMR	08:_Western_Africa	02:_Equator	Non-Annex_I
Canada	CAN	01:_Canada	01:_Northern Temperate Zone	24 OECD (1990)
Cape Verde	CPV	08:_Western_Africa	02:_Equator	Non-Annex_I
Cayman Islands	CYM	04:_Rest Central America	02:_Equator	Non-Annex_I
Central African Republic	CAF	08:_Western_Africa	02:_Equator	Non-Annex_I
Chad	TCD	08:_Western_Africa	02:_Equator	Non-Annex_I
Chile	CHL	06:_Rest South America	03:_Southern Temperate Zone	Non-Annex_I
China (mainland China)	CHN	20:_China +	01:_Northern Temperate Zone	Non-Annex_I
Colombia	COL	06:_Rest South America	02:_Equator	Non-Annex_I
Comoros	COM	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Congo	COG	08:_Western_Africa	02:_Equator	Non-Annex_I
Congo_the Democratic Republic of the	COD	08:_Western_Africa	02:_Equator	Non-Annex_I
Cook Islands	COK	24:_Oceania	03:_Southern Temperate Zone	Non-Annex_I
Costa Rica	CRI	04:_Rest Central America	02:_Equator	Non-Annex_I
Cote d'Ivoire	CIV	08:_Western_Africa	02:_Equator	Non-Annex_I
Croatia	HRV	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Cuba	CUB	04:_Rest Central America	02:_Equator	Non-Annex_I
Cyprus	CYP	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Czech Republic	CZE	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Denmark	DNK	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Djibouti	DJI	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Dominica	DMA	04:_Rest Central America	02:_Equator	Non-Annex_I
Dominican Republic	DOM	04:_Rest Central America	02:_Equator	Non-Annex_I
Ecuador	ECU	06:_Rest South America	02:_Equator	Non-Annex_I
Egypt	EGY	07:_Northern_Africa	01:_Northern Temperate Zone	Non-Annex_I
El Salvador	SLV	04:_Rest Central America	02:_Equator	Non-Annex_I
Equatorial Guinea	GNQ	08:_Western_Africa	02:_Equator	Non-Annex_I
Eritrea	ERI	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Estonia	EST	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Ethiopia	ETH	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Falkland Islands (Malvinas)	FLK	06:_Rest South America	02:_Equator	Non-Annex_I
Faroe Islands (under Danish governance)	FRO	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Fiji	FJI	24:_Oceania	02:_Equator	Non-Annex_I
Finland	FIN	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
France (including Monaco and Andorra)	FRA	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)

French Guiana	GUF	06:_Rest South America	02:_Equator	Non-Annex_I
French Polynesia	PYF	24:_Oceania	02:_Equator	Non-Annex_I
Gabon	GAB	08:_Western_Africa	02:_Equator	Non-Annex_I
Gambia	GMB	08:_Western_Africa	02:_Equator	Non-Annex_I
Georgia	GEO	16:_Russia +	01:_Northern Temperate Zone	Non-Annex_I
Germany	DEU	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Ghana	GHA	08:_Western_Africa	02:_Equator	Non-Annex_I
Gibraltar	GIB	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Greece	GRC	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Greenland (under Danish governance)	GRL	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Grenada	GRD	04:_Rest Central America	02:_Equator	Non-Annex_I
Guadeloupe	GLP	04:_Rest Central America	02:_Equator	Non-Annex_I
Guam	GUM	24:_Oceania	02:_Equator	Non-Annex_I
Guatemala	GTM	04:_Rest Central America	02:_Equator	Non-Annex_I
Guernsey (under British governance)	GGY	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Guinea	GIN	08:_Western_Africa	02:_Equator	Non-Annex_I
Guinea-Bissau	GNB	08:_Western_Africa	02:_Equator	Non-Annex_I
Guyana	GUY	06:_Rest South America	02:_Equator	Non-Annex_I
Haiti	HTI	04:_Rest Central America	02:_Equator	Non-Annex_I
Honduras	HND	04:_Rest Central America	02:_Equator	Non-Annex_I
Hong Kong (under governance of China)	HKG	20:_China +	02:_Equator	Non-Annex_I
Hungary	HUN	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Iceland	ISL	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
India	IND	18:_India +	02:_Equator	Non-Annex_I
Indonesia	IDN	22:_Indonesia +	02:_Equator	Non-Annex_I
Iran (Islamic Republic of Iran)	IRN	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I
Iraq	IRQ	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I
Ireland	IRL	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Isle of Man (under British governance)	IMN	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Israel	ISR	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I
Italy (including Vatican, San Marino)	ITA	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Jamaica	JAM	04:_Rest Central America	02:_Equator	Non-Annex_I
Japan	JPN	23:_Japan	01:_Northern Temperate Zone	24 OECD (1990)
Jersey (under British governance)	JEY	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Jordan	JOR	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I
Kazakhstan	KAZ	15:_Asia-Stan	01:_Northern Temperate Zone	Non-Annex_I
Kenya	KEN	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Kiribati	KIR	24:_Oceania	02:_Equator	Non-Annex_I
Korea North (Democratic People's Republic of Korea)	PRK	19:_Korea	01:_Northern Temperate Zone	Non-Annex_I
Korea South (Republic of Korea)	KOR	19:_Korea	01:_Northern Temperate Zone	Non-Annex_I
Kuwait	KWT	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I

Kyrgyzstan	KGZ	15:_Asia-Stan	01:_Northern Temperate Zone	Non-Annex_I
Lao People's Democratic Republic	LAO	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Latvia	LVA	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Lebanon	LBN	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I
Lesotho	LSO	10:_Southern_Africa	02:_Equator	Non-Annex_I
Liberia	LBR	08:_Western_Africa	02:_Equator	Non-Annex_I
Libyan Arab Jamahiriya	LBY	07:_Northern_Africa	01:_Northern Temperate Zone	Non-Annex_I
Lithuania	LTU	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Luxembourg	LUX	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Macao (under governance of China)	MAC	20:_China +	02:_Equator	Non-Annex_I
Macedonia (former Yugoslav Republic of Macedonia)	MKD	12:_Central Europe	01:_Northern Temperate Zone	Non-Annex_I
Madagascar	MDG	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Malawi	MWI	10:_Southern_Africa	02:_Equator	Non-Annex_I
Malaysia	MYS	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Maldives	MDV	18:_India +	02:_Equator	Non-Annex_I
Mali	MLI	08:_Western_Africa	02:_Equator	Non-Annex_I
Malta	MLT	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Marshall Islands	MHL	24:_Oceania	02:_Equator	Non-Annex_I
Martinique	MTQ	04:_Rest Central America	02:_Equator	Non-Annex_I
Mauritania	MRT	08:_Western_Africa	02:_Equator	Non-Annex_I
Mauritius	MUS	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Mayotte	MYT	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Mexico	MEX	03:_Mexico	02:_Equator	Non-Annex_I
Micronesia (Federated States of Micronesia)	FSM	24:_Oceania	02:_Equator	Non-Annex_I
Moldova (Republic of Moldova)	MDA	14:_Ukraine +	01:_Northern Temperate Zone	Non-Annex_I
Mongolia	MNG	20:_China +	01:_Northern Temperate Zone	Non-Annex_I
Montserrat	MSR	04:_Rest Central America	02:_Equator	Non-Annex_I
Morocco	MAR	07:_Northern_Africa	01:_Northern Temperate Zone	Non-Annex_I
Mozambique	MOZ	10:_Southern_Africa	02:_Equator	Non-Annex_I
Myanmar	MMR	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Namibia	NAM	10:_Southern_Africa	02:_Equator	Non-Annex_I
Nauru	NRU	24:_Oceania	02:_Equator	Non-Annex_I
Nepal	NPL	18:_India +	01:_Northern Temperate Zone	Non-Annex_I
Netherlands	NLD	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Netherlands Antilles	ANT	04:_Rest Central America	02:_Equator	Non-Annex_I
New Caledonia	NCL	24:_Oceania	02:_Equator	Non-Annex_I
New Zealand	NZL	24:_Oceania	03:_Southern Temperate Zone	24 OECD (1990)
Nicaragua	NIC	04:_Rest Central America	02:_Equator	Non-Annex_I
Niger	NER	08:_Western_Africa	02:_Equator	Non-Annex_I
Nigeria	NGA	08:_Western_Africa	02:_Equator	Non-Annex_I
Niue	NIU	24:_Oceania	02:_Equator	Non-Annex_I
Norfolk Island (under Australian governance)	NFK	24:_Oceania	03:_Southern Temperate Zone	Non-Annex_I

Northern Mariana Islands	MNP	24:_Oceania	02:_Equator	Non-Annex_I
Norway	NOR	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Oman	OMN	17:_Middle_East	02:_Equator	Non-Annex_I
Pakistan	PAK	18:_India +	01:_Northern Temperate Zone	Non-Annex_I
Palau	PLW	24:_Oceania	02:_Equator	Non-Annex_I
Panama	PAN	04:_Rest Central America	02:_Equator	Non-Annex_I
Papua New Guinea	PNG	22:_Indonesia +	02:_Equator	Non-Annex_I
Paraguay	PRY	06:_Rest South America	02:_Equator	Non-Annex_I
Peru	PER	06:_Rest South America	02:_Equator	Non-Annex_I
Philippines	PHL	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Pitcairn	PCN	24:_Oceania	02:_Equator	Non-Annex_I
Poland	POL	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Portugal	PRT	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Puerto Rico (under USA governance)	PRI	04:_Rest Central America	02:_Equator	Non-Annex_I
Qatar	QAT	17:_Middle_East	02:_Equator	Non-Annex_I
Reunion	REU	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Romania	ROU	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Russian Federation	RUS	16:_Russia +	01:_Northern Temperate Zone	16 EIT (1990)
Rwanda	RWA	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Saint Helena	SHN	08:_Western_Africa	02:_Equator	Non-Annex_I
Saint Kitts and Nevis	KNA	04:_Rest Central America	02:_Equator	Non-Annex_I
Saint Lucia	LCA	04:_Rest Central America	02:_Equator	Non-Annex_I
Saint Pierre and Miquelon (under French governance)	SPM	02:_USA	01:_Northern Temperate Zone	24 OECD (1990)
Saint Vincent and the Grenadines	VCT	04:_Rest Central America	02:_Equator	Non-Annex_I
Samoa	WSM	24:_Oceania	02:_Equator	Non-Annex_I
Sao Tome and Principe	STP	08:_Western_Africa	02:_Equator	Non-Annex_I
Saudi Arabia	SAU	17:_Middle_East	02:_Equator	Non-Annex_I
Senegal	SEN	08:_Western_Africa	02:_Equator	Non-Annex_I
Serbia and Montenegro (including Kosovo)	SCG	12:_Central Europe	01:_Notrhtern Temperate Zone	Non-Annex_I
Seychelles	SYC	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Sierra Leone	SLE	08:_Western_Africa	02:_Equator	Non-Annex_I
Singapore	SGP	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Slovakia	SVK	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Slovenia	SVN	12:_Central Europe	01:_Northern Temperate Zone	16 EIT (1990)
Solomon Islands	SLB	24:_Oceania	02:_Equator	Non-Annex_I
Somalia	SOM	09:_Eastern_Africa	02:_Equator	Non-Annex_I
South Africa	ZAF	10:_Southern_Africa	03:_Southern Temperate Zone	Non-Annex_I
Spain	ESP	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Sri Lanka	LKA	18:_India +	02:_Equator	Non-Annex_I
Sudan (North and South Sudan)	SDN	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Suriname	SUR	06:_Rest South America	02:_Equator	Non-Annex_I
Swaziland	SWZ	10:_Southern_Africa	02:_Equator	Non-Annex_I

Sweden	SWE	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Switzerland (including Liechtenstein)	CHE	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
Syrian Arab Republic	SYR	17:_Middle_East	01:_Northern Temperate Zone	Non-Annex_I
Taiwan (under governance of China)	TWN	20:_China +	02:_Equator	Non-Annex_I
Tajikistan	TJK	15:_Asia-Stan	01:_Northern Temperate Zone	Non-Annex_I
Tanzania (United Republic of Tanzania)	TZA	10:_Southern_Africa	02:_Equator	Non-Annex_I
Thailand	THA	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Timor-Leste	TLS	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Togo	TGO	08:_Western_Africa	02:_Equator	Non-Annex_I
Tokelau	TKL	24:_Oceania	02:_Equator	Non-Annex_I
Tonga	TON	24:_Oceania	02:_Equator	Non-Annex_I
Trinidad and Tobago	TTO	04:_Rest Central America	02:_Equator	Non-Annex_I
Tunisia	TUN	07:_Northern_Africa	01:_Northern Temperate Zone	Non-Annex_I
Turkey	TUR	13:_Turkey	01:_Northern Temperate Zone	24 OECD (1990)
Turkmenistan	TKM	15:_Asia-Stan	01:_Northern Temperate Zone	Non-Annex_I
Turks and Caicos Islands	TCA	04:_Rest Central America	02:_Equator	Non-Annex_I
Tuvalu	TUV	24:_Oceania	02:_Equator	Non-Annex_I
Uganda	UGA	09:_Eastern_Africa	02:_Equator	Non-Annex_I
Ukraine	UKR	14:_Ukraine +	01:_Northern Temperate Zone	16 EIT (1990)
United Arab Emirates	ARE	17:_Middle_East	02:_Equator	Non-Annex_I
United Kingdom	GBR	11:_OECD_Europe	01:_Northern Temperate Zone	24 OECD (1990)
United States	USA	02:_USA	01:_Northern Temperate Zone	24 OECD (1990)
Uruguay	URY	06:_Rest South America	03:_Southern Temperate Zone	Non-Annex_I
Uzbekistan	UZB	15:_Asia-Stan	01:_Northern Temperate Zone	Non-Annex_I
Vanuatu	VUT	24:_Oceania	02:_Equator	Non-Annex_I
Venezuela	VEN	06:_Rest South America	02:_Equator	Non-Annex_I
Viet Nam	VNM	21:_Southeastern Asia	02:_Equator	Non-Annex_I
Virgin Islands (under British governance)	VGB	04:_Rest Central America	02:_Equator	24 OECD (1990)
Virgin Islands (under USA governance)	VIR	04:_Rest Central America	02:_Equator	24 OECD (1990)
Wallis and Futuna	WLF	24:_Oceania	02:_Equator	Non-Annex_I
Western Sahara	ESH	07:_Northern_Africa	02:_Equator	Non-Annex_I
Yemen	YEM	17:_Middle_East	02:_Equator	Non-Annex_I
Zambia	ZMB	10:_Southern_Africa	02:_Equator	Non-Annex_I
Zimbabwe	ZWE	10:_Southern_Africa	02:_Equator	Non-Annex_I

2   EDGARv4 human activities

The sector-specific structure of the EDGAR database consists of 26 main sectors (characterized with the first three letter codes), which are further subdivided in subsectors, depending on the type of technology (see Table S3). In addition EDGARv4 uses the same fuel types as IEA and the same livestock and crop types as FAO. The fuel types are for the sake of clarity presented in Table S2 following the main categories of IPCC (2006) guidelines.

Table S2: Different types of fuel (based on IEA definitions), which are grouped in IPCC (2006) guidelines' categories and applied as such in EDGARv4.3.2.

Fuel Category	Fuel Description	code	Comment
SOLID FOSSIL FUELS			*(CO2 long cycle)*
Hard coal	Anthracite	ANT	Anthracite
Hard coal	Other Bituminous Coal	BTC	Bituminous
Hard coal	Coking Coal	CKC	Bituminous
Hard coal	Coal Tar	CLT	Coal product *(for non-energy use)*
Hard coal	Gas Coke	GCK	Coal product
Hard coal	Hard Coal (if no detail)	HDC	
Hard coal	Coke Oven Coke	OCK	Coal product
Hard coal	Patent Fuel	PAT	Coal product
Hard coal	Sub-Bituminous Coal	SBC	Sub-bituminous
Brown coal	BKB/Peat Briquettes	BKB	Coal product
Brown coal	Brown Coal (if no detail)	BRC	Lignite
Brown coal	Lignite/Brown Coal	LGN	Lignite
Peat	Peat	PEA	Peat or under Brown coal
Solid waste	Municipal Waste (Non-Renew)	MWN	Non-biomass
FOSSIL OIL AND OIL PRODUCTS			
Heavy oils	Bitumen	BIT	*for non-energy use*
Heavy oils	Crude/NGL/Feedstocks (if no detail)	CNF	Crude subtype
Heavy oils	Crude Oil	CRU	
Heavy oils	Gas/Diesel Oil	DIE	diesel
Heavy oils	Residual Fuel Oil	HFO	
Heavy oils	Lubricants	LUB	*for non-energy use*
Heavy oils	Other Hydrocarbons	NCR	
Heavy oils	Petroleum Coke	PCK	*for non-energy use*
Heavy oils	Paraffin Waxes	PWX	*for non-energy use*
Heavy oils	Refinery Feedstocks	RFD	Crude subtype
Light oils	Additives/Blending Components	ADD	Crude subtype
Light oils	Aviation Gasoline	AVG	
Light oils	Ethane	ETH	
Light oils	Gasoline Type Jet Fuel	GJE	
Light oils	Kerosene Type Jet Fuel	JET	
Light oils	Liquefied Petroleum Gases (LPG)	LPG	
Light oils	Motor Gasoline	MOG	Petrol
Light oils	Naphtha	NAP	*for non-energy use*
Light oils	Natural Gas Liquids	NGL	Crude subtype
Light oils	Kerosene	OKE	
Light oils	Non-specified Petroleum Products	OPR	
Light oils	White Spirit & SBP	WSP	for NEU

GASEOUS FOSSIL FUELS			
Natural gas	Natural Gas	NGS	
Derived gases	Blast Furnace Gas	BFG	Coal product
Derived gases	Gas Works Gas	GGS	Coal product
Derived gases	Elec/Heat Output from Non-spec. Manuf. Gases	MNG	Miscelaneous fossil fuel product
Derived gases	Coke Oven Gas	OGS	Coal product
Derived gases	Refinery Gas	RGS	Oil product
Derived gases	Oxygen Steel Furnace Gas	SGS	Coal product
BIOMASS FUELS			*(CO2 short cycle)*
Solid biomass	Charcoal	CHA	Wood product
Solid biomass	Dung	DNG	
Solid biomass	Industrial Waste	IWS	Waste
Solid biomass	Municipal Waste (Renew)	MWR	Waste
Solid biomass	Non-specified Combust. Renewables + Wastes	NSF	
Solid biomass	Primary Solid Biomass (non-specified)	SBI	
Solid biomass	Vegetal waste	VWS	
Solid biomass	Wood	WOD	
Liquid biomass	Biodiesel	BDS	
Liquid biomass	Biogasoline	BGL	
Liquid biomass	Bagasse	BGS	Sugar cane product
Liquid biomass	Black Liquor	BLI	Pulp product
Liquid biomass	Liquid Biomass	LBI	Bioethanol, biodiesel
Liquid biomass	Other Liquid Biofuels	OLB	
Gaseous biomass	Biogas	GBI	Landfills, Waste Water Treatment plant, digester

Table S3: Source categories used in EDGARv4.3.2. These include the main category with all Source/Sink Categories conform with the common reporting format of the IPCC (1996) and IPCC (2006) Guidelines. Note that neither large scale biomass burning nor land-use, land-use change and forestry emissions are included, although we do include agricultural activities (such as livestock and milk production, crop and rice production, agricultural waste burning, field burning, histosols and liming).

sector	Sector description	Detail	Detailed desription	IPCC (1996)	IPCC (2006)
AGS	Agricultural soils	AGS.ANW	Animal Manure Applied to Soils	4D12	3.C.4
AGS	Agricultural soils	AGS.BFL, CHC, CML, CTT, DCK, GTS, HRS, PGS, SHP, SSS, TRK	Pasture, Range and Paddock Manure	4D2	3.C.4
AGS	Agricultural soils	AGS.CRP	Crop Residue	4D14	3.C.4
AGS	Agricultural soils	AGS.HIS	Cultivation of Histosols	4D15	3.C.4
AGS	Agricultural soils	AGS.LMN	CO2 from agricultural lime application	4D4b	3.C.2
AGS	Agricultural soils	AGS.NFC	Direct soil emissions	4D13	3.C.4
AGS	Agricultural soils	AGS.NFE	Synthetic Fertilizers	4D11	3.C.4
AGS	Agricultural soils	AGS.RIC	Rice cultivation	4C	3.C.7

AGS	Agricultural soils	AGS.TRK	Pasture, Range and Paddock Manure	4D2	3.C.4
AGS	Agricultural soils	AGS.URE	CO2 from urea application	4D4a	3.C.3
AWB	Agricultural waste burning	AWB.CRP	Field burning of agric. res.: cereals,pulses, tuber, roots,sugar cane, other	4F1,2,3,4,5	3.C.1.b
CHE	Production of chemicals	CHE.AAP	Adipic acid production	2B3	2.B.3
CHE	Production of chemicals	CHE.AMP	Ammonia production (gross CO2)	2B1g	2.B.1
CHE	Production of chemicals	CHE.BLK	CO2-ammonia stored in urea	2B1s	2.B.8.a
CHE	Production of chemicals	CHE.BLK	production of bulk chemiclas (BC,ethylene, styrene, methanol, urea, vinyl chloride, urea)	2B5	2.B.8.a
CHE	Production of chemicals	CHE.CLC	Calcium carbide production	2B4b	2.B.5
CHE	Production of chemicals	CHE.CLP	Caprolactam production	2B5f	2.B.4
CHE	Production of chemicals	CHE.GXA	Glyoxal production	2B5h1	2.B.4
CHE	Production of chemicals	CHE.GXY	Glyoxylic acid production	2B5h3	2.B.4
CHE	Production of chemicals	CHE.NAP	Nitric acid production	2B2	2.B.2
CHE	Production of chemicals	CHE.NFP	Other bulk chemicals production	2B5g	2.B.2
CHE	Production of chemicals	CHE.SAP	Other bulk chemicals production	2B5g	2.B.4
CHE	Production of chemicals	CHE.SLC	Silicon carbide production	2B4a	2.B.5
CHE	Production of chemicals	CHE.SPC	Other bulk chemicals production	2B5g	2.B.6
CHE	Production of chemicals	CHE.TTN	Other bulk chemicals production	2B5g	2.B.6
ENE	Power industry	ENE.AEL	Electricity Generation (autoproducers)	1A1a5	1.A.1.a.i
ENE	Power industry	ENE.AHE	Heat Plants (autoproducers)	1A1a7	1.A.1.a.iii
ENE	Power industry	ENE.AHP	Combined Heat and Power gen. (autoprod.)	1A1a6	1.A.1.a.ii
ENE	Power industry	ENE.CHP	Public Combined Heat and Power gen.	1A1a2	1.A.1.a.ii
ENE	Power industry	ENE.DHE	Public Heat Plants	1A1a3	1.A.1.a.iii
ENE	Power industry	ENE.NUC	Public electricity and heat production	1A1a	1.A.1.a.i
ENE	Power industry	ENE.PEL	Public Electricity Generation	1A1a1	1.A.1.a.i
ENE	Power industry	ENE.POW	Public Electricity Generation (own use)	1A1a4	1.A.1.a.i
ENE	Power industry	ENE.PUM	Public electricity and heat production	1A1a	1.A.1.a.i
ENE	Power industry	ENE.PUM	Public Electricity Generation	1A1a1	1.A.1.a.i
ENF	Enteric fermentation	ENF.BFL	Buffalo	4A2	3.A.1.b
ENF	Enteric fermentation	ENF.CML	Camels and Lamas	4A5	3.A.1.e
ENF	Enteric fermentation	ENF.CTT	Dairy cattle	4A1-d	3.A.1.a.ii
ENF	Enteric fermentation	ENF.CTT	Non-dairy cattle	4A1-n	3.A.1.a.ii
ENF	Enteric fermentation	ENF.GTS	Goats	4A4	3.A.1.d
ENF	Enteric fermentation	ENF.HRS	Horses	4A6	3.A.1.f
ENF	Enteric fermentation	ENF.PGS	Swine	4A8	3.A.1.h
ENF	Enteric fermentation	ENF.SHP	Sheep	4A3	3.A.1.c
ENF	Enteric fermentation	ENF.SSS	Mules and asses	4A7	3.A.1.g
FFF	Fossil fuel fires	FFF.COA	Coal fires (underground)	7A1	5.B
FFF	Fossil fuel fires	FFF.GSF	Gas fires	7A3	5.B
FFF	Fossil fuel fires	FFF.OIL	Oil fires (Kuwait)	7A2	5.B
FOO	Production of foods	FOO.BRD	Food and drink production	2D2	2.H.2
FOO	Production of foods	FOO.BRP	Food and drink production	2D2	2.H.2

FOO	Production of foods	FOO.OTH	Food and drink production	2D2	2.H.2
FOO	Production of foods	FOO.WIN	Food and drink production	2D2	2.H.2
IDE	Indirect emissions	IDE.NH3	Indirect N2O from NH3 emitted in cat. 1A	7C1	5.A
IDE	Indirect emissions	IDE.NH3	Indirect N2O from NH3 emitted in cat. 2-3	7C2	5.A
IDE	Indirect emissions	IDE.NOX	Indirect N2O from NOx emitted in cat. 1A	7B1	5.A
IDE	Indirect emissions	IDE.NOX	Indirect N2O from NOx emitted in cat. 2-3	7B2	5.A
IND	Manufacturing industry	IND.CHE	Chemicals	1A2c	1.A.2.c
IND	Manufacturing industry	IND.CON	Other industries (stationary)	1A2f	1.A.2.k
IND	Manufacturing industry	IND.FOO	Food and tobacco	1A2e	1.A.2.e
IND	Manufacturing industry	IND.INO	Other industries (stationary)	1A2f	1.A.2.m
IND	Manufacturing industry	IND.IRO	Iron and steel	1A2a	1.A.2.a
IND	Manufacturing industry	IND.MAC	Other industrial machinary (stationary)	1A2f	1.A.2.h
IND	Manufacturing industry	IND.MIN	Off-road machinery: mining (diesel)	1A2f2	1.A.2.i
IND	Manufacturing industry	IND.NFE	Non-ferrous metals	1A2b	1.A.2.b
IND	Manufacturing industry	IND.NMM	Other mineral industries (stationary)	1A2f	1.A.2.f
IND	Manufacturing industry	IND.PAP	Pulp and paper	1A2d	1.A.2.d
IND	Manufacturing industry	IND.TEQ	Other techn. equip. industries (stationary)	1A2f	1.A.2.g
IND	Manufacturing industry	IND.TEX	Other textile industries (stationary)	1A2f	1.A.2.l
IND	Manufacturing industry	IND.WOO	Other wood industries (stationary)	1A2f	1.A.2.j
IRO	Production of iron and steel	IRO.CSP	Crude steel production total	2C1a	2.C.1
IRO	Production of iron and steel	IRO.FEA	Ferroy Alloy production	2C2	2.C.2
IRO	Production of iron and steel	IRO.PIG	Pig iron production	2C1c	2.C.1
IRO	Production of iron and steel	IRO.PLT	Pellet production	2C1e	2.C.1
IRO	Production of iron and steel	IRO.SNT	Sinter production	2C1d	2.C.1
IRO	Production of iron and steel	IRO.STC	Steel casting	2C1f	2.C.1
MNM	Manure management	MNM.BFL	Manure Man.: Buffalo (confined)	4B2	3.A.2.b
MNM	Manure management	MNM.CHC	Manure Man.: Poultry (confined)	4B9	3.A.2.i
MNM	Manure management	MNM.CML	Manure Man.: Camels and llamas (confined)	4B5	3.A.2.e
MNM	Manure management	MNM.CTT	Manure Man.: Dairy Cattle (confined)	4B1-d	3.A.2.a.ii
MNM	Manure management	MNM.CTT	Manure Man.: Non-Dairy Cattle (confined)	4B1-n	3.A.2.a.ii
MNM	Manure management	MNM.DCK	Manure Man.: Poultry (confined)	4B9	3.A.2.i
MNM	Manure management	MNM.GES	Manure Man.: Goats (confined)	4B4	3.A.2.i
MNM	Manure management	MNM.GTS	Manure Man.: Goats (confined)	4B4	3.A.2.d
MNM	Manure management	MNM.HRS	Manure Man.: Horses (confined)	4B6	3.A.2.f
MNM	Manure management	MNM.PGS	Manure Man.: Swine (confined)	4B8	3.A.2.h
MNM	Manure management	MNM.SHP	Manure Man.: Sheep (confined)	4B3	3.A.2.c
MNM	Manure management	MNM.SSS	Manure Man.: Mules and asses (confined)	4B7	3.A.2.g
MNM	Manure management	MNM.TRK	Manure Man.: Poultry (confined)	4B9	3.A.2.i
N2O	Indirect N2O emissions	N2O.AGR	Indirect N2O: Atm. Depos. - agricult. (4D)	4D3a	3.C.5
N2O	Indirect N2O emissions	N2O.IDR	Indirect N2O from agriculture	4D3	3.C.6

N2O	Indirect N2O emissions	N2O.IDR	Indirect N2O: Leaching and Run-Off - agri.	4D3b	3.C.6
N2O	Indirect N2O emissions	N2O.OTH	Indirect N2O from agriculture	4D3	3.C.5
NEU	Non energy use of fuels	NEU.FEE, IND, TRA	Non-energy use of lubricants/waxes (CO2)	2G1	2.D.2
NEU	Non energy use of fuels	NEU.OTH	Other Non-energy use of fuels (CO2 only)	2G2	2.D.2
NFE	Prod. of non-ferrous metals	NFE.ALP	Aluminium production (primary)	2C3a	2.C.3
NFE	Prod. of non-ferrous metals	NFE.ALP	Aluminium production (secondary)	2C3b	2.C.3
NFE	Prod. of non-ferrous metals	NFE.ALP	Aluminium foundries: SF6 use	2C4b	2.C.3
NFE	Prod. of non-ferrous metals	NFE.AUP	Gold production	2C5au	2.C.7
NFE	Prod. of non-ferrous metals	NFE.CUP	Copper production (primary)	2C5cp	2.C.7
NFE	Prod. of non-ferrous metals	NFE.CUP	Copper production (secondary)	2C5cs	2.C.7
NFE	Prod. of non-ferrous metals	NFE.HGP	Mercury production	2C5hg	2.C.7
NFE	Prod. of non-ferrous metals	NFE.MGP	Magnesium foundries: SF6 use	2C4a	2.C.4
NFE	Prod. of non-ferrous metals	NFE.MGP	Magnesium production (primary)	2C5mp	2.C.4
NFE	Prod. of non-ferrous metals	NFE.MGP	Magnesium production (secondary)	2C5ms	2.C.4
NFE	Prod. of non-ferrous metals	NFE.OTH	Other non-ferrous production total	2C5	2.C.7
NFE	Prod. of non-ferrous metals	NFE.OTH	Mercury production	2C5hg	2.C.7
NFE	Prod. of non-ferrous metals	NFE.OTH	Molybdenum production	2C5mo	2.C.7
NFE	Prod. of non-ferrous metals	NFE.PBP	Lead production (primary)	2C5lp	2.C.5
NFE	Prod. of non-ferrous metals	NFE.PBP	Lead production (secondary)	2C5ls	2.C.5
NFE	Prod. of non-ferrous metals	NFE.ZNP	Zinc production (primary)	2C5zp	2.C.6
NFE	Prod. of non-ferrous metals	NFE.ZNP	Zinc production (secondary)	2C5zs	2.C.6
NMM	Prod. non-metallic minerals	NMM.BRK	Other uses of carbonate	2A7b	2.A.4.a
NMM	Prod. non-metallic minerals	NMM.CMN	Cement production	2A1	2.A.1
NMM	Prod. non-metallic minerals	NMM.CRB	Other uses of carbonate	2A7b	2.A.4.a
NMM	Prod. non-metallic minerals	NMM.GLS	Glass production	2A7a	2.A.3
NMM	Prod. non-metallic minerals	NMM.GPB	Other uses of carbonate	2A7b	2.A.3
NMM	Prod. non-metallic minerals	NMM.LMN	Lime production	2A2	2.A.2
NMM	Prod. non-metallic minerals	NMM.LMU	Limestone and Dolomite Use	2A3	2.A.4.d
NMM	Prod. non-metallic minerals	NMM.OTH	Other minerals production	2A7	2.A.5
NMM	Prod. non-metallic minerals	NMM.SDS	Soda ash production	2A4a	2.A.4.b
NMM	Prod. non-metallic minerals	NMM.SDS	Soda ash use	2A4b	2.A.4.b
PAP	Production of pulp and paper	PAP.PLP	Pulp and paper production	2D1	2.H.1
PAP	Production of pulp and paper	PAP.PPR	Pulp and paper production	2D1	2.H.1
PRO	Fuel production/transmission	PRO.BRC	Brown coal mining	1B1a3	1.B.1.a
PRO	Fuel production/transmission	PRO.GAS.NGS	Gas production	1B2b1	1.B.2.b.ii
PRO	Fuel production/transmission	PRO.GAS.PIP	Gas transmission	1B2b3	1.B.2.b.ii
PRO	Fuel production/transmission	PRO.GAS.DIS	Gas distribution	1B2b4	1.B.2.b.ii
PRO	Fuel production/transmission	PRO.HDC	Hard coal mining (gross)	1B1a1	1.B.1.a
PRO	Fuel production/transmission	PRO.HDC	Methane recovery from coal mining	1B1a1r	1.B.1.a
PRO	Fuel production/transmission	PRO.HDC	Abandoned mines	1B1a2	1.B.1.a
PRO	Fuel production/transmission	PRO.OIL	Fugitive emissions from oil and gas	1B2	1.B.2.a.ii
PRO	Fuel production/transmission	PRO.OIL.OPR	Oil production	1B2a1	1.B.2.a.ii
PRO	Fuel production/transmission	PRO.OIL.PIP	Oil transmission	1B2a2	1.B.2.a.ii

PRO	Fuel production/transmission	PRO.OIL.TK1	Tanker loading	1B2a3-l	1.B.2.a.ii
PRO	Fuel production/transmission	PRO.OIL.TK2	Tanker oil transport (crude and NGL)	1B2a4-l	1.B.2.a.ii
PRO	Fuel production/transmission	PRO.OIL.TRK	Transport by oil trucks	1B2a4-t	1.B.2.a.ii
PRO	Fuel production/transmission	PRO.OIL.VAF	Venting and flaring during oil and gas production	1B2c	1.B.2.a.ii
PRO	Fuel production/transmission	PRO.PEA	Peat mining	1B1a4	1.B.1.a
PRU	Production, use of products	PRU.N2O	Use of N2O as anaesthesia	3D1	2.G.3.b
PRU	Production, use of products	PRU.N2O	Use of N2O in aerosol spray cans	3D3	2.G.3.b
PRU	Production, use of products	PRU.OTH	Use of other non-specified products	3D5	2.G.3.c
RCO	Residential	RCO.AGR	Agriculture and forestry (incl.off-road)	1A4c1	1.A.4.c.i
RCO	Residential	RCO.COM	Commercial and public services	1A4a	1.A.4.a
RCO	Residential	RCO.FSH	Fishing	1A4c3	1.A.4.c.iii
RCO	Residential	RCO.OTH	Non-specified other	1A4d	1.A.5.b.ii
RCO	Residential	RCO.RES	Residential	1A4b	1.A.4.b
REF	Oil refineries	REF.CMB	Refineries: combustion	1A1b	1.A.1.b
REF	Oil refineries	REF.EVA	Oil refineries (evaporation)	1B2a5(e)	1.B.2.a.iii.4
REF	Oil refineries	REF.INP, OUT	Oil refineries (carbon losses)	1B2a5(c)	1.B.2.a.iii.4
SOL	Application of solvents	SOL.CHI	Chemical products	3C	2.D.3
SOL	Application of solvents	SOL.DRC	Degreasing and dry cleaning	3B	2.D.3
SOL	Application of solvents	SOL.GLA	Other product use (glue & additives)	3D	2.D.3
SOL	Application of solvents	SOL.GRA	Other product use (Graphic arts)	3D	2.D.3
SOL	Application of solvents	SOL.HHP	Other product use	3D	2.D.3
SOL	Application of solvents	SOL.IDG	Degreasing and dry cleaning	3B	2.D.3
SOL	Application of solvents	SOL.LTH	Other product use (leather)	3D	2.D.3
SOL	Application of solvents	SOL.OTH	Other product use	3D	2.D.3
SOL	Application of solvents	SOL.PAI	Solvents in paint	3A	2.D.3
SOL	Application of solvents	SOL.PST	Chemical products (pesticides)	3C	2.D.3
SOL	Application of solvents	SOL.RBP	Chemical products (rubber)	3C	2.D.3
SOL	Application of solvents	SOL.VGO	Other product use (vegetal oil)	3D	2.D.3
SWD	Solid waste disposal	SWD.COM	Other waste	6D	4.B
SWD	Solid waste disposal	SWD.INC.MSW	Waste incineration - uncontrolled MSW burning	6Cb1	4.C.1
SWD	Solid waste disposal	SWD.INC.HOS, SEW, ISW	Waste incineration - non biogenic	6Cb2	4.C.1
SWD	Solid waste disposal	SWD.LDF	Managed waste disposal on land	6A1	4.A.1
SWD	Solid waste disposal	SWD.OTH.HAZ	Waste incineration - hazardous	6C	4.C.1
SWD	Solid waste disposal	SWD.OTH	Other waste	6D	4.C.1
TNR	Non-road transport	TNR.DAT	Domestic air transport	1A3a	1.A.3.a.ii
TNR	Non-road transport	TNR.IAT	International air transport	1C1	1.A.3.a.i
TNR	Non-road transport	TNR.ILW	Inland shipping	1A3d	1.A.3.d.ii
TNR	Non-road transport	TNR.OTH	Non-road transport	1A3e	1.A.3.e.ii
TNR	Non-road transport	TNR.PIP	Non-road transport	1A3e	1.A.3.e.i
TNR	Non-road transport	TNR.RAI	Non-road transport (rail, etc.)	1A3c	1.A.3.c
TNR	Non-road transport	TNR.SEA	International marine transport (bunkers)	1C2	1.A.3.d.i
TRF	Transformation industry	TRF.EBF	Blast furnaces (pig iron prod.)	1A1c2	1.A.1.c.ii

TRF	Transformation industry	TRF.EBK	Other transformation sector (BKB, etc.)	1A1c5	1.A.1.c.ii
TRF	Transformation industry	TRF.EBO	Other transformation sector (BKB, etc.)	1A1c5	1.A.1.c.ii
TRF	Transformation industry	TRF.ECH	Fuel comb. charcoal production	1A1c4	1.A.1.c.ii
TRF	Transformation industry	TRF.ECK	Fuel combustion coke ovens	1A1c1	1.A.1.c.i
TRF	Transformation industry	TRF.EGW	Gas works	1A1c3	1.A.1.c.ii
TRF	Transformation industry	TRF.ELN, ELQ, ENO, EOG, EPA	Other transformation sector (BKB, etc.)	1A1c5	1.A.1.c.ii
TRF	Transformation industry	TRF.EMI	Off-road machinery: mining (diesel)	1A5b1	1.A.5.b.iii
TRF	Transformation industry	TRF.TBN, TBO, TCE, TGL, TLN, TLS, TNO, TPE	Fuel transformation of gaseous fuels (GTL, Blend, (re-)gasif./Liquef.)	1B2b5	1.B.2.b.iii
TRF	Transformation industry	TRF.TBF	Blast furnaces	2C1b	1.B.1.c
TRF	Transformation industry	TRF.TBK, TLQ, TPA	Fuel transformation of solid fuels (BKB Plants, coal liquefaction, patent fuel plants)	1B1b4	1.B.1.c
TRF	Transformation industry	TRF.TCH	Fugitive emissions from solid fuels	1B1	1.B.1.c
TRF	Transformation industry	TRF.TCK	Fuel transformation coke ovens	1B1b1	1.B.1.c
TRF	Transformation industry	TRF.TGW	Fuel transformation in gas works	1B1b2	1.B.2
TRO	Road transport	TRO.EVP	Road transport (evaporation)	1A3b	1.A.3.b
TRO	Road transport	TRO.ROA	Road transport (mobile combustion)	1A3b	1.A.3.b
WWT	Waste water	WWT.DOM	Domestic and commercial wastewater	6B2	4.D.1
WWT	Waste water	WWT.IND	Industrial wastewater	6B1	4.D.2

3   EDGARv4 temporal and spatial distribution

A key proxy dataset is the gridded world population provided by the Center for International Earth Science Information Network (CIESIN, 2005 and updated in 2011) for the years 1990, 1995, 2000, 2005, 2010 and projected to 2015. In-house proxy datasets are developed by dividing the total population into rural and urban. These data are applied in order to cover the country area and population and take into account the fraction of country data in cells with an intersection of the country's borders.

For the agricultural emission sources with diffuse areal distribution, agricultural land use and soil type maps, such as grassland and cropland cover datasets, rice cultivation area and animal density maps from FAO Geonetwork (2011, 2014) and Monfreda et al. (2008) are used. Coastal fishing activities are distributed on the artisanal fishing map of Halpern et al. (2015).

Industrial activities (power plants, oil refineries, mines) are mainly located at the plant location coordinates on the point source grid-maps. Power plant emissions have been distributed according to the CARMAv3.0 (2012) point source distribution making use of the CARMAv3.0 intensity parameter and differentiating three fuel types (coal, gas and oil). CARMA's point sources with low intensity are used to allocate emissions from auto-producing power or heat plants. A specific proxy was developed for the non-metallic minerals production (mainly cement and lime) for the world leading producers of cement (i.e. Brasil, USA, China and India) based on the plant locations and annual throughput of the facility listed by the CEC (2015) for China, Canada and Mexico, EPRTR (2012) v4.2 for Europe and USGS (2016) and IndustryAbout.com (2016) for the rest of the world.

Because of the incompleteness of the list of cement factories (in particular also those with smaller throughput), the country total is not fully distributed over the single reported point sources. Instead annual emission estimates per facility were applied. The difference between the total of the facility emissions and the country total of the given sector is distributed using urban population data. Gas flaring activities are distributed on NOAA's night-time light data (Elvidge et al., 2009) for those areas of Central America, Nigeria and Western Africa, the North Sea region, Middle East and Russia with strong gas flaring activities. For the major coal producers (i.e., China, USA and Southern Africa) the coordinates of coal mines from the World Coal Association (2016) are used to distribute emissions from underground and surface coal mines, also distinguishing between hard and brown coal. Coal mine locations for China have been updated and extended with the data of Liu et al. (2015).

Line sources are exclusively used to describe emissions from the transport sector. Different proxy data layers for three road types worldwide (highways, primary and secondary, residential and commercial roads) obtained from the OpenStreetMap of Geofabrik (2015) are used with different weighting factors for the emission distribution, depending on the type of vehicles circulating on the different types of roads. Similar data from OpenRailwayMap are used for railways. For inland waterways the maritime traffic lines (for ships and ferries) are composed from the navigable parts of rivers and lakes, using the InlandWaterwaysMap of the US Department of Transport US DoT (2015) for the USA, the UNECE Waterway network (2015) for Europe and the hydrology map of Lehner et al. (2011) for the rest of the world. Wang et al. (2008) is used for international shipping, updated for the Mediterranean, Black and Baltic Sea with Long Range Identification and Tracking data from the European Maritime Safety Agency, as described in Trombetti et al. (2017). The spatial proxy for the aviation sector is derived from International Civil Aviation Organization (ICAO, 2015) flight information and is specified at three different heights: takeoff/landing, climb-out/descending and cruise (see Fig. S1 in the Supplementary). ICAO (2015) specifies a typical flight pattern with landing/take-off cycle within few km of the airport, followed by climb-out/descending phase during the first 100 km and the last 100km of a flight and finally the remaining part from km 101 until the last 101 km as the cruise phase. Input data regarding airports and routes used in this approach are taken from Airline Route Mapper of ICAO (2015). Civil supersonic aviation using the Franco-British Concorde between 1976 and 2003 and the Russian Tupolev TU-144 between 1970 and 1983 are also included.

Each of the EDGAR human activities (at subsector level) is uniquely coupled to one temporal profile and one spatial distribution profile. The temporal profiles are given in Table S4a and the spatial profiles in Table S4b. These profiles have been collected, reviewed with our QA/QC procedure and refined over many years. The largest variation is found in the temporal profiles from Asman (1992) for the agricultural sector (Fig. S2a). A smaller modulation in emissions from residential heating is seen in the temporal profiles of Friedrich and Reis (2004), while the modulation of the power generation sector is from Veldt (1992), both updated by Thiruchitampalam (2012). For the monthly distribution of shipping emissions, the profile of Wang et al. (2008) is applied while aviation is distributed with the temporal profile of the AERO2K project of Eyers et al. (2004). Therefore the underlying source of information is given at our best knowledge with the reference in the tables which are a mix of data sources with hyperlinks and literature references.

Table S4a – List of temporal profiles to which the human activities are allocated in EDGARv4.3.2 for monthly distribution. The data source provides the literature reference, in which these underlying proxies are described.

Geographical zone	Sector	Subsector	temporal profile	Data source
Northern temperate zone	energy	Power industry	based on LOTOS	Veldt (1992), Builtjes (1992)
	Waste	solid waste and waste water	Constant	
	fuel production & use	Mining	Constant	
		non-energy use of fuels	Constant	
		Refineries	Constant	
	process industry	Metal	Constant	
		Chemical	Constant	
		manufacturing and other	Constant	
	Solvents	production & application	German data for paint, ink, glue of 90s	Friedrich (2000)
	Residential	gaseous fuel use	based on GENEMIS	Friedrich & Reis (2004)
		solid fuel use	based on GENEMIS	Friedrich & Reis (2004)
	Transport	Ground	national data of the Netherlands, UK and USA	Friedrich (2000)
		Shipping	Inland and international	Wang et al. (2008)
		domestic & int. Aviation	AERO2K	Eyers et al. (2004)
	Agriculture	agricultural soils	based on agricultural model	Asman (1992)
		agricultural waste burning	based on agricultural model	Asman (1992)
		enteric fermentation	based on agricultural model	Asman (1992)
		manure management	based on agricultural model	Asman (1992)
Equator	all		Constant	
	transport	Ground	national data of the Netherlands, UK and USA	Friedrich (2000)
		Shipping	Inland and international	Wang et al. (2008)
		Aviation	AERO2K	Eyers et al. (2004)
Southern temperate zone	all	idem Northern temperate zone but shifted with 6 months		cfr. references above

Table S4b – List of spatial proxy data that are in EDGARv4.3.2 applied to spatially distribute the national totals. The reference provides either the literature reference or the hyperlink where these underlying data can be found. All these spatial proxy datasets are modified to fit within the gridding algorithm of EDGARv4.3.2 and often combine different sources when no global coverage was obtained with the proxy data.

EDGAR sector	Sector description	Gridmaps	Reference
AGS	**Agricultural soils**	Animals: buffaloes, cattles, chickens, ducks, goats, pigs, poultry, sheeps	livestock: http://livestock.geo-wiki.org/ buffaloes: http://www.fao.org/AG/AGAInfo/resources/en/glw/GLW_dens.html
		Crops: barley, beans, broad bean, cassava, chick peas, cow peas, pasture, lentils, maize, millet, oats, other cereals, other pulses, other roots tubers, peas, potatoes, rice, rye, sorghum, soy bean, sugar beet, sugarcane, sweet potatoes, wheat, yams	Ramankutty, N., A.T. Evan, C. Monfreda, and J.A. Foley (2008), Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. Global Biogeochemical Cycles 22, GB1003, doi:10.1029/2007GB002952.
		Histosols	FAO Geonetwork, 2007
		Grassland	Global Land Cover map JRC (2000)
AWB	**Agricultural waste burning**	Crops: barley, beans, broad bean, cassava, chick peas, cow peas, pasture, lentils, maize, millet, oats, other cereals, other pulses, other roots tubers, peas, potatoes, rice, rye, sorghum, soy bean, sugar beet, sugarcane, sweet potatoes, wheat, yams	Ramankutty, N., A.T. Evan, C. Monfreda, and J.A. Foley (2008), Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. Global Biogeochemical Cycles 22, GB1003, doi:10.1029/2007GB002952.
		Grassland	Global Land Cover map JRC (2000)
CHE	**Production of chemicals**	adipic acid, ammonia, caprolactam, glyoxal, nitric acid, sulfuric acid	In-house EDGAR proxy
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
ENE	**Power industry**	Power plants: auto-producers, coal, gas, oil	CARMA v3.0 (http://carma.org/) and local data for China
ENF	**Enteric fermentation**	Animals: buffaloes, cattles, goats, pigs, sheeps	livestock: http://livestock.geo-wiki.org/ buffaloes: http://www.fao.org/AG/AGAInfo/resources/en/glw/GLW_dens.html
		Grassland	Global Land Cover map JRC (2000)
FOO	**Production of foods**	Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
FFF	**Fossil Fuel Fires**	coal fires	In-house EDGAR proxy
		gas flaring	In-house EDGAR proxy based on https://www.ngdc.noaa.gov/eog/viirs.html
IND	**Combustion for manufacturing industry**	Cement	In-house EDGAR proxy based on USGS (http://mrdata.usgs.gov/mineral-operations/) and EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)

		Chemical	In-house EDGAR proxy
		Mining	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		Paper	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		Steel	In-house EDGAR proxy
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
IRO	**Iron and steel production**	Blast furnace, Basic oxygen furnace, Open hearth furnace, Crude steel,Electric furnace, Sinter, Steel	In-house EDGAR proxy
MNM	**Manure management**	Animals: buffaloes, cattles, chickens, ducks, goats, pigs, poultry, sheeps	livestock: http://livestock.geo-wiki.org/ buffaloes: http://www.fao.org/AG/AGAInfo/resources/en/glw/GLW_dens.html
		Grassland	Global Land Cover map JRC (2000)
NEU	**Non energy use of fuels**	Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
NFE	**Non-ferrous metals production**	Aluminum production (primary and secondary)	In-house EDGAR proxy
		Copper production (primary and secondary)	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		Magnesium production (primary and secondary)	In-house EDGAR proxy
		Lead production (primary and secondary)	In-house EDGAR proxy
		Zinc production (primary and secondary)	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
NMM	**Non-metallic minerals production**	Cement	In-house EDGAR proxy based on USGS (http://mrdata.usgs.gov/mineral-operations/) and EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		Lime	In-house EDGAR proxy based on USGS (http://mrdata.usgs.gov/mineral-operations/) and EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
PAP	**Production of pulp and paper**	Paper	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)

		Coal mining: brown and hard coal	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and USGS (https://www.usgs.gov/) and Global Energy Observatory (http://globalenergyobservatory.org/)
PRO	**Fuel exploitation**	gas flaring	In-house EDGAR proxy based on https://www.ngdc.noaa.gov/eog/viirs.html
		Gas pipelines transmission	In-house EDGAR proxy
		oil pipelines	In-house EDGAR proxy
		oil terminals	In-house EDGAR proxy based on World Port Index (PUB 150) (http://msi.nga.mil/MSISiteContent/StaticFiles/NAV_PUBS/WPI/Pub150bk.pdf)
		shipping tankers	In-house EDGAR proxy based on LRIT and Wang et al. (2007)
		Population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
		Roads: commercial heavy duty, residential	In-house EDGAR proxy based on OpenStreetMap
PRU	**Production and use of other products**	Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
RCO	**Energy for buildings**	Fishing	In-house EDGAR proxy based on KNB (Benjamin Halpern, Melanie Frazier, John Potapenko, Kenneth Casey, Kellee Koenig, et al. 2015. Cumulative human impacts: raw stressor data (2008 and 2013). KNB Data Repository. doi:10.5063/F1S180FS.) https://knb.ecoinformatics.org/#view/raw_2013_inorganic_mol_20150714095441
		Rural population, urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
REF_TRF	**Oil refineries and Transformation industry**	Coke	In-house EDGAR proxy
		gas flaring	In-house EDGAR proxy based on https://www.ngdc.noaa.gov/eog/viirs.html
		Iron Blast furnace	In-house EDGAR proxy
		Mining	In-house EDGAR proxy based on USGS (https://mrdata.usgs.gov/mrds/)
		oil refinerie	In-house EDGAR proxy
		oil terminals	In-house EDGAR proxy based on World Port Index (PUB 150) (http://msi.nga.mil/MSISiteContent/StaticFiles/NAV_PUBS/WPI/Pub150bk.pdf)
		Residential Roads	In-house EDGAR proxy based on OpenStreetMap

		Urban population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
SOL	**Application of solvents**	Urban population, rural population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/
SWD_ INC	**Solid waste incineration**	Solid waste incineration	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu)
SWD_ LDF	**Solid waste landfills**	Solid waste landfills	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
TNR_ Aviation _CDS	**Aviation climbing&descent**	domestic aviation climb-out/descending, international aviation climb-out/descending	In-house EDGAR proxy based on Airline Route Mapper (http://arm.64hosts.com/)
TNR_ Aviation _CRS	**Aviation cruise**	domestic aviation cruise, international aviation cruise	In-house EDGAR proxy based on Airline Route Mapper (http://arm.64hosts.com/)
TNR_ Aviation _LTO	**Aviation landing&take off**	domestic aviation takeoff landing, international aviation takeoff landing	In-house EDGAR proxy based on Airline Route Mapper (http://arm.64hosts.com/)
TNR_ Aviation _SPS	**Aviation supersonic**	supersonic aviation	In-house EDGAR proxy
TNR_ Other	**Railways, pipelines, off-road transport**	Residential Roads	In-house EDGAR proxy based on OpenStreetMap
		Railways	In-house EDGAR proxy
TNR_ Ship	**Shipping**	Shipping: cargo, passengers, tankers	In-house EDGAR proxy based on LRIT and Wang et al. (2007)
		inland waterways	In-house EDGAR proxy
TRO	**Road transportation**	Roads: commercial heavy and light duty, residential	In-house EDGAR proxy based on OpenStreetMap
WWT	**Waste water handling**	Waste water treatment	In-house EDGAR proxy based on EPRTR (http://prtr.ec.europa.eu) and CEC (http://takingstock.cec.org/)
		Urban population, rural population	In-house EDGAR proxy based on http://sedac.ciesin.columbia.edu/

The distribution of the country totals for a given sector over the different grid cells of the country occurs, where needed, with technology-specific and timedependent proxy data f_{ij} (in formula (2)):

- For road transport, technology-dependence is highly important, to reflect the traffic of passenger cars but no heavy duty vehicles on residential roads, but both on highways. The OpenstreetMap has been downloaded for all parts of the globe with the 4 different types of roads. For each vehicle type in EDGARv4 (motorcycles, mopeds, passenger cars, light duty vehicles, heavy duty vehicles and busses) a proxy dataset is composed with the appropriate roads (max. 4 out of the 4) on which the given type of vehicles are mainly running. The proxy data does not vary over time, but the shares of the different vehicles do vary over time and as such a time variation is obtained in the road transport emissions distribution.

- For power plants, no technology-dependence is available in the proxy datasets, but fuel- and time-dependence, given by the CARMAv3.0 datasets (2004, 2007, future). After a standard QA/QC screening with gapfilling of missing (0,0) plant coordinates, correcting inverted (lon,lat) coordinates and adding some additional points for Russia, the proxy data were used for 2004 (covering the period up to 2005), for 2007 (covering the period 2006-2010) and for future (covering the period 2011-2012). With the given carbon-intensity, a differentiation between coal, oil and gas power plants could be made, so that the distribution of the power plant emissions can be done while keeping the fuel characteristics. The capacity is used to vary the strength of the point sources relatively within the same fuel category. For larger countries (e.g. USA) with a non-uniform distribution of coal power plants, this was considered a significant improvement. There is a high uncertainty inusing the capacity for the actual strength of the point source. However, plant information data is sensitive and the CARMAv3.0 provides the desired input for a global picture. In the future, satellite data might help to complete that picture, as illustrated by Nassar et al. (2017).

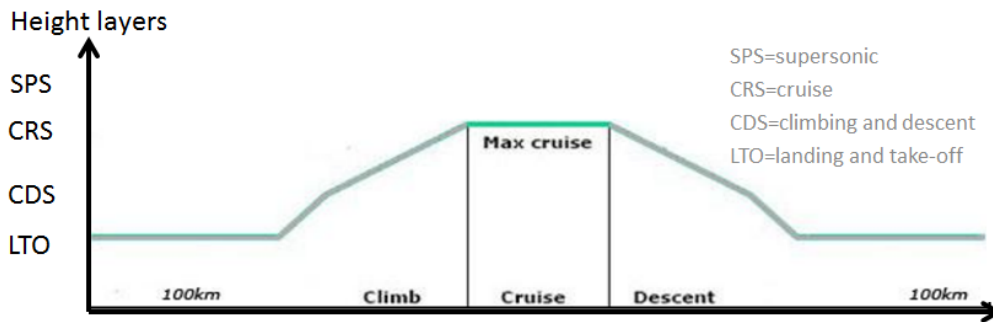



Figure S1 – EDGAR approach to distribute emissions from aviation over 4 different altitude ranges.

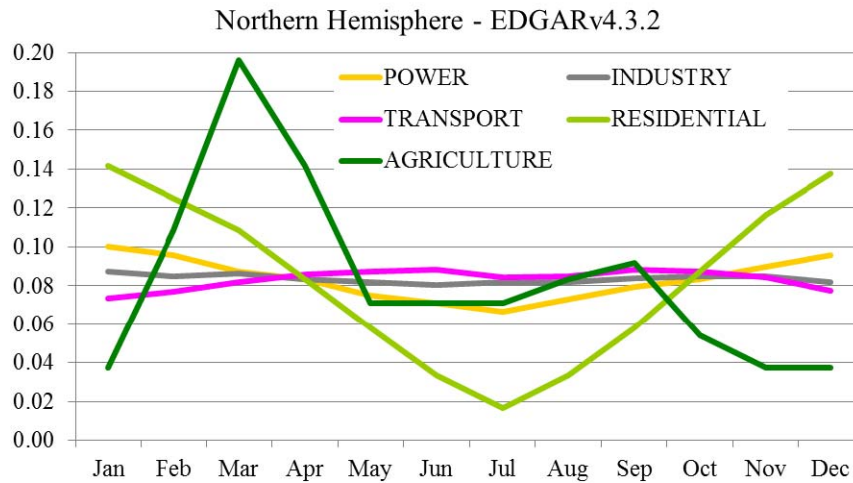



Figure S2 – a. Proxy data used in EDGARv4.3.2 to temporally distribute the annual emissions over 12 months.

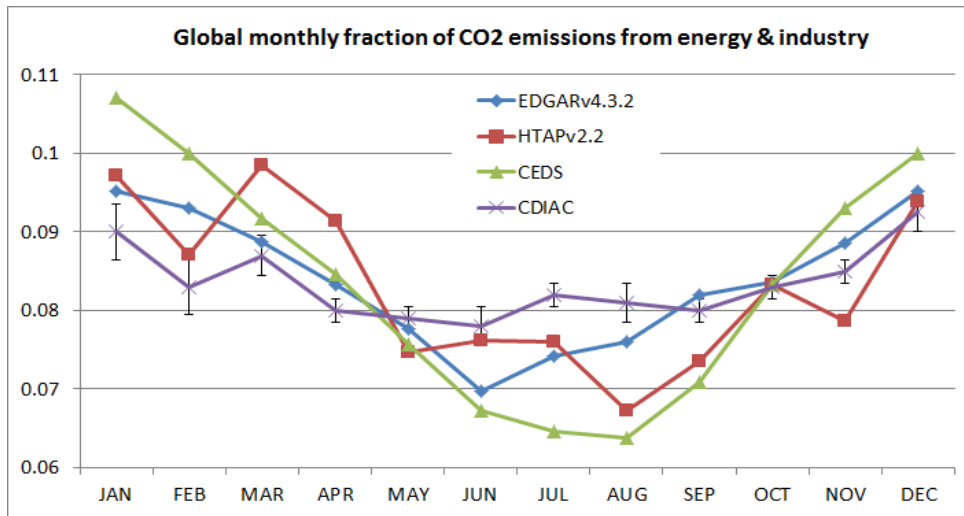



Fig. S2b: Comparison of the monthly fractions of CO2 emissions from energy and industry applied by EDGARv4.3.2, with those derived by Andres et al. (2011) for CDIAC, Hoesly et al. (2018) for CEDS and Janssens-Maenhout et al. (2015) for HTAPv2.2.

4 Comparison of EDGARv4.3.2 to previous versions v4.2 and v4.1

Compared to former versions of the EDGAR database (e.g. EDGARv4.2, http://edgar.jrc.ec.europa.eu/overview.php?v=42), some emission factors have been updated, mostly for CH4 on coal mining and N2O on agricultural soils. This explains the differences in the comparison of the different

10 EDGAR versions in Fig. S3.

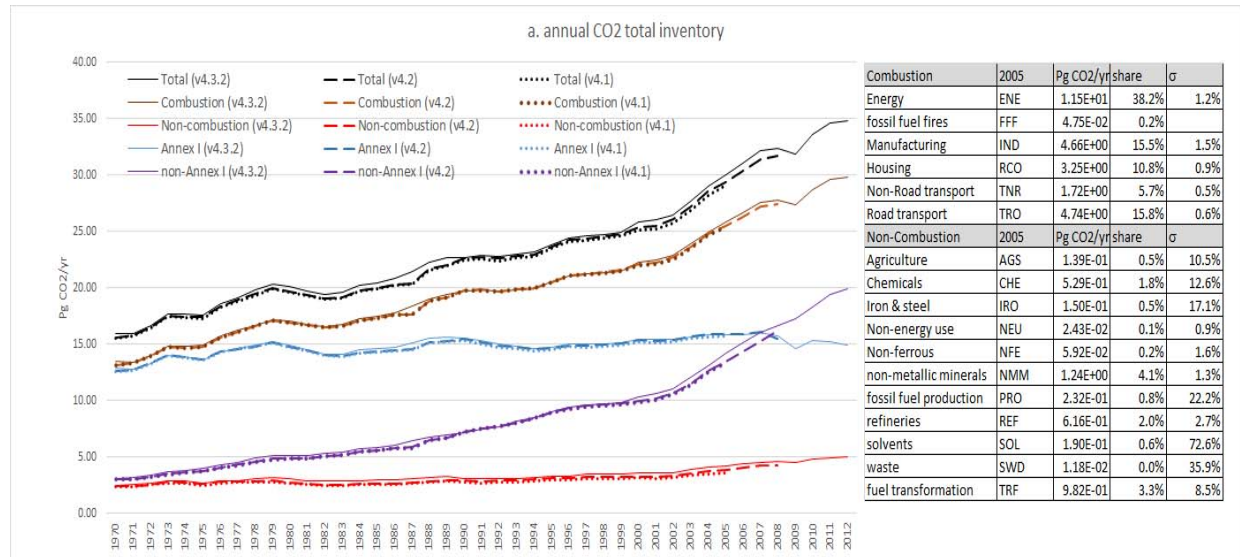
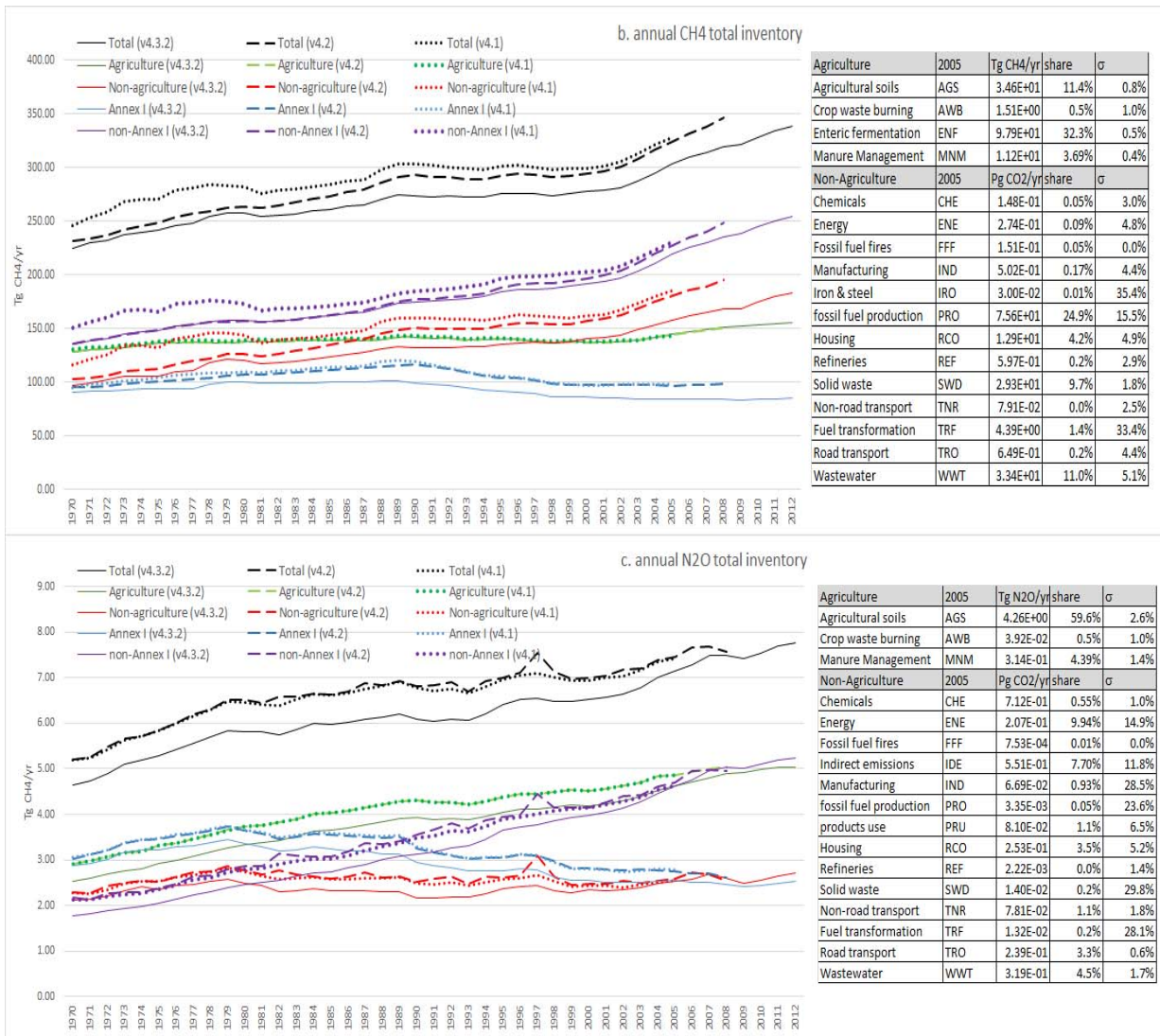



Figure S3: Comparison of v4.3.2 with previous EDGARversions (v4.2 and v4.1) for CO$_2$ (a), CH$_4$ (b) and N$_2$O (c)

The largest improvement of the gridmaps is due to the significant update of the proxy data (see Table S4) to localise better the non-diffusive emissions. The new proxy data provided in particular a better and more appropriate representation of the road transportation activity with the 4 types of road in v4.3.2 (versus the generic „roads x population" proxy in v4.2) for the transport by passenger cars. This allows to represent the volume traffice well, not only in Europe (as analysed by Thiruchitampalam, 2012) but also in the USA with sufficient weight the city connections (contrary to v4.2 as observed by Gately et al., 2017). The new proxy also works on a different road pattern for China and other developing regions, where road density and urban areas have a completely different pattern from the ones of industrialized countries. Also the power plants proxy from CARMA v3.0 yield a better and more appropriate representation of the power and heat generation activity, of which we did not only update the large power plant locations splitup by fuel type (coal, oil, gas) but we now included also the autoproducers and small scale electricity and heat production plants. In addition, the QA/QC procedures do not only check the completeness of the proxies but also the values over plant facilities.

5   Resulting trends for CO₂, CH₄ and N₂O per country group

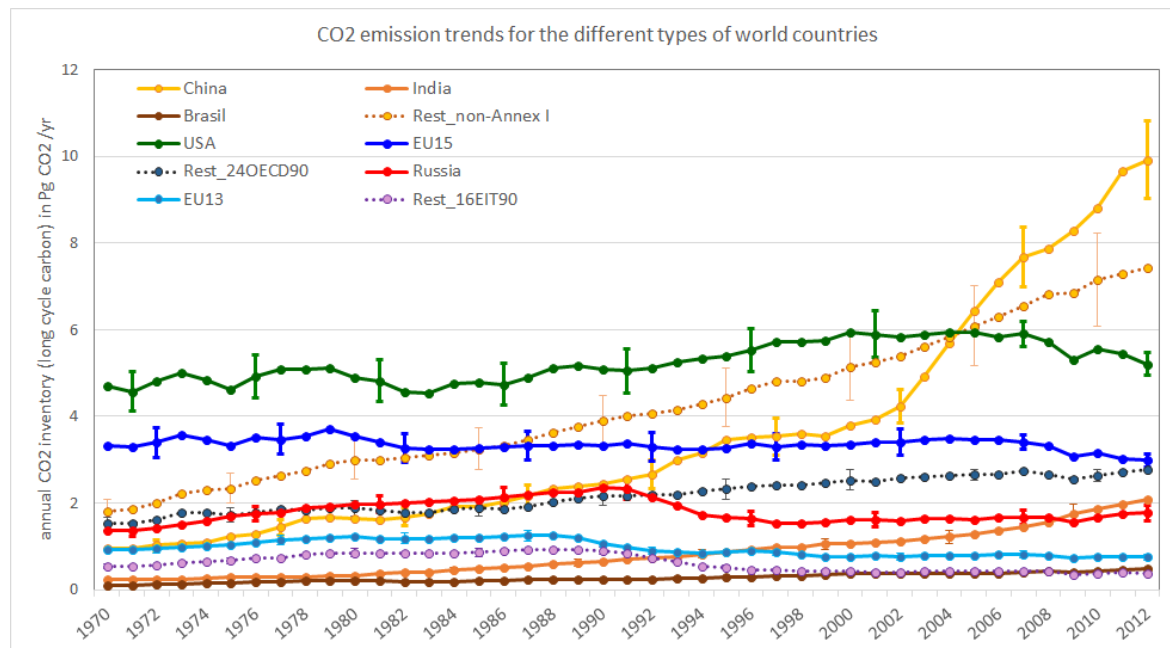
In addition to the GHG trends for the three major regions in Fig. 4, the figures S4a, S4b and S4c present the three

GHG separately for the same regions and countries: (i) non-Annex I countries with China, India, Brazil and Rest

of non-Annex I countries, (ii) 24OECD90 countries with USA, EU15 and the remaining 8 OECD countries of

5   1990, (iii) 16EIT90 countries with Russia, EU13 and the remaining 2 newly independent Eurasian states. While

Fig. S4a shows a similar trend as Fig. 4, this is not the case for Fig. S4b and S4c, where e.g. non-Annex I countries with

significant agricultural activities and relative large uncertainties are important.

10   **Figure S4a: Annual CO₂ time series 1970-2012 of EDGARv4.3.2 with periodic error bar indication for the different types of countries with top emitters: China, India, Brasil, USA, EU-15, EU13, Russia and the rest of the non-Annex I countries, the rest of the OECD countries and the rest of the Eurasian states.**

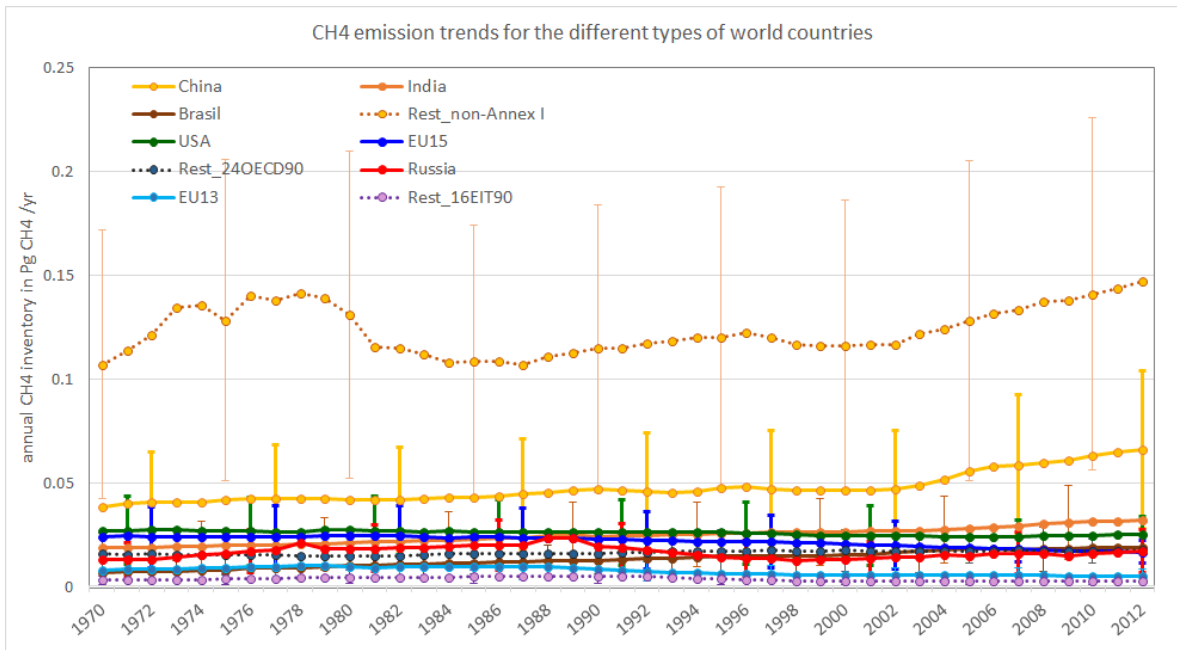



Figure S4b: Annual CH₄ time series 1970-2012 of EDGARv4.3.2 with periodic error bar indication for the different types of countries with top emitters: China, India, Brasil, USA, EU-15, EU13, Russia and the rest of the non-Annex I countries, the rest of the OECD countries and the rest of the Eurasian states.

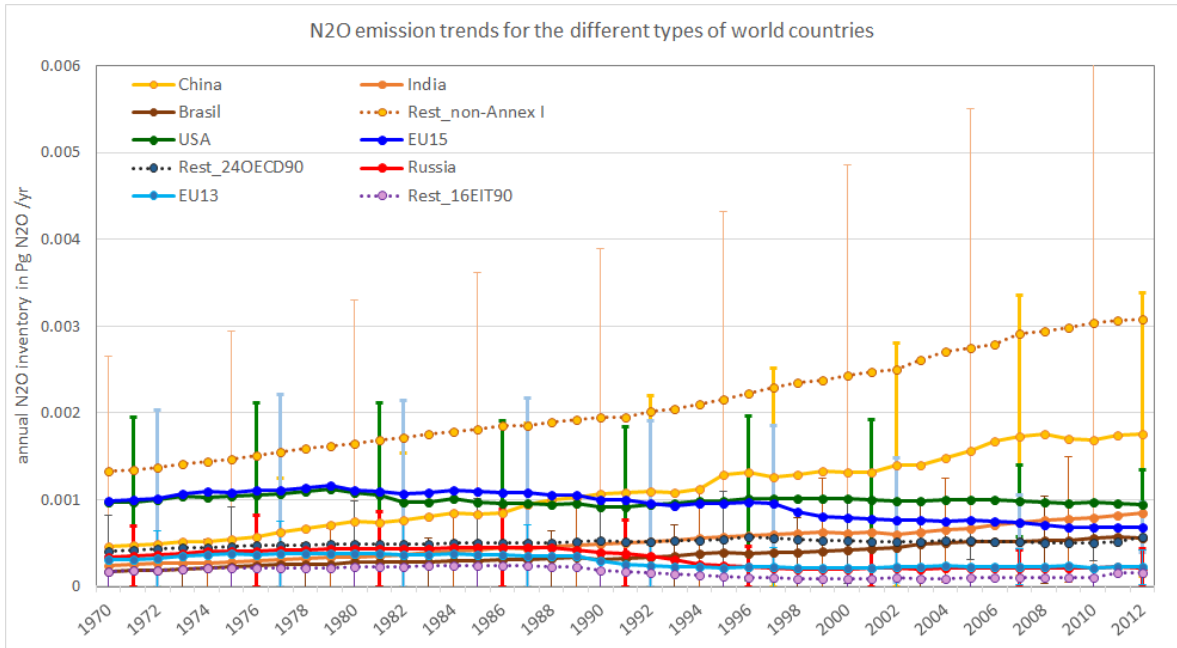



Figure S4c: Annual N₂O time series 1970-2012 of EDGARv4.3.2 with periodic error bar indication for the different types of countries with top emitters: China, India, Brasil, USA, EU-15, EU13, Russia and the rest of the non-Annex I countries, the rest of the OECD countries and the rest of the Eurasian states.

6   Resulting grid-maps of CO$_2$ - addition

The grid-maps of CO$_2$ presented in Fig. 9, 10 and 11 include both the short- and long-cycle carbon. For the buildings and road transport sector, it is interesting to look at the emissions difference for the long- and short-cycle carbon CO$_2$ separately. Figures S5a and S5b present the buildings sector for the long-cycle carbon CO$_2$ (from the combustion of fossil fuel) and respectively the short-cycle carbon CO$_2$ (from combustion of biofuel such as wood, wood waste, vegetal waste, dung, which are important for e.g. India). While the combustion of fossil fuel increased in Asia (India and China) considerably, the consumption of biofuel in the residential sector is partially decreasing, particularly in highly populated areas. Figures S5c and S5d present the transport sector for the long-cycle carbon CO$_2$ (mainly from combustion of diesel, petrol, gas) and the short-cycle carbon CO$_2$ respectively (from combustion of biodiesel and biogasoline). The trend of increasing fuel consumption for road transport is almost globally strongly present for the fossil fuel, while the biofuel consumption in road transport remains limited so far (except for Brasil).

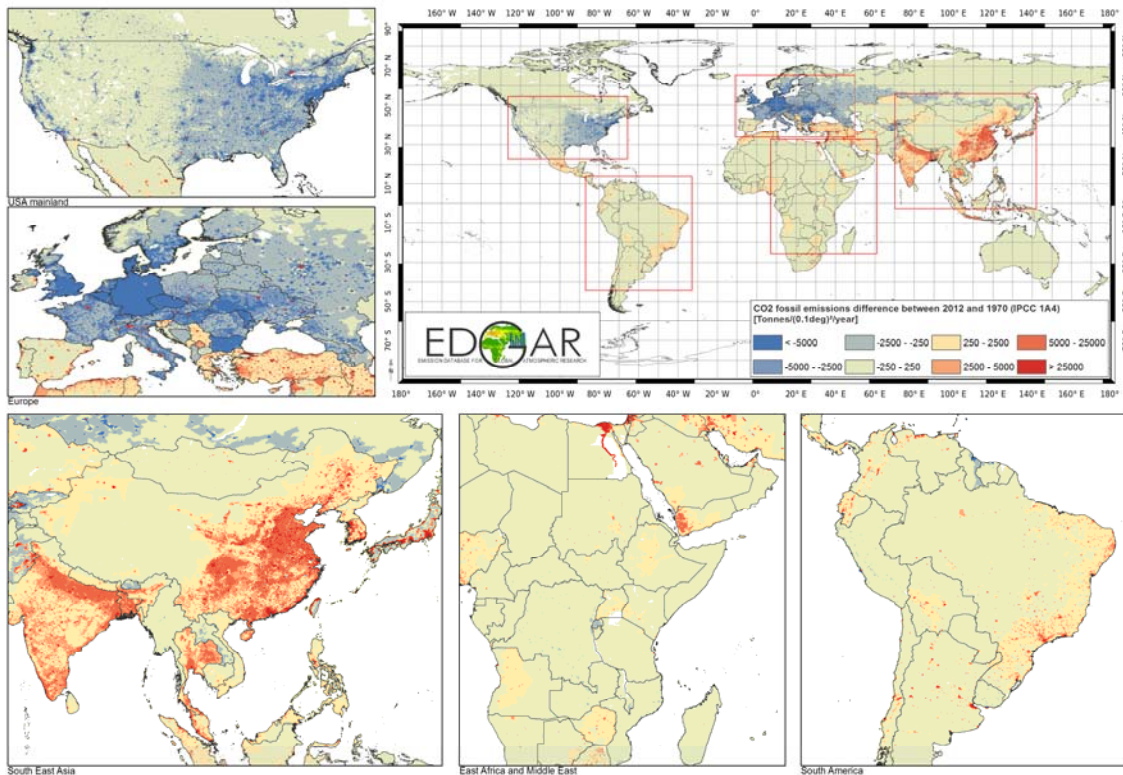



Figure S5a: Difference between 2012 and 1970 in long-cycle carbon CO$_2$ emissions from the buildings sector (combustion of fossil fuel for heating, cooling and equiping buildings, including also lighting and cooking).

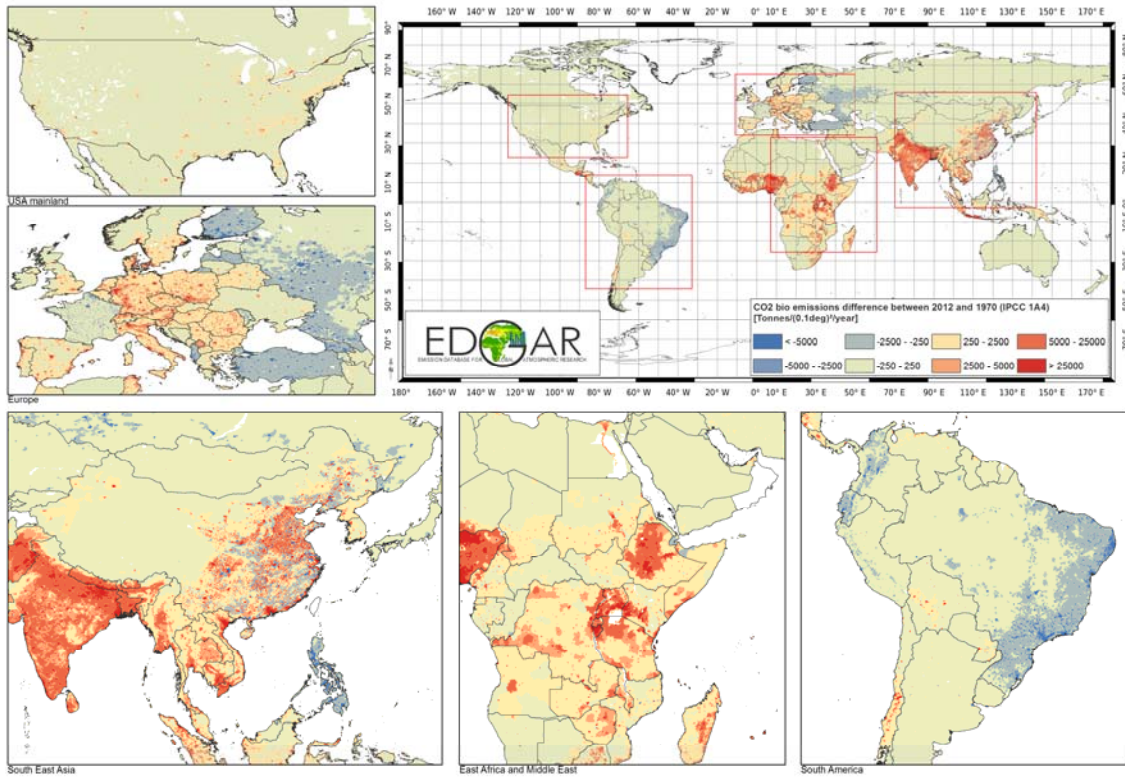



Figure S5b: Difference between 2012 and 1970 in short-cycle carbon CO₂ emissions from the buildings sector (combustion of biofuel, vegetal waste, wood waste, dung, wood for heating and cooking).

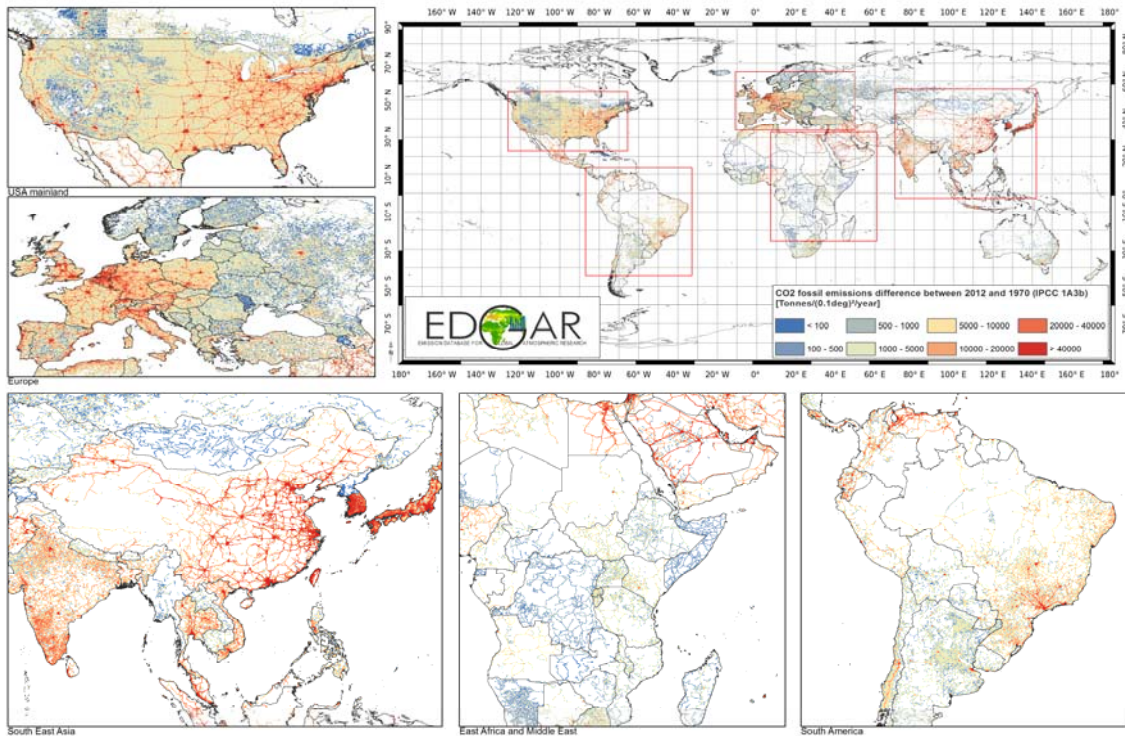



Figure S5c: Difference between 2012 and 1970 in long-cycle carbon CO₂ emissions from the transport sector (consumption of diesel, petrol, gas by vehicles for road transport).

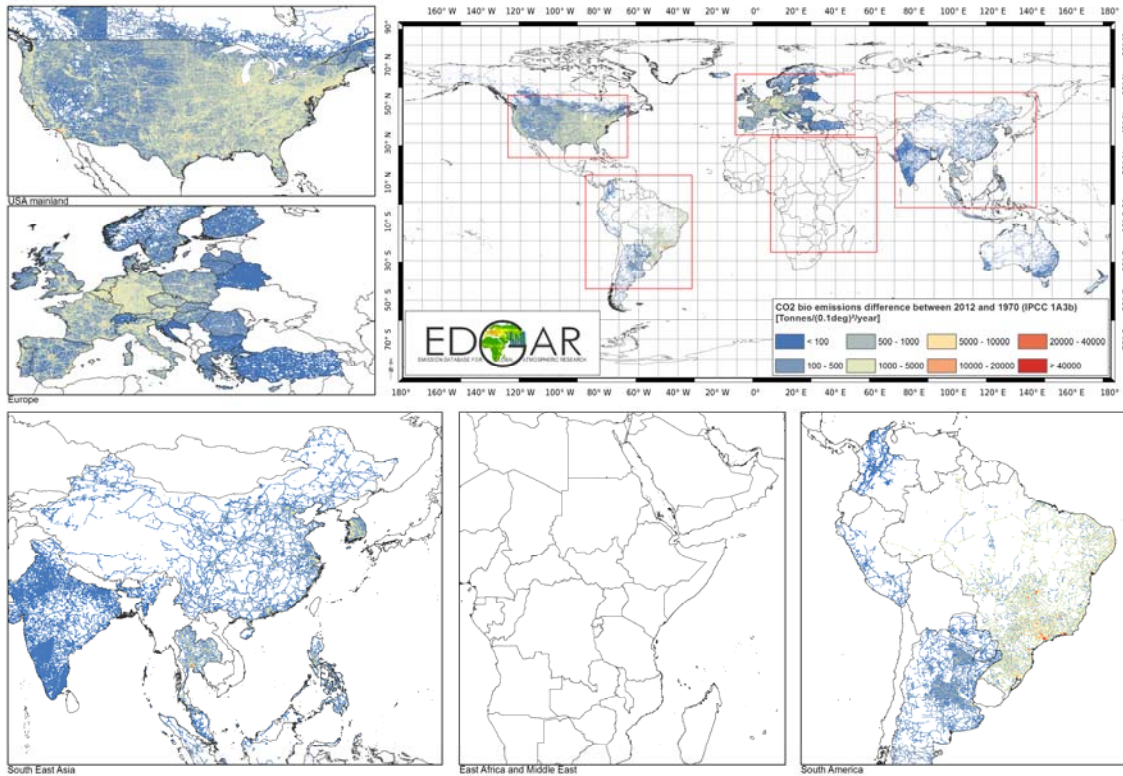



Figure S5d: Difference between 2012 and 1970 in short-cycle carbon CO₂ emissions from the transport sector (consumption of biodiesel or biogasoline in vehicles).

The sensitivity of the spatial distribution in the gridmaps is not negligible and subject to investigation in the H2020 project CHE. However, the atmospheric modeling community has been using EDGARv4, as shown in Table S5 and feedback has been taken up in the v4.3.2 version.

Table S5 – Non-exhaustive list of examples of EDGARv4 uptake by the atmospheric modeling community.

EDGAR version	Greenhouse Gas	Reference
EDGARv4.0	CH$_4$	Beck et al. (2012) ; Monteil et al. (2011)
EDGAR v4.1 (EC-JRC/PBL, 2010)	CH$_4$, N$_2$O	Montzka et al. (2011)
EDGARv4.2 (EC-JRC/PBL, 2012)	CO$_2$	Agusti-Panareda et al. (2014); Liu et al. (2015); Schneising et al. (2013)
	CH$_4$	Alexe et al. (2015); Buchwitz et al. (2017); Bergamaschi et al. (2015); Houweling et al. (2014) ; Jacob et al. (2016) ; Kirschke et al. (2013); Massart et al. (2014) ; Miller et al. (2013)
	N$_2$O	Bergamaschi et al. (2015)

EDGARv4.2FT2010 EC-JRC/PBL (2013)	CO_2	Liu et al. (2017) ; Pandey et al. (2016)
	CH_4	Henne et al. (2016) ; Janardanan et al. (2017); Pandey et al. (2016) ; Röckmann et al. (2016) ; Thompson et al. (2017) ; Turner et al. (2016) ; Wunch et al. (2018) ; Yu et al. (2017)
EDGARv4.2FT-InGOS Janssens-Maenhout et al. (2014)	CH_4, N_2O	Bergamaschi et al. (2018)
EDGARv4.3.1 EC-JRC/PBL (2016)	CO_2	Boschetti et al. (2018) ; Vardag et al. (2015)
EDGAR v4.3.2 Janssens-Maenhout et al. (2018)	CO_2	Le Quéré et al. (2018)

Additional References

Agustí-Panareda, A., Massart, S., Chevallier, F., Boussetta, S., Balsamo, G., Beljaars, A., Ciais, P., Deutscher, N. M., Engelen, R., Jones, L., Kivi, R., Paris, J.-D., Peuch, V.-H., Sherlock, V., Vermeulen, A. T., Wennberg, P. O., and Wunch, D.: Forecasting global atmospheric CO2, Atmos. Chem. Phys., 14, 11959-11983, https://doi.org/10.5194/acp-14-11959-2014, 2014

Alexe, M., Bergamaschi, P., Segers, A., Detmers, R., Butz, A., Hasekamp, O., Guerlet, S., Parker, R., Boesch, H., Frankenberg, C., Scheepmaker, R. A., Dlugokencky, E., Sweeney, C., Wofsy, S. C., and Kort, E. A.: Inverse modelling of CH_4 emissions for 2010–2011 using different satellite retrieval products from GOSAT and SCIAMACHY, Atmos. Chem. Phys., 15, 113-133, https://doi.org/10.5194/acp-15-113-2015, 2015

Aluminum Verlag: Primary Aluminium Smelters and Producers of the World, Aluminium Verlag, Düsseldorf, Germany, 2007.

Asman, W. A. H., Ammonia Emission in Europe: Updated Emission and Emission Variations, Rep. 228471008, Natl. Inst. for Public Health and Environ. Prot., Bilthoven, The Netherlands, 1992.

Beck, V. Chen, H., Gerbig, C., Bergamaschi, P., Bruhwiller, L., Houweling, S., Röckmann, T., Kolle, O., Steinbach, J., Koch, T., Sapart, C.J., van der Veen, C., Frankenberg, C., Andreae, M.O., Artaxo, P., Longo, K.M., Wofsy, S.C.: Methane airborne measurements and comparison to global models during BARCA, J. Geophys. Res. Atm., https://doi.org/10.1029/2011JD017345, 2012

Boschetti, F., Thouret, V., Maenhout, G. J., Totsche, K. U., Marshall, J., and Gerbig, C.: Multi-species inversion and IAGOS airborne data for a better constraint of continental-scale fluxes, Atmos. Chem. Phys., 18, 9225-9241, https://doi.org/10.5194/acp-18-9225-2018, 2018

Bouwman, A.F., Van der Hoek, K.W., Eickhout, B., Soenario, I.: Exploring changes in world ruminant production systems. Agricultural Systems, 84,:121-153, 2005.

Buchwitz, M., Schneising, O., Reuter, M., Heymann, J., Krautwurst, S., Bovensmann, H., Burrows, J. P., Boesch, H., Parker, R. J., Somkuti, P., Detmers, R. G., Hasekamp, O. P., Aben, I., Butz, A., Frankenberg, C., and Turner, A. J.: Satellite-derived methane hotspot emission estimates using a fast data-driven method, Atmos. Chem. Phys., 17, 5751-5774, https://doi.org/10.5194/acp-17-5751-2017, 2017.

CARMAv3.0: Carbon Monitoring for Action: power plants: dataset version v3.0, downloaded from the former website http://carma.org/plant in 2012 (this link is now redirected to https://www.cgdev.org/topics/carbon-monitoring-action).

CEC: Commission for Environmental Cooperation, http://takingstock.cec.org, 2015.

CIA: The World Fact Book. Central Intelligence Agency (CIA), Washington DC, downloaded from https://www.cia.gov/library/publications/download/download-2008/, 2008.

CIA: The World Fact Book. Central Intelligence Agency (CIA), Washington DC, downloaded from https://www.cia.gov/library/publications/download/download-2016/, 2016

CIESIN: Gridded population of the world, version 3 (GPWv3), Center for International Earth Science INformation Network (CIESIN), USA, downloaded from http://sedac.ciesin.columbia.edu/data/collection/gpw-v3, 2005 and updated in 2011.

Doorn, M.R.J., Strait, R.P., Barnard, W.R., Eklund, B.: Estimates of global greenhouse-gas emissions from industrial and domestic waste water treatment. Report no. NRMRL-RTP-086. R 8/18/97. Pechan & Ass., Durham. 1997.

Doorn, M.J. and Liles, D.S.: Quantification of methane emissions and discussion of nitrous oxide, and ammonia emissions from septic tanks, latrines, and stagnant open sewers in the world. EPA, Washington DC. EPA report EPA-600/R-99-089, October 1999.

EC-JRC)/PBL. European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL): EDGAR version 4.1. http://edgar.jrc.ec.europa.eu/overview.php?v=41, 2010

EC-JRC/PBL, European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL): EDGAR version 4.2FT2010. http://edgar.jrc.ec.europa.eu/overview.php?v=42FT2010, 2013.

EC-JRC/PBL, European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR), release version 4.3.1 http://edgar.jrc.ec.europa.eu/overview.php?v=431, 2016

EIA: International Energy Statistics: Fuel Ethanol and Biodiesel Consumption, 1980-2011. U.S. Energy Information Administration. http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=79&pid=79&aid=2, 2013

Eurogas: Eurogas statistical report, Eurogas.org NPO, downloaded from http://www.eurogas.org/uploads/media/Statistics_2010_29.11.10.pdf, November 2010.

Eyers, C.J., Norman, P., Middel, J., Plohr, M., Michot, S., Atkinson, K., Christou, R.A.: AERO2K Global Aviation Emissions Inventories for 2002 and 2025. QinetiQ Ltd. Farnborough, U.K.. Project report QINETIQ04/01113, 2004.

FAO Geonetwork: Digital Soil Map of the world and Digital Climate Map of the world, Food and Agriculture Organisation of the UN http://www.fao.org.geonetwork/srv/en/metadata.show?id=14116&currTab=simple, 2011 and updated 2014.

FAO: Suite of Food Security Indicators, average protein supply. FAOSTAT, Food and Agriculture Organisation of the UN http://www.fao.org/faostat/en/#data/FS , info retrieved 10.2016, 2016a.

FAO: Livestock Primary. FAOSTAT, Food and Agriculture Organisation of the UN http://www.fao.org/faostat/en/#data/QL , info retrieved 10.2016, 2016b.

FAO: Crops processed, sugar raw centrifugal. FAOSTAT, Food and Agriculture Organisation of the UN http://www.fao.org/faostat/en/#data/QD , info retrieved 10.2016, 2016c.

FAO: Forestry production and trade, pulpwood. Food and Agriculture Organisation of the UN http://www.fao.org/faostat/en/#data/FO , info retrieved 10.2016, 2016d.

Friedrich, R.: GENEMIS Generation and Evaluation of Emission Data: Annual Report 1999, EUROTRAC-2, a EUREKA Environmental Project, http://genemis.ier.uni-stuttgart.de/GENEMIS1999.pdf, 2000.

Friedrich, R., Reis, S.: Emissions of Air Pollutants–Measurements, Calculations and Uncertainties, Springer, p. 335, 2004.

Geofabrik: Openstreetmap, downloaded from https://www.openstreetmap.org, and OpenRailwayMap, downloaded from https://www.openrailwaymap.org/, 2015.

Goldewijk, K. van Drecht, G., Bouwman, A: Mapping contemporary global cropland and grassland distribution on a 5x5 minute resolution, Journal of Land Use Science, 2, 167-190, 2007.

Gupta, S., Krishna, M., Prasad, R.K., Gupta, S., Kansal, A.: Solid waste management in India: options and opportunities. Resource, Conservation and Recycling 24, 137–154, 1998.

Halpern, B., Frazier, B., Potapenko, J., Casey, K., Koenig, K.: Cumulative human impacts: raw stressor data (2008 and 2013). KNB Data Repository. https://knb.ecoinformatics.org/#view/doi:10.5063/F1S180FS, 2015.

Höglund-Isaksson, L., A. Thomson, K. Kupiainen, S. Rao, and G. Janssens-Maenhout: Chapter 5: Anthropogenic methane sources, emissions and future projections. In AMAP Assessment 2015: Methane as an Arctic climate forcer, Arctic Monitoring and Assessment Programme (AMAP), Oslo, 2015.

Houweling, S., Krol, M., Bergamaschi, P., Frankenberg, C., Dlugokencky, E. J., Morino, I., Notholt, J., Sherlock, V., Wunch, D., Beck, V., Gerbig, C., Chen, H., Kort, E. A., Röckmann, T., and Aben, I.: A multi-year methane inversion using SCIAMACHY, accounting for systematic errors using TCCON measurements, Atmos. Chem. Phys., 14, 3991-4012, https://doi.org/10.5194/acp-14-3991-2014, 2014

Husain, T.: Kuwaiti oil fires – Source estimate and plume characterization, Atm. Env., Vol 28, No. 13, pp. 2149–2158, http://dx.doi.org/10.1016/1352-2310(94)90357-3, 1994.

IAI: International Aluminium Institute: The Aluminium Sector Greenhouse Gas Protocol (2006) downloaded from http://www.world-aluminium.org/publications/, October 2006.

IFA: (International Ferilizer Industry Organisation): Historical production, trade and consumption statistics. Internet: http://www.fertilizer.org//En/Statistics/PIT_Excel_Files.aspx, 2015.

IIASA: GAINS model. Greenhouse Gas - Air Pollution Interactions and Synergies, International Institute for Applied Systems Analysis, http://gains.iiasa.ac.at/models/index.html, 2007.

IMA: The Magnesium Diecasters Guide 1999, Vol. III, version 23, February 1999.

ICAO: International Civil Aviation Organisation data: Airline Route Mapper data, http://arm.64hosts.com/, 2015.

IndustryAbout.com: World Industry Information, Industry About, Industrial mining map, http://www.industryabout.com/, 2015.

IRRI: World Rice statistics. Distribution of rice crop area by environment. International Rice Research Institute, downloaded in 2009 from http://www.irri.org/science/ricestat/, 2007

Jacob, D. J., Turner, A. J., Maasakkers, J. D., Sheng, J., Sun, K., Liu, X., Chance, K., Aben, I., McKeever, J., and Frankenberg, C.: Satellite observations of atmospheric methane and their value for quantifying methane emissions, Atmos. Chem. Phys., 16, 14371-14396, https://doi.org/10.5194/acp-16-14371-2016, 2016

Janardanan, R., Maksyutov, S., Ito, A., Yoshida, Y., Matsunaga, T.: Assessment of Anthropogenic Methane Emissions over Large Regions Based on GOSAT Observations and High Resolution Transport Modeling, Remote Sens, 2017, Vol. 9 (9), 941, https://doi.org/10.3390/rs9090941, 2017

Janssens-Maenhout, G., Guizzardi, D., Bergamaschi, P., Muntean, M., On the CH4 and N2O emission inventory compiled by EDGAR and improved with the EPRTR data for the INGOS project, JRC Technical report http://edgar.jrc.ec.europa.eu/ingos/JRC-INGOS-report.pdf, 2014

Lehner, B., Liermann, C. R., Revenga, C., Vörösmarty, C., Fekete, B., Crouzet, P., Döll, P., Endejan, M., Frenken, K., Magome, J., Nilsson, C., Robertson, J. C., Rödel, R., Sindorf, N. and Wisser, D.: High-resolution mapping of the world's reservoirs and dams for sustainable river-flow management. Frontiers in Ecology and the Environment, 9: 494–502. doi:10.1890/100125, 2011.

Leip, A., Marchi, G., Koeble, R., Kempen M., Britz W. and Li, C.: Linking an economic model for European agriculture with a mechanistic model to estimate nitrogen losses from cropland soil in Europe, Biogeosciences Discuss., 4, 2215-2278, 2007.

Liu, Y., Gruber, N., and Brunner, D.: Spatiotemporal patterns of the fossil-fuel CO2 signal in central Europe: results from a high-resolution atmospheric transport model, Atmos. Chem. Phys., 17, 14145-14169, https://doi.org/10.5194/acp-17-14145-2017, 2017

Massart, S., Agusti-Panareda, A., Aben, I., Butz, A., Chevallier, F., Crevoisier, C., Engelen, R., Frankenberg, C., and Hasekamp, O.: Assimilation of atmospheric methane products into the MACC-II system: from SCIAMACHY to TANSO and IASI, Atmos. Chem. Phys., 14, 6139-6158, https://doi.org/10.5194/acp-14-6139-2014, 2014

Monfreda, C., N. Ramankutty, and J.A. Fole: Farming the planet. Part 2: Geographic distribution of crop areas, yields, physiological types, and net primary production in the year 2000. *Global Biogeochemical Cycles* 22, GB1022, doi:10.1029/2007GB002947; data available at www.earthstat.org, 2008.

Montzka, S. A., Dlugokencky, E.J., Butler, J.H.: Non-CO_2 greenhouse gases and climate change Nature 476, 43-50, 2011.

Nassar, R., Hill, T.G., McLinden, C.A., Wunch, D., Jones, D.B.A., Crisp, D., Quantifying CO2 Emissions From Individual Power Plants From Space, Geophys. Res. Letters, 44, 10,045–10,053doi.org/10.1002/2017GL074702, 2017.

Oonk, H.: Literature Review: Methane from landfills: Methods to quantify generation oxidation and emission, http://www.ewp.rpi.edu/hartford/~ernesto/S2014/SHWPCE/Papers/SW-Landfill-Disposal/Oonk2010-FinalReport-LandfillMethane-Review.pdf , OonKAY Innovations in Env. Techn. Co., April 2010.

Pandey, S., Houweling, S., Krol, M., Aben, I., Chevallier, F., Dlugokencky, E. J., Gatti, L. V., Gloor, E., Miller, J. B., Detmers, R., Machida, T., and Röckmann, T.: Inverse modeling of GOSAT-retrieved ratios of total column CH4 and CO2 for 2009 and 2010, Atmos. Chem. Phys., 16, 5043-5062, https://doi.org/10.5194/acp-16-5043-2016, 2016

RFA Renewable Fuels Association: World fuel ethanol production, http://www.ethanolrfa.org/resources/industry/statistics/#1454099271060-171d2f93-158a, 2016.

Röckmann, T., Eyer, S., van der Veen, C., Popa, M. E., Tuzson, B., Monteil, G., Houweling, S., Harris, E., Brunner, D., Fischer, H., Zazzeri, G., Lowry, D., Nisbet, E. G., Brand, W. A., Necki, J. M., Emmenegger, L., and

Mohn, J.: In situ observations of the isotopic composition of methane at the Cabauw tall tower site, Atmos. Chem. Phys., 16, 10469-10487, https://doi.org/10.5194/acp-16-10469-2016, 2016

Schneising, O., Heymann, J., Buchwitz, M., Reuter, M., Bovensmann, H., and Burrows, J. P.: Anthropogenic carbon dioxide source areas observed from space: assessment of regional enhancements and trends, Atmos. Chem. Phys., 13, 2445-2454, https://doi.org/10.5194/acp-13-2445-2013, 2013

Sharholy, M., Ahmad, K., Mahmood, G., Trivedi, R.C.: Municipal solid waste management in Indian cities – A review, Waste Management 28, 459-467, 2008.

SRI Consulting: Adipic acid, nitric acid and caprolactam production data 1974-2007. SRI Consulting, Gaithersburg, Maryland. Tables from the Directory of Chemical Producers, 2008.

Thiruchittampalam, B.: Entwicklung und Anwendung von Methoden und Modellen zur Berechnung von räumlich und zeitlich hochaufgelösten Emissionen in Europa, PhD Thesis at the University Stuttgart IER, Band 118, 2012.

Thompson, R. L., Sasakawa, M., Machida, T., Aalto, T., Worthy, D., Lavric, J. V., Lund Myhre, C., and Stohl, A.: Methane fluxes in the high northern latitudes for 2005–2013 estimated using a Bayesian atmospheric inversion, Atmos. Chem. Phys., 17, 3553-3572, https://doi.org/10.5194/acp-17-3553-2017, 2017

Trombetti, M., Alessandrini, A.; Guizzardi, D., Janssens-Maenhout, G., Pisoni, E., Vespe, M.: On the use of vessel Long Range Identification and Tracking data to estimate shipping emissions, Journal of Maps, 2017.

Turner, A. J., Jacob, D.J., Benmergui, J., Wofsy, S.C., Maasakkers, J.D., Butz, A., Hasekamp, O., Biraud, S.C.: A large increase in U.S. methane emissions over the past decade inferred from satellite data and surface observations, Geophys. Res. Lett., 43, pp. 2218–2224, doi:10.1002/2016GL067987, 2016

UN Comtrade: United Nations, Department of Economic and Social Affairs, Statistics Division, International Trade Statistics Database, https://comtrade.un.org/data, 2016.

UN DP: World Urbanization Prospects: The 2014 Revision, United Nations, Department of Economic and Social Affairs, Population Division., CD-ROM Edition, 2014.

UN DP: World Population Prospects: The 2015 Revision, United Nations, Department of Economic and Social Affairs, Population Division (2015). DVD Edition, 2015.

UNECE waterway network: Blue book database, https://www.unece.org/trans/main/sc3/bluebook_database.html, 2012, updated in 2015.

UN HABITAT: Global Urban Indicators database. http://mirror.unhabitat.org/stats/Default.aspx, info on population in slums (% of urban population), 2016a.

UN HABITAT: World Atlas of Slum Evolution, 2015. United Nations Human Settlements Programme, Nairobi 00100, Kenya. http://unhabitat.org/world-atlas-of-slum-evolution/, 2016b.

UN SD: UN Ethyl alcohol denatured or not and other spirits denatured of any strength, UN data of UN Statistics Division, http://data.un.org/Data.aspx?q=ethyl+alcohol+&d=ICS&f=cmID%3a24100-1, latest access: 10/2016, 2016.

UN STATS: Industrial Commodity Production Statistics 1970-2013, UN Statistics Division, http://unstats.un.org/unsd/industry/publications.asp, 2014.

US DA: Biofuel Annuals. GAIN Reports for Argentina, Brasil (Sugar Annual), China, India, Indonesia, Malaysia, Peru, Philippines and Thailand, US Department of Agriculture, https://www.fas.usda.gov/data, 2014.

US DoT: Freight Transport Statistics – 2015, US Department of Transport, https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/subject_areas/freight_transportation/index.html, 2015.

Van Dijk P.M., Kuenzer, C., Zhang, J., Wolf, K.H.A.A., Wang, J., Fossil fuel deposit fires, Occurrence Inventory, design and assessment of Instrumental Options. WAB report 500102021. PBL Netherlands Environmental Assessment Agency, The Hague/ Bilthoven, 2009.

Van Drecht, G., A. Bouwman, J. Knoop, A. Beusen, C. Meinardi: Global modelling of the fate of nitrogen from point and nonpoint sources in soils, groundwater, and surface water. Global Biogeochemical Cycles, 17, 1115, doi:10.1029/2003GB002060, 2003.

Van Drecht, G, A.F. Bouwman, J. Harrison and J.M. Knoop: Global nitrogen and phosphate in urban wastewater for the period 1970 to 2050. Global Biogeochemical Cycles, 23, GB0A03, doi:10.1029/2009GB003458, 2009.

Vardag, S. N., Gerbig, C., Janssens-Maenhout, G., and Levin, I.: Estimation of continuous anthropogenic CO_2: model-based evaluation of CO_2, CO, $\delta^{13}C(CO_2)$ and $\Delta^{14}C(CO_2)$ tracer methods, Atmos. Chem. Phys., 15, 12705-12729, https://doi.org/10.5194/acp-15-12705-2015, 2015

Veldt, C., Updating and upgrading the PHOXA emission data base to 1990, TNO report, 92-118, Netherlands Organisation for Applied Scientific Research, Apeldoorn, 1992

Wang, C., Corbett, J.J., Firestone, J.:Improving Spatial Representation of Global Ship Emissions Inventories, Env. Sci. Techn., 42(1), pp. 193-199, 2008.

WBCSD-CSI (World Business Council for Sustainable Development-Cement Sustainability Initiative): GNR project Reporting CO_2. http://www.wbcsdcement.org/GNR 2012/index.html, 2015.

World Bank: Population living in slums. http://data.worldbank.org/indicator/EN.POP.SLUM.UR.ZS; http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=710&crid=, info on urban population in slums., 2016

World Coal Association, Spatial proxies for the coal mining activities, http://www.worldcoal.org/coal/coal-mining/, 2016.

Wunch, D., Toon, G. C., Deutscher, N. M., Hase, F., Notholt, J., Sussmann, R., Warneke, T., Kuenen, J., and Denier van der Gon, H.: Emissions of methane in Europe inferred by total column measurements, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-266, in review, 2018

WSA: Steel statistics, World Steel Association. https://www.worldsteel.org/statistics/crude-steel-production.html, 2015

Yevich, R. and J. Logan: An assessment of biofuel use and burning of agricultural waste in the developing world. Global biogeochemical cycles, 17, 1095, doi:10.1029/2002GB001952, 2003.

Zhou, J. B., Jiang, M. M., and Chen, G. Q.: Estimation of methane and nitrous oxide emission from livestock and poultry in China during 1949–2003, Energy Policy, 35, 3759-3767, http://dx.doi.org/10.1016/j.enpol.2007.01.013 2007.