



Development of the Preliminary Version 7 Non-CO₂ GHG Emissions Dataset¹

By

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GTAP Research Memorandum No. 17

January 2010

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Year 2004 emissions were estimated by applying annual growth rates to the detailed year 2001 emissions data (Rose et al., 2007) that was the input dataset for the GTAP version 6 non-CO₂ emissions (Rose and Lee, 2009). Two methodologies were applied: one for methane (CH₄) and nitrous oxide (N₂O), the other for fluorinated gases (F-gases). Each is described below.

Globally, the estimated 2004 emissions are slightly greater than those in 2001, with increases in N₂O, CH₄ and F-gas emissions, and the largest increases in CH₄ (Figure 1). Global sector emissions are given in Figures 2 through 4. The figures below report emissions in MtCeq units. To facilitate review, we have also provided the same figures in MtCO₂eq units in the Appendix.

Figure 1: Global N₂O, CH₄, and F-gas version 6 and version 7 emissions

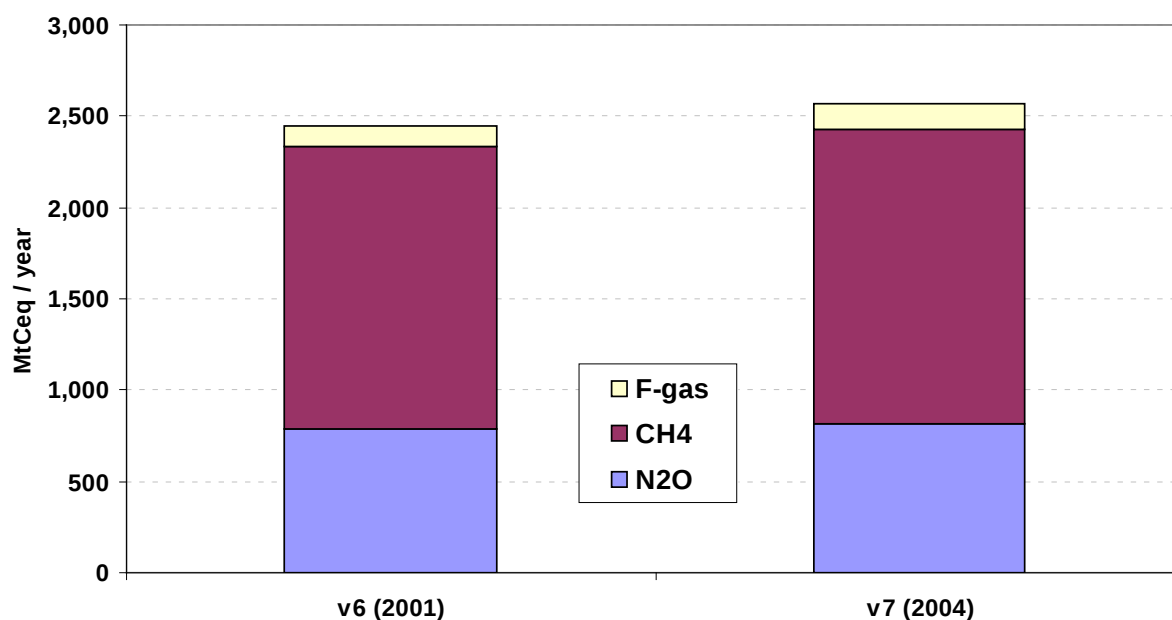


Figure 2: Global N₂O emissions by sector

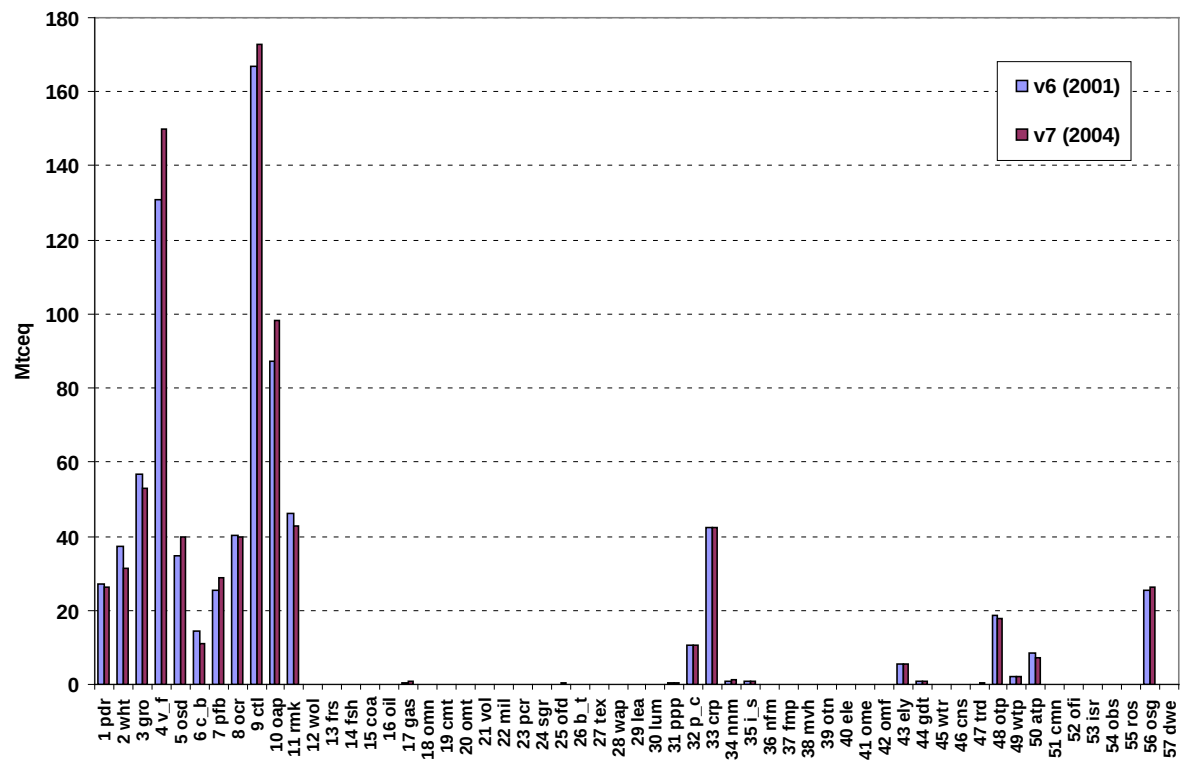


Figure 3: Global CH₄ emissions by sector

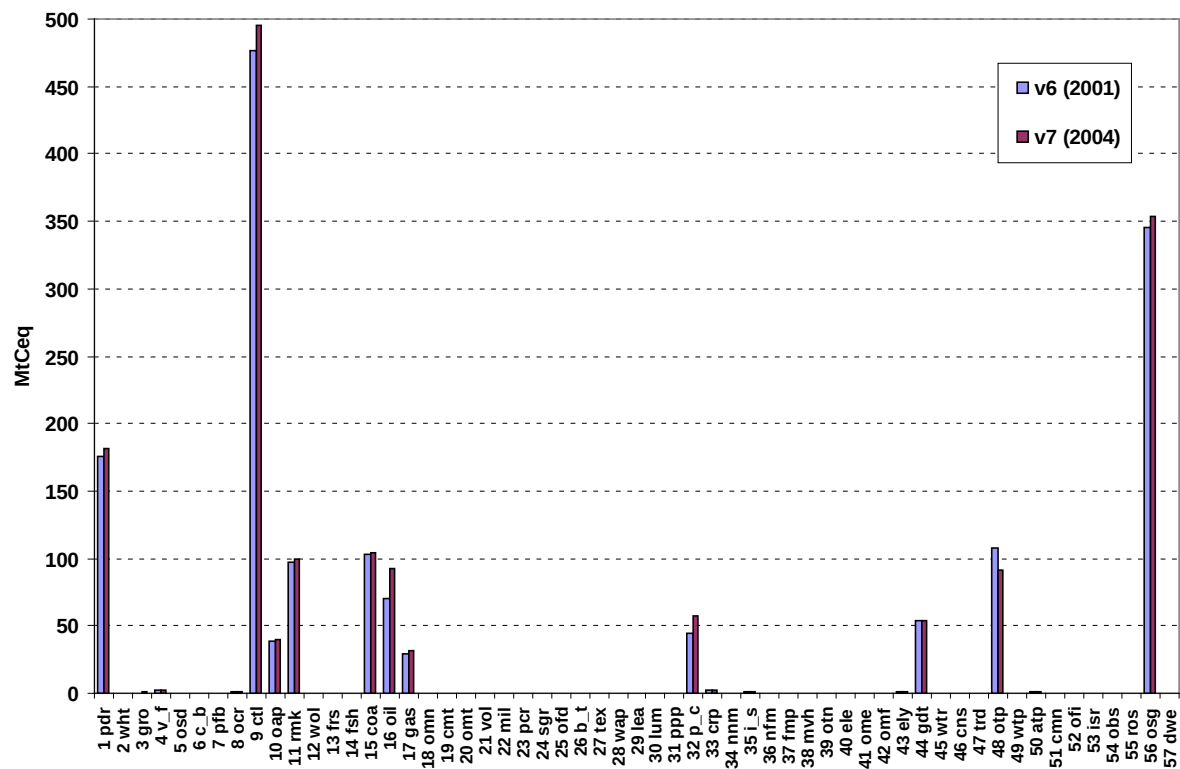
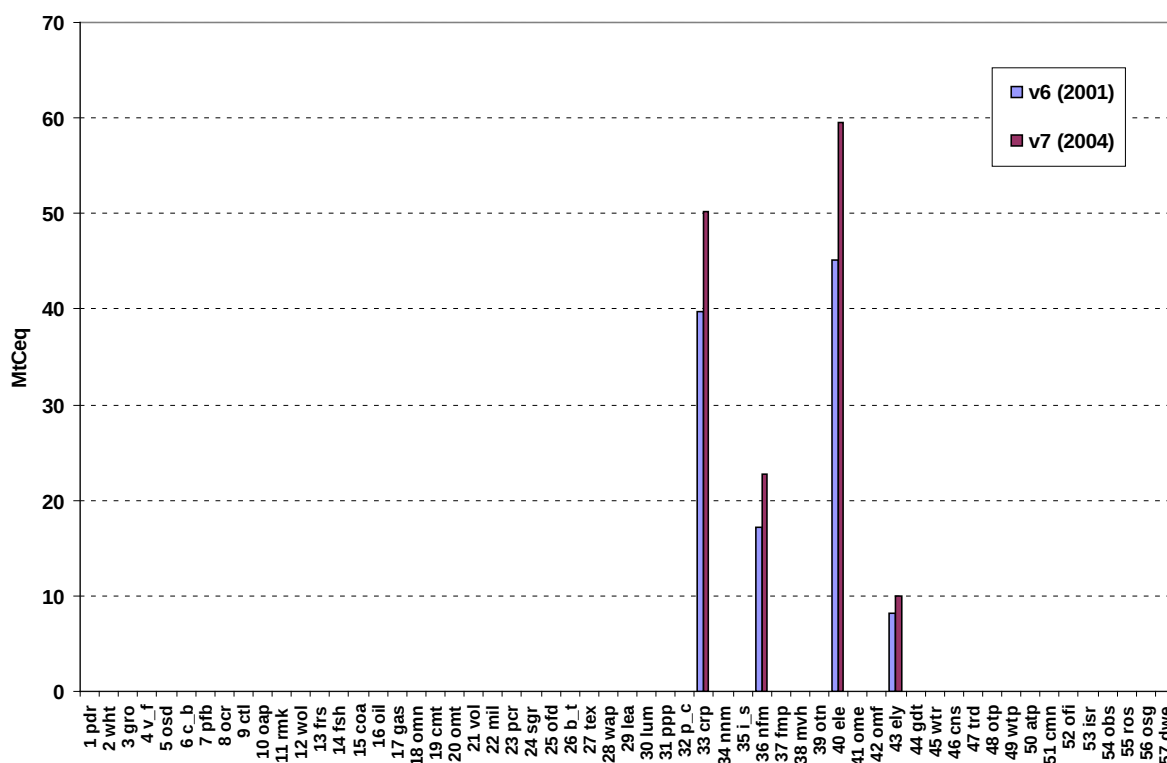


Figure 4: Global F-gas emissions by sector



Methane (CH₄) and Nitrous Oxide (N₂O)

For CH₄ and N₂O emissions, region and source specific annual growth rates for the period 2000 to 2005 were derived from USEPA (2006). USEPA (2006) includes region and source specific projections, which, depending on the country, are based on either government reported projections for 2005 or emissions estimates based on IPCC emissions factors applied to projected 2005 activity data.

The derived annual growth rates for CH₄ and N₂O are given in Tables 1 and 2 respectively.⁵ USEPA (2006) reported emissions regions and categories are more aggregated than those in the version 6 input dataset developed by Rose et al. (2009). Therefore, the growth rates in Tables 1 and 2 were applied to all relevant emissions subcategories and countries within each USEPA (2006) region and category respectively. The region and category mappings are given in Tables 3 and 4.

⁵ An “N/A” entry in Tables 1 and 2 indicates that there was no emissions estimate in USEPA (2006). A zero growth rate is used in these cases. For Australia and New Zealand, USEPA (2006) indicates that ADIPNIT (adipic and nitric) emissions were included elsewhere. The same is true for Sweden WWTER (waste water) emissions. Since GTAP version 6 2001 emissions are zero for these categories for these specific countries, a zero growth is used. US emissions in Tables 1 and 2 are those from USEPA (2006) that include reductions from voluntary programs.

Table 1: CH₄ annual growth rates

	OILGAS	COAL	STATMOB	BIOCOMB	IND_NONAG	ENTFERM	RICE	MANURE	OTHAG	LNDLFL	WWTER	NONAG
Country	Oil & natural gas fugitives	Coal mines	Stationary and mobile combustion	Biomass combustion	Industrial non-agriculture	Enteric fermentation	Rice paddies	Manure management	Other agriculture	Landfilling solid waste	Waste water	Other non-agriculture
Albania	3.0%	0.0%	1.9%	-0.3%	#N/A	-0.1%	0.0%	9.8%	0.0%	11.8%	0.6%	0.0%
Algeria	0.3%	2.0%	3.5%	1.9%	#N/A	2.3%	1.7%	2.0%	0.0%	1.7%	1.8%	2.0%
Argentina	0.0%	-1.7%	3.4%	0.5%	#N/A	1.5%	1.2%	1.6%	0.0%	1.2%	1.2%	-1.7%
Armenia	9.1%	0.0%	2.4%	-0.3%	#N/A	1.0%	#N/A	1.0%	0.0%	0.2%	0.1%	#N/A
Australia	5.3%	2.1%	1.7%	#N/A	0.0%	-0.2%	0.0%	-0.3%	0.0%	1.7%	1.0%	#N/A
Austria	0.4%	0.4%	0.4%	#N/A	10.1%	-0.3%	#N/A	-0.3%	0.0%	-0.3%	-0.3%	0.0%
Azerbaijan	6.5%	0.0%	1.2%	-0.3%	#N/A	-0.2%	0.9%	-0.4%	0.0%	0.9%	0.6%	#N/A
Bangladesh	0.8%	0.0%	6.7%	1.0%	#N/A	1.9%	2.0%	2.0%	0.0%	3.7%	2.1%	#N/A
Belarus	1.7%	#N/A	3.0%	#N/A	0.4%	-0.5%	#N/A	-0.2%	0.0%	1.4%	-0.4%	#N/A
Belgium	-0.4%	-0.3%	0.1%	#N/A	-7.7%	-0.5%	0.0%	-0.1%	0.0%	-5.3%	-5.3%	-5.3%
Bolivia	3.3%	0.0%	3.6%	0.5%	#N/A	1.7%	1.9%	1.6%	0.0%	1.9%	2.2%	0.0%
Brazil	12.4%	-1.6%	3.3%	1.0%	0.0%	1.7%	1.2%	1.7%	0.0%	1.2%	1.2%	#N/A
Bulgaria	2.2%	2.2%	2.2%	#N/A	0.0%	5.5%	5.5%	5.5%	0.0%	1.0%	1.0%	#N/A
Cambodia	1.8%	0.0%	2.4%	2.4%	#N/A	5.8%	2.4%	5.8%	0.0%	2.4%	2.5%	#N/A
Canada	0.0%	-1.5%	0.0%	#N/A	#N/A	2.4%	#N/A	2.8%	0.0%	2.0%	0.8%	0.0%
Chile	4.4%	3.5%	3.1%	0.5%	#N/A	1.6%	1.2%	1.8%	0.0%	1.2%	1.2%	#N/A
China	9.0%	2.9%	4.8%	0.3%	#N/A	2.3%	0.7%	2.1%	0.0%	0.6%	0.7%	#N/A
Colombia	0.6%	3.1%	3.5%	0.5%	#N/A	1.3%	1.6%	1.2%	0.0%	1.6%	1.6%	#N/A
Croatia	3.7%	0.0%	3.7%	#N/A	0.0%	3.0%	0.0%	3.0%	0.0%	2.1%	0.0%	#N/A
Czech Republic	0.9%	-0.8%	-0.6%	#N/A	0.0%	0.2%	#N/A	0.2%	0.0%	-0.7%	-0.1%	#N/A
Democratic Republic of Congo (Kinshasa)	0.6%	0.3%	1.6%	1.9%	#N/A	2.4%	2.9%	2.6%	0.0%	2.9%	3.4%	#N/A
Denmark	0.0%	6.7%	-0.9%	#N/A	0.0%	-1.2%	0.0%	-1.0%	#N/A	-3.4%	0.2%	0.3%
Ecuador	3.3%	0.0%	0.7%	0.5%	#N/A	1.7%	1.5%	1.7%	0.0%	1.5%	1.8%	#N/A
Egypt	3.8%	0.0%	0.5%	1.9%	#N/A	0.9%	2.0%	0.9%	0.0%	2.0%	1.7%	#N/A
Estonia	-1.9%	-1.9%	-3.9%	#N/A	#N/A	10.2%	#N/A	10.2%	0.0%	-2.0%	-1.1%	#N/A
Ethiopia	0.0%	0.0%	2.8%	1.9%	#N/A	2.3%	#N/A	2.3%	0.0%	2.5%	2.4%	#N/A
Finland	0.0%	-4.3%	0.0%	#N/A	0.0%	-1.9%	0.0%	-1.9%	0.0%	-0.7%	0.1%	0.0%
France	-1.0%	0.2%	-1.0%	#N/A	0.0%	-0.1%	-0.1%	-0.1%	0.0%	-6.2%	0.4%	0.0%
Georgia	2.4%	-36.1%	0.3%	-0.3%	#N/A	-0.5%	#N/A	-0.4%	0.0%	-0.9%	-0.5%	#N/A
Germany	0.9%	-3.8%	0.0%	#N/A	0.0%	-3.4%	#N/A	-3.3%	0.0%	-8.7%	0.0%	#N/A
Greece	-0.4%	-0.4%	-2.5%	#N/A	0.0%	0.1%	0.1%	0.1%	0.0%	-3.8%	0.0%	0.0%
Hungary	0.0%	-2.7%	0.6%	#N/A	0.0%	4.7%	10.8%	7.9%	0.0%	0.0%	-0.5%	#N/A
Iceland	0.4%	#N/A	3.3%	#N/A	0.0%	0.0%	#N/A	0.0%	0.0%	0.0%	0.7%	#N/A
India	10.3%	4.2%	4.5%	0.8%	0.0%	1.5%	1.5%	1.5%	0.0%	2.7%	1.5%	#N/A
Indonesia	2.0%	2.0%	1.8%	0.3%	0.0%	2.6%	1.3%	2.4%	0.0%	1.3%	1.2%	#N/A
Iran	10.4%	1.2%	2.6%	2.0%	0.0%	4.0%	0.5%	3.1%	0.0%	1.2%	1.4%	#N/A
Iraq	-2.6%	0.0%	2.6%	2.0%	#N/A	1.5%	2.7%	1.3%	0.0%	2.7%	2.8%	#N/A
Ireland	0.0%	0.0%	-0.7%	#N/A	0.0%	-2.6%	0.0%	-2.6%	0.0%	0.3%	1.0%	0.0%
Israel	-0.4%	0.0%	2.5%	2.0%	#N/A	0.3%	#N/A	0.9%	0.0%	2.0%	2.0%	#N/A
Italy	0.2%	0.2%	0.2%	#N/A	0.7%	-0.5%	0.0%	0.5%	0.0%	-7.1%	-0.7%	0.0%
Japan	-0.3%	-0.3%	0.1%	#N/A	0.0%	0.6%	0.6%	0.6%	0.0%	-2.3%	0.2%	0.0%
Jordan	-0.3%	0.0%	0.5%	2.0%	#N/A	1.4%	#N/A	1.3%	0.0%	2.7%	2.8%	#N/A
Kazakhstan	9.2%	-7.7%	0.7%	-0.3%	#N/A	0.1%	-0.4%	0.3%	0.0%	-0.4%	-0.4%	#N/A
Kuwait	-0.5%	0.0%	2.5%	0.0%	#N/A	1.8%	#N/A	0.0%	0.0%	3.5%	2.6%	#N/A
Kyrgyzstan	4.3%	-2.6%	1.9%	-0.3%	#N/A	0.7%	1.4%	0.6%	0.0%	1.4%	1.2%	#N/A
Laos	1.8%	0.0%	#N/A	0.3%	#N/A	2.2%	2.3%	2.0%	0.0%	2.3%	2.3%	#N/A
Latvia	1.1%	#N/A	0.8%	#N/A	#N/A	-1.2%	#N/A	-1.2%	0.0%	-6.0%	-0.6%	#N/A
Liechtenstein	0.0%	#N/A	-1.2%	#N/A	#N/A	-0.3%	#N/A	-0.3%	0.0%	0.9%	0.6%	#N/A
Lithuania	4.5%	#N/A	0.0%	#N/A	0.0%	0.0%	#N/A	0.0%	0.0%	0.0%	0.0%	#N/A
Luxembourg	0.0%	0.0%	0.0%	#N/A	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%
Macedonia	0.4%	1.4%	2.0%	-0.3%	#N/A	-0.1%	0.5%	0.0%	0.0%	0.5%	0.3%	#N/A
Mexico	4.9%	2.8%	3.8%	0.5%	0.0%	1.6%	1.5%	1.4%	0.0%	1.5%	1.4%	#N/A
Moldova	2.5%	0.0%	1.3%	-0.3%	#N/A	-0.4%	#N/A	-0.1%	0.0%	-0.1%	-0.3%	0.0%
Monaco	0.0%	0.0%	0.0%	#N/A	#N/A	#N/A	#N/A	#N/A	0.0%	0.0%	1.2%	-3.2%
Mongolia	1.8%	-4.6%	0.0%	0.8%	#N/A	1.2%	#N/A	1.4%	0.0%	2.2%	1.1%	#N/A
Myanmar	13.3%	8.0%	0.9%	0.8%	#N/A	2.2%	1.3%	1.8%	0.0%	3.0%	1.2%	#N/A
Nepal	1.8%	-3.9%	4.0%	1.0%	#N/A	1.1%	1.4%	1.1%	0.0%	4.5%	2.4%	#N/A
Netherlands	0.0%	0.3%	2.0%	#N/A	0.0%	-0.5%	#N/A	-1.0%	#N/A	#N/A	#N/A	-2.2%
New Zealand	3.7%	3.7%	3.7%	#N/A	0.0%	0.7%	#N/A	2.2%	0.0%	1.2%	0.7%	#N/A
Nigeria	5.3%	-58.5%	2.8%	1.9%	0.0%	2.0%	2.6%	1.9%	0.0%	2.6%	2.6%	0.0%
North Korea	1.8%	-1.0%	1.6%	0.8%	#N/A	1.1%	0.5%	1.5%	0.0%	0.5%	0.7%	#N/A
Norway	0.3%	0.0%	0.0%	#N/A	0.0%	0.2%	#N/A	0.0%	#N/A	0.1%	0.4%	0.0%
Pakistan	-0.3%	0.6%	5.4%	1.0%	#N/A	2.2%	2.5%	2.2%	0.0%	3.6%	2.6%	#N/A
Peru	2.2%	-100.0%	3.2%	0.5%	#N/A	1.9%	1.5%	1.9%	0.0%	1.5%	1.6%	#N/A
Philippines	2.3%	0.3%	3.1%	0.8%	0.0%	2.3%	1.8%	2.8%	0.0%	1.8%	1.9%	#N/A
Poland	6.0%	-1.0%	1.0%	#N/A	-6.3%	-1.7%	#N/A	-0.5%	0.0%	0.0%	-0.1%	#N/A
Portugal	2.5%	0.0%	2.5%	#N/A	0.0%	0.4%	0.4%	0.4%	0.0%	-8.6%	-8.6%	0.0%
Romania	2.2%	0.7%	0.0%	#N/A	0.0%	2.3%	-0.2%	1.4%	0.0%	0.8%	-0.3%	#N/A
Russian Federation	0.8%	-2.0%	0.0%	#N/A	0.0%	1.9%	-0.6%	2.6%	0.0%	-0.6%	-0.6%	#N/A
Saudi Arabia	1.2%	0.0%	2.4%	2.0%	0.0%	1.0%	#N/A	1.0%	0.0%	3.0%	3.2%	0.0%
Senegal	0.8%	0.0%	3.6%	1.9%	#N/A	2.3%	2.4%	2.3%	0.0%	2.4%	2.5%	#N/A
Singapore	10.5%	0.0%	3.3%	0.0%	#N/A	1.9%	#N/A	2.0%	0.0%	1.7%	1.8%	#N/A
Slovak Republic	0.1%	-5.2%	0.0%	#N/A	#N/A	2.1%	#N/A	7.1%	0.0%	0.1%	0.4%	#N/A
Slovenia	0.0%	0.0%	0.0%	#N/A	-1.7%	0.0%	#N/A	0.0%	0.0%	0.0%	-0.1%	0.0%
South Africa	2.6%	0.9%	1.8%	1.9%	0.0%	0.6%	0.6%	0.6%	0.0%	0.6%	0.8%	#N/A
South Korea	4.7%	-4.8%	4.4%	0.8%	0.0%	1.7%	0.6%	1.6%	0.0%	0.8%	0.7%	#N/A
Spain	2.4%	-0.1%	-1.0%	#N/A	0.0%	0.5%	-0.1%	1.3%	0.0%	0.2%	0.0%	0.0%
Sweden	4.3%	1.0%	-2.1%	#N/A	0.0%	-0.5%	#N/A	-0.6%	0.0%	0.0%	#N/A	#N/A
Switzerland	-1.0%	#N/A	-1.0%	#N/A	0.0%	-0.2%	#N/A	-0.2%	0.0%	-2.5%	-0.1%	2.6%
Tajikistan	4.2%	-2.6%	1.8%	0.0%	#N/A	0.5%	0.9%	0.4%	0.0%	0.9%	0.7%	#N/A
Thailand	2.3%	2.0%	0.8%	0.8%	0.0%	2.5%	0.2%	2.5%	0.0%	1.0%	1.1%	#N/A
Turkey	5.3%	1.4%	-1.6%	3.6%	#N/A	0.8%	1.4%	0.8%	0.0%	1.4%	1.3%	#N/A
Turkmenistan	13.7%	0.0%	2.3%	0.0%	#N/A	0.6%	1.5%	0.4%	0.0%	1.5%	1.9%	#N/A
Uganda	0.0%	0.0%	2.5%	1.9%	#N/A	2.1%	3.3%	2.1%	0.0%	3.3%	3.2%	#N/A
Ukraine	0.8%	-1.5%	3.5%	#N/A	0.0%	2.6%	-100.0%	2.6%	0.0%	2.1%	-0.9%	0.0%
United Arab Emirates	3.0%	0.0%	2.9%	2.0%	#N/A	3.0%	#N/A	2.7%	0.0%	2.0%	1.7%	#N/A
United Kingdom	-0.8%	-0.8%	3.7%	#N/A	0.0%	-0.2%	#N/A	-1.5%	0.0%	-6.2%	0.2%	0.0%
United States	-3.1%	-0.3%	-3.0%	#N/A	-2.3%	-0.5%	0.4%	0.6%	0.7%	0.0%	0.5%	#N/A
Uruguay	0.5%	-100.0%	3.4%	0.5%	#N/A	1.8%	0.7%	1.8%	0.0%	0.7%	0.7%	#N/A
Uzbekistan	2.6%	-0.9%	1.5%	-0.3%	#N/A	0.6%	1.5%	0.5%	0.0%	1.5%	1.4%	#N/A
Venezuela	3.7%	5.7%	4.0%	0.5%	0.0%	1.9%	1.9%	1.8%	0.0%	1.9%	1.8%	#N/A
Viet Nam	2.8%	3.6%	4.5%	0.8%	#N/A	2.3%	1.4%	2.4%	0.0%	2.9%	1.3%	#N/A
Rest of Africa	1.8%	0.0%	2.6%	1.9%	0.0%	2.2%	2.8%	2.1%	0.0%	2.2%	2.4%	#N/A
Rest of China/CPA	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Rest of Latin America	2.7%	0.0%	3.0%	0.5%	#N/A	1.8%	1.3%	1.5%	0.0%	1.3%	1.7%	#N/A
Rest of Middle East	2.3%	0.0%	2.3%	2.0%	#N/A	1.5%	2.4%	1.4%	0.0%	2.9%	3.2%	#N/A
Rest of Non-EU Eastern Europe	2.1%	4.7%	0.8%	-0.3%	#N/A	-0.4%	#N/A	0.1%	0.0%	0.3%	0.3%	#N/A
Rest of Non-EU FSU	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Rest of OECD90 & EU	-0.2%	0.0%	2.3%	-0.3%	#N/A	1.1%	#N/A	1.1%	0.0%	0.8%	0.9%	#N/A
Rest of SE Asia	5.6%	0.0%	4.4%	0.9%	51.2%	1.7%	2.0%	1.8%	0.0%	2.0%	2.1%	#N/A

Table 2: N₂O annual growth rates

	STATMOB	BIOCOMB	ADIPNIT	IND_NONAG	SOIL	MANURE	OTHAG	HUMSEW	NONAG
Country	Stationary & mobile	Biomass combustion	Adipic & nitric acid	Industrial non-ag	Ag soil	Livestock manure	Other ag	Human sewage	Other non-agriculture
Albania	1.8%	-0.3%	0.0%	#N/A	#N/A	14.3%	0.0%	0.6%	#N/A
Algeria	3.7%	1.9%	0.0%	#N/A	2.5%	2.0%	0.0%	1.8%	#N/A
Argentina	5.7%	0.5%	0.0%	#N/A	3.5%	1.6%	0.0%	1.2%	#N/A
Armenia	6.7%	6.7%	0.0%	#N/A	1.3%	-0.5%	0.0%	0.1%	#N/A
Australia	6.3%	#N/A	#N/A	0.0%	-0.2%	-0.3%	0.0%	1.0%	0.0%
Austria	0.0%	#N/A	0.7%	#N/A	-0.3%	0.0%	0.0%	-0.1%	0.0%
Azerbaijan	0.6%	-0.3%	0.0%	#N/A	1.3%	-0.4%	0.0%	0.6%	#N/A
Bangladesh	6.7%	1.0%	0.0%	#N/A	1.6%	2.0%	0.0%	2.1%	#N/A
Belarus	1.0%	#N/A	0.0%	#N/A	1.0%	-0.2%	0.0%	-0.4%	0.0%
Belgium	-5.4%	#N/A	0.7%	0.0%	-0.3%	-0.6%	-51.3%	0.1%	0.0%
Bolivia	4.7%	0.5%	0.0%	#N/A	2.3%	1.6%	0.0%	2.2%	#N/A
Brazil	3.2%	1.0%	1.9%	#N/A	2.6%	1.7%	0.0%	1.2%	#N/A
Bulgaria	2.7%	#N/A	11.7%	#N/A	4.6%	0.0%	0.0%	-1.0%	#N/A
Cambodia	2.6%	2.6%	#N/A	#N/A	4.0%	6.6%	0.0%	2.8%	#N/A
Canada	3.3%	#N/A	0.7%	#N/A	1.8%	2.4%	0.0%	0.8%	0.2%
Chile	3.5%	0.5%	0.0%	#N/A	2.3%	1.8%	0.0%	0.1%	#N/A
China	3.4%	0.3%	1.2%	#N/A	1.0%	2.1%	#N/A	0.7%	#N/A
Colombia	3.9%	0.5%	0.0%	#N/A	2.3%	1.2%	0.0%	1.6%	#N/A
Croatia	0.0%	#N/A	0.0%	#N/A	4.6%	0.0%	0.0%	0.0%	#N/A
Czech Republic	-2.2%	#N/A	0.0%	#N/A	0.0%	0.2%	0.0%	-0.1%	0.4%
Democratic Republic of Congo (Kinshasa)	0.0%	1.9%	0.0%	#N/A	3.2%	2.6%	0.0%	3.4%	#N/A
Denmark	1.6%	#N/A	0.0%	0.0%	-2.8%	-3.4%	#N/A	-1.5%	0.0%
Ecuador	0.7%	0.5%	0.0%	#N/A	2.3%	1.7%	0.0%	1.8%	#N/A
Egypt	0.6%	1.9%	0.0%	#N/A	2.9%	0.9%	0.0%	1.7%	#N/A
Estonia	0.0%	#N/A	#N/A	#N/A	4.3%	4.6%	0.0%	-1.1%	#N/A
Ethiopia	2.8%	1.9%	0.0%	#N/A	2.7%	2.3%	0.0%	2.4%	#N/A
Finland	2.2%	#N/A	2.5%	#N/A	-1.1%	-1.1%	0.0%	0.1%	0.0%
France	-6.8%	#N/A	2.4%	0.0%	-0.2%	-0.2%	#N/A	0.4%	17.5%
Georgia	0.3%	-0.3%	0.0%	#N/A	1.3%	-0.4%	0.0%	-0.5%	#N/A
Germany	2.4%	#N/A	0.6%	#N/A	0.2%	-3.3%	0.0%	0.0%	0.0%
Greece	0.9%	#N/A	0.0%	0.0%	-1.5%	0.1%	0.0%	0.0%	0.0%
Hungary	0.0%	#N/A	-5.9%	#N/A	0.2%	7.9%	0.0%	-0.5%	0.0%
Iceland	0.0%	#N/A	0.0%	0.0%	0.0%	-0.8%	0.0%	0.7%	-4.0%
India	4.2%	0.8%	1.2%	#N/A	1.1%	1.5%	0.0%	1.5%	#N/A
Indonesia	3.3%	0.6%	0.0%	#N/A	1.0%	2.4%	0.0%	1.2%	#N/A
Iran	2.4%	2.0%	0.0%	#N/A	5.7%	1.5%	0.0%	1.4%	#N/A
Iraq	2.3%	2.0%	0.0%	#N/A	2.7%	1.3%	0.0%	2.8%	#N/A
Ireland	1.7%	#N/A	0.0%	0.0%	-0.8%	0.0%	0.0%	1.0%	0.0%
Israel	4.0%	2.0%	0.0%	#N/A	2.9%	0.9%	0.0%	2.0%	#N/A
Italy	2.9%	#N/A	1.0%	#N/A	-0.5%	0.5%	0.0%	-0.1%	0.0%
Japan	-10.2%	#N/A	1.6%	#N/A	0.5%	0.5%	0.0%	0.1%	6.3%
Jordan	0.5%	2.0%	0.0%	#N/A	2.9%	1.3%	0.0%	2.8%	#N/A
Kazakhstan	0.4%	-0.3%	0.0%	#N/A	0.5%	0.3%	0.0%	-0.4%	#N/A
Kuwait	2.3%	0.0%	0.0%	#N/A	#N/A	0.0%	0.0%	2.6%	#N/A
Kyrgyzstan	1.7%	-0.3%	#N/A	#N/A	#N/A	0.0%	0.0%	1.2%	#N/A
Laos	#N/A	0.3%	#N/A	#N/A	#N/A	1.8%	0.0%	2.3%	#N/A
Latvia	0.0%	#N/A	#N/A	#N/A	1.4%	-1.2%	0.0%	-0.6%	0.0%
Liechtenstein	-100.0%	#N/A	#N/A	#N/A	0.0%	0.0%	0.0%	#N/A	#N/A
Lithuania	-0.5%	#N/A	-23.1%	#N/A	-16.3%	-2.0%	0.0%	-0.2%	#N/A
Luxembourg	0.0%	#N/A	0.0%	#N/A	0.0%	#N/A	0.0%	0.1%	#N/A
Macedonia	2.2%	-0.3%	#N/A	#N/A	#N/A	0.0%	0.0%	0.3%	#N/A
Mexico	3.8%	0.5%	1.3%	#N/A	2.3%	1.4%	0.0%	1.4%	#N/A
Moldova	1.3%	-0.3%	0.0%	#N/A	0.4%	-0.1%	0.0%	-0.3%	0.0%
Monaco	0.0%	#N/A	#N/A	#N/A	#N/A	#N/A	0.0%	0.0%	0.0%
Mongolia	0.0%	0.8%	0.0%	#N/A	1.6%	1.4%	0.0%	1.1%	#N/A
Myanmar	4.4%	0.8%	0.0%	#N/A	5.4%	1.8%	0.0%	1.2%	#N/A
Nepal	3.7%	1.0%	0.0%	#N/A	2.6%	1.8%	0.0%	2.4%	#N/A
Netherlands	2.3%	#N/A	1.0%	-0.7%	-0.8%	0.0%	#N/A	#N/A	0.2%
New Zealand	2.9%	#N/A	#N/A	#N/A	2.6%	0.0%	0.0%	0.7%	0.0%
Nigeria	2.9%	1.9%	0.0%	#N/A	3.4%	1.9%	0.0%	2.6%	#N/A
North Korea	1.9%	0.8%	0.0%	#N/A	1.4%	1.5%	0.0%	0.7%	#N/A
Norway	0.0%	#N/A	-0.2%	#N/A	0.0%	0.0%	#N/A	0.4%	0.0%
Pakistan	4.2%	1.0%	0.0%	#N/A	0.3%	-15.0%	0.0%	2.6%	#N/A
Peru	2.9%	0.5%	0.0%	#N/A	2.3%	1.9%	0.0%	1.6%	#N/A
Philippines	2.8%	0.8%	0.0%	#N/A	1.0%	2.8%	0.0%	1.9%	#N/A
Poland	4.1%	#N/A	0.0%	#N/A	0.6%	0.6%	0.0%	-0.1%	#N/A
Portugal	4.3%	#N/A	0.0%	0.0%	0.3%	1.9%	0.0%	0.1%	0.0%
Romania	0.0%	#N/A	0.0%	#N/A	4.0%	0.0%	0.0%	-0.3%	#N/A
Russian Federation	0.0%	#N/A	0.0%	#N/A	0.6%	2.5%	0.0%	-0.6%	0.0%
Saudi Arabia	2.3%	2.0%	0.0%	#N/A	2.6%	1.0%	0.0%	3.2%	0.0%
Senegal	2.7%	1.9%	0.0%	#N/A	0.2%	2.3%	0.0%	2.5%	#N/A
Singapore	3.1%	0.0%	2.0%	#N/A	0.0%	2.0%	0.0%	#N/A	#N/A
Slovak Republic	1.2%	#N/A	0.0%	#N/A	7.9%	3.1%	0.0%	0.1%	0.0%
Slovenia	2.7%	#N/A	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%	0.0%
South Africa	2.1%	1.9%	0.0%	#N/A	1.1%	0.6%	0.0%	0.8%	#N/A
South Korea	4.2%	0.8%	2.0%	#N/A	1.0%	1.6%	0.0%	0.7%	#N/A
Spain	0.4%	#N/A	-0.1%	#N/A	1.0%	1.3%	0.0%	0.0%	0.0%
Sweden	0.7%	#N/A	-3.6%	0.0%	-0.1%	-0.1%	0.0%	-0.1%	0.0%
Switzerland	-6.3%	#N/A	0.0%	0.0%	-1.0%	-0.3%	0.0%	-0.1%	1.9%
Tajikistan	2.5%	0.0%	#N/A	#N/A	#N/A	0.0%	0.0%	0.7%	#N/A
Thailand	3.1%	0.8%	0.0%	#N/A	1.0%	1.1%	0.0%	1.1%	#N/A
Turkey	-0.2%	3.6%	0.0%	#N/A	2.9%	0.8%	0.0%	1.3%	#N/A
Turkmenistan	1.8%	0.0%	0.0%	#N/A	1.3%	0.4%	0.0%	1.9%	#N/A
Uganda	2.6%	1.9%	0.0%	#N/A	3.5%	2.1%	0.0%	3.2%	#N/A
Ukraine	0.0%	#N/A	1.0%	0.0%	4.7%	2.5%	0.0%	-0.9%	0.0%
United Arab Emirates	3.0%	2.0%	0.0%	#N/A	#N/A	0.0%	0.0%	1.7%	#N/A
United Kingdom	3.4%	#N/A	0.0%	0.0%	-0.5%	0.0%	0.0%	0.2%	0.0%
United States	-5.5%	#N/A	-2.6%	#N/A	0.0%	-0.5%	0.9%	0.2%	0.2%
Uruguay	2.9%	0.5%	0.0%	#N/A	2.3%	1.8%	0.0%	0.7%	#N/A
Uzbekistan	1.6%	-0.3%	0.0%	#N/A	1.1%	0.5%	0.0%	0.7%	#N/A
Venezuela	4.2%	0.5%	1.6%	#N/A	2.3%	1.8%	0.0%	1.8%	0.0%
Viet Nam	4.1%	0.8%	0.0%	#N/A	1.2%	2.4%	0.0%	1.3%	#N/A
Rest of Africa	2.7%	1.9%	#N/A	#N/A	2.4%	3.2%	0.0%	2.4%	#N/A
Rest of China/CPA	#N/A	#N/A	0.0%	#N/A	4.4%	#N/A	#N/A	#N/A	#N/A
Rest of Latin America	3.0%	0.5%	0.0%	#N/A	1.2%	1.5%	0.0%	1.6%	#N/A
Rest of Middle East	2.2%	2.0%	0.0%	#N/A	1.6%	0.0%	0.0%	3.1%	#N/A
Rest of Non-EU Eastern Europe	2.2%	-0.3%	0.0%	#N/A	-1.7%	0.0%	0.0%	0.2%	#N/A
Rest of Non-EU FSU	#N/A	#N/A	0.0%	#N/A	-3.2%	#N/A	#N/A	#N/A	#N/A
Rest of OECD90 & EU	1.7%	-0.3%	0.0%	#N/A	-0.1%	0.0%	0.0%	0.7%	#N/A
Rest of SE Asia	4.1%	1.0%	0.0%	#N/A	1.0%	1.9%	0.0%	1.9%	#N/A

Table 3: Country mapping for CH₄ and N₂O emissions growth rates

Country	Growth rate region
Aruba	World
Afghanistan	Rest of SE Asia
Anguilla	World
Albania	Albania
Algeria	Algeria
Andorra	Rest of OECD90 & EU
Angola	Rest of Africa
Antigua and Barbuda	Rest of Latin America
Argentina	Argentina
Armenia	Armenia
American Samoa	World
French Southern Territories (a.o. Kerguelen)	World
Australia	Australia
Austria	Austria
Azerbaijan	Azerbaijan
Bahrain	Rest of Middle East
Bangladesh	Bangladesh
Barbados	Rest of Latin America
Burundi	Rest of Africa
Belgium	Belgium
Benin	Rest of Africa
Burkina Faso	Rest of Africa
Bulgaria	Bulgaria
Bahamas	Rest of Latin America
Bosnia and Herzegovina	Rest of Non-EU Eastern Europe
Belarus	Belarus
Belize	Rest of Latin America
Bermuda	World
Bolivia	Bolivia
Brazil	Brazil
Myanmar	Myanmar
Brunei Darussalam	Rest of SE Asia
Bhutan	Rest of SE Asia
Bouvet Island	World
Botswana	Rest of Africa
Central African Republic	World
Canada	Canada
Cambodia	Cambodia
Cocos (Keeling) Islands	World
Chad	Rest of Africa
Chile	Chile
China	China
Colombia	Colombia
Sri Lanka	Rest of SE Asia
Cameroon	Rest of Africa
Republic of the Congo (Brazzaville)	Rest of Africa

Cook Islands	World
Comoros	Rest of Africa
Cape Verde	Rest of Africa
Côte d'Ivoire	Rest of Africa
Costa Rica	Rest of Latin America
Cuba	Rest of Latin America
Christmas Island (Australia)	World
Cayman Islands	World
Cyprus	Rest of OECD90 & EU
Czech Republic	Czech Republic
Germany	Germany
Djibouti	Rest of Africa
Democratic People's Republic of Korea	North Korea
Dominica	Rest of Latin America
Denmark	Denmark
Dominican Republic	Rest of Latin America
Democratic Republic of Congo (Kinshasa)	Democratic Republic of Congo (Kinshasa)
Egypt	Egypt
Ecuador	Ecuador
Eritrea	Rest of Africa
Western Sahara	World
Spain	Spain
Estonia	Estonia
Ethiopia	Ethiopia
Finland	Finland
Fiji	Rest of SE Asia
Falklands Islands (Malvinas)	World
France	France
Faroe Islands (Foroyar)	World
Micronesia	Rest of SE Asia
Gabon	Rest of Africa
United Kingdom	United Kingdom
Georgia	Georgia
Ghana	Rest of Africa
Gibraltar	World
Guadeloupe	World
Gambia	Rest of Africa
Guinea	Rest of Africa
Guinea-Bissau	World
Equatorial Guinea	Rest of Africa
Greece	Greece
Grenada	Rest of Latin America
Greenland	World
Guatemala	Rest of Latin America
French Guiana	World
Guam	World
Guyana	Rest of Latin America
Hong Kong	World
Honduras	Rest of Latin America

Croatia	Croatia
Haiti	Rest of Latin America
Hungary	Hungary
Indonesia	Indonesia
India	India
British Indian Ocean Terr. (Chagos)	World
Ireland	Ireland
Iran	Iran
Iraq	Iraq
Iceland	Iceland
Israel	Israel
Italy	Italy
Jamaica	Rest of Latin America
Jordan	Jordan
Japan	Japan
Kazakhstan	Kazakhstan
Kenya	Rest of Africa
Kyrgyzstan	Kyrgyzstan
Kiribati	Rest of SE Asia
St Kitts & Nevis (St Christopher)	World
Republic of Korea	South Korea
Kuwait	Kuwait
Lao People's Democratic Republic	Laos
Lebanon	Rest of Middle East
Liberia	Rest of Africa
Libyan Arab Jamahiriya	World
Saint Lucia	World
Liechtenstein	Liechtenstein
Lesotho	Rest of Africa
Lithuania	Lithuania
Luxembourg	Luxembourg
Latvia	Latvia
Macau	World
Mauritius	Rest of Africa
Monaco	Monaco
Madagascar	Rest of Africa
Mexico	Mexico
Marshall Islands	Rest of SE Asia
The former Yugoslav Republic of Macedonia	Macedonia
Malaysia	Rest of SE Asia
Maldives	Rest of SE Asia
Mali	Rest of Africa
Malta	Rest of OECD90 & EU
Mongolia	Mongolia
Northern Mariana Islands	World
Moldova	Moldova
Mozambique	Rest of Africa
Morocco	Rest of Africa
Montserrat	World

Mauritania	Rest of Africa
Martinique	World
Malawi	Rest of Africa
Mayotte	World
Netherlands Antilles	World
Nicaragua	Rest of Latin America
New Caledonia	World
Norfolk Island	World
Niger	Rest of Africa
Nigeria	Nigeria
Niue	World
Netherlands	Netherlands
Namibia	Rest of Africa
Norway	Norway
Nepal	Nepal
Nauru	Rest of SE Asia
New Zealand	New Zealand
Oman	Rest of Middle East
Occupied Palestinian Territory	World
Pakistan	Pakistan
Panama	Rest of Latin America
Philippines	Philippines
Palau	World
Papua New Guinea	Rest of SE Asia
Poland	Poland
Paraguay	Rest of Latin America
Puerto Rico	World
Portugal	Portugal
Peru	Peru
French Polynesia (Tuamotu & Marquesas)	World
Qatar	Rest of Middle East
Reunion	World
Romania	Romania
Rwanda	Rest of Africa
Russian Federation	Russian Federation
South Africa	South Africa
Serbia and Montenegro	Rest of Non-EU Eastern Europe
Samoa	Rest of SE Asia
Saudi Arabia	Saudi Arabia
Sudan	Rest of Africa
Senegal	Senegal
Seychelles	Rest of SE Asia
St Helena	World
Svalbard and Jan Mayen Islands	World
Solomon Islands	Rest of SE Asia
El Salvador	Rest of Latin America
San Marino	Rest of OECD90 & EU
Singapore	Singapore
Somalia	Rest of Africa

St-Pierre & Miquelon	World
Sierra Leone	Rest of Africa
Sao Tome and Principe	World
Suriname	Rest of Latin America
Slovak Republic	Slovak Republic
Slovenia	Slovenia
Sweden	Sweden
Switzerland	Switzerland
Swaziland	Rest of Africa
Syrian Arab Republic	World
Turks & Caicos Islands	World
Togo	Rest of Africa
Thailand	Thailand
Tajikistan	Rest of Non-EU FSU
Tokelau	World
Turkmenistan	Turkmenistan
Timor Timur (East Timor)	World
Tonga	Rest of SE Asia
Trinidad and Tobago	Rest of Latin America
Tunisia	Rest of Africa
Turkey	Turkey
Tuvalu	Rest of SE Asia
Taiwan	Rest of SE Asia
United Republic of Tanzania	World
United Arab Emirates	United Arab Emirates
Uganda	Uganda
Ukraine	Ukraine
US Minor Outlying Islands	World
Uruguay	Uruguay
United States	United States
Uzbekistan	Uzbekistan
Holy See (Vatican City)	Rest of OECD90 & EU
Saint Vincent and the Grenadines	World
Venezuela	Venezuela
British Virgin Islands	World
Virgin Islands (US)	World
Viet Nam	Viet Nam
Vanuatu	Rest of SE Asia
Wallis & Futuna	World
Yemen	Rest of Middle East
Zambia	Rest of Africa
Zimbabwe	Rest of Africa

Note: Territories were assigned World growth rates since emissions drivers for territories can be very different from those for the parent country.

Table 4: Emissions category mapping for CH₄ and N₂O growth rates

v6 input emissions data category	v6 input data id	USEPA (2006) id	USEPA (2006) category
Adipic & Nitric Acid Production	ADIPAC	ADIPNIT	Adipic & Nitric Acid Production
	ADIPNIT	ADIPNIT	
	NITACID	ADIPNIT	
Biomass Burning	AGRES	OTHAG	Other Agriculture
	MHLFF	OTHAG	
	MHLGF	OTHAG	
	PBECN	OTHAG	
	SAVAN	OTHAG	
	TROPC	OTHAG	
Biomass Combustion	BIOGAS-TOTAL	BIOCOMB	Biomass Combustion
	LIQUID BIOFUELS-TOTAL	BIOCOMB	
	SOLID-AG	BIOCOMB	
	SOLID-CPS	BIOCOMB	
	SOLID-EN	BIOCOMB	
	SOLID-IND-CHEM/PETROCHEM	BIOCOMB	
	SOLID-IND-CONST	BIOCOMB	
	SOLID-IND-FOOD/TOBACCO	BIOCOMB	
	SOLID-IND-IRON/STEEL	BIOCOMB	
	SOLID-IND-MACHINERY	BIOCOMB	
	SOLID-IND-MINING/QUARRYING	BIOCOMB	
	SOLID-IND-NONFERROUS_METALS	BIOCOMB	
	SOLID-IND-NONMETALLIC	BIOCOMB	
	SOLID-IND-PRP	BIOCOMB	
	SOLID-IND-PULP/PAPER	BIOCOMB	
	SOLID-IND-TEXTILES/LEATHER	BIOCOMB	
	SOLID-IND-TRANSPORT	BIOCOMB	
	SOLID-IND-WOOD	BIOCOMB	
	SOLID-RES	BIOCOMB	
	SOLID-TRANSFORM-CHP	BIOCOMB	
	SOLID-TRANSFORM-CPP	BIOCOMB	
	SOLID-TRANSFORM-ELEC	BIOCOMB	
	SOLID-TRANSFORM-HEAT	BIOCOMB	
	SOLID-TRANSFORM-OTHER	BIOCOMB	

	SOLID-TRANSPORT	BIOCOMB	
Cropland Soils	SOIL	SOIL	Agricultural soils
Fugitives from Coal Mining Activities	COAL	COAL	Fugitives from Coal Mining Activities
Fugitives from Oil and Natural Gas Systems	NATGAS_DIST	OILGAS	Fugitives from Oil and Natural Gas Systems
	NATGAS_EXP	OILGAS	
	NATGAS_FLR	OILGAS	
	NATGAS_LK	OILGAS	
	NATGAS_LKIND	OILGAS	
	NATGAS_LKRES	OILGAS	
	NATGAS_PROD	OILGAS	
	NATGAS_TRANS	OILGAS	
	NATGAS_VNT	OILGAS	
	OIL_DIS	OILGAS	
	OIL_EXP	OILGAS	
	OIL_FLR	OILGAS	
	OIL_OTH	OILGAS	
	OIL_PROD	OILGAS	
	OIL_REF	OILGAS	
	OIL_TRANS	OILGAS	
	OIL_VNT	OILGAS	
	OILGAS	OILGAS	
	OILGAS_FLR	OILGAS	
	OILGAS_GEO	OILGAS	
	OILGAS_STOR	OILGAS	
	OILGAS_UND	OILGAS	
	OILGAS_VNT	OILGAS	
Human Sewage	HUMSEW	HUMSEW	Human Sewage
Landfilling of Solid Waste	LNDFL	LNDFL	Landfilling of Solid Waste
Livestock Enteric Fermentation	BUFFALO	ENTFERM	Livestock Enteric Fermentation
	CAMEL/LLAMA	ENTFERM	
	DAIRY_CATTLE	ENTFERM	
	GOAT	ENTFERM	
	HORSE	ENTFERM	
	MULE/ASS	ENTFERM	
	NONDAIRY_CATTLE	ENTFERM	
	OTHER	ENTFERM	
	POULTRY	ENTFERM	
	SHEEP/LAMB	ENTFERM	
	SWINE	ENTFERM	
	UNKNOWN	ENTFERM	
Livestock Manure Management	BUFFALO	MANURE	Livestock Manure Management
	CAMEL/LLAMA	MANURE	
	DAIRY_CATTLE	MANURE	
	GOAT	MANURE	
	HORSE	MANURE	
	MULE/ASS	MANURE	
	NONDAIRY_CATTLE	MANURE	

	OTHER	MANURE	
	POULTRY	MANURE	
	SHEEP/LAMB	MANURE	
	SWINE	MANURE	
	UNKNOWN	MANURE	
Other Industrial Non-Agricultural Sources	ALLMTL	IND_NONAG	Other Industrial Non-Agricultural Sources
	ALMNFER	IND_NONAG	
	CHMIND	IND_NONAG	
	IRNSTL	IND_NONAG	
	MINPROD	IND_NONAG	
	OTHER	IND_NONAG	
Pasture, Range, and Paddock	BUFFALO	SOIL	Agricultural soils
	CAMEL/LLAMA	SOIL	
	DAIRY_CATTLE	SOIL	
	GOAT	SOIL	
	HORSE	SOIL	
	MULE/ASS	SOIL	
	NONDAIRY_CATTLE	SOIL	
	OTHER	SOIL	
	POULTRY	SOIL	
	SHEEP/LAMB	SOIL	
	SWINE	SOIL	
	UNKNOWN	SOIL	
Paddy Rice Cultivation	RICE	RICE	Paddy Rice Cultivation
Stationary and Mobile Combustion	STATMOB	STATMOB	Stationary and Mobile Combustion
	STM_AG	STATMOB	
	STM_CPS	STATMOB	
	STM_EN	STATMOB	
	STM_IND	STATMOB	
	STM_MO	STATMOB	
	STM_OTH	STATMOB	
	STM_RES	STATMOB	
	STM_UNSOOTH	STATMOB	
Wastewater Treatment	WWTER	WWTER	Wastewater Treatment

Fluorinated gases (F-gases)

For the F-gases, we used a different approach based on output growth between 2001 (GTAP version 6) and 2004 (GTAP version 7). The following steps were taken:

1. Version 7 base data was mapped from 113 regions to the 87 regions of version 6.
2. The aggregated version 7 data were deflated to 2001 US dollars.
3. Annual growth rates in regional output for the F-gas emitting sectors between 2001 and 2004 (or between version 6 and adjusted version 7) were computed (Table 5).
4. The growth rates for 87 regions were applied to the version 6 raw input emissions data. We used the same growth rates for all countries within each of the 87 regions.

This methodology has two disadvantages: it reflects changes in the value of production (price as well as quantity) versus just quantities, and it uses a single regional GDP deflator, which does not distinguish between sector specific changes in output prices.

Table 5: F-gas annual growth rates for relevant sectors

Region		Sector			
		33 crp	36 nfm	40 ele	43 ely
1	aus	17%	16%	18%	4%
2	nzl	11%	16%	23%	9%
3	xoc	10%	24%	17%	91%
4	chn	9%	15%	33%	19%
5	hkg	11%	70%	9%	17%
6	jpn	6%	4%	3%	-5%
7	kor	12%	20%	16%	-1%
8	twn	12%	21%	12%	-9%
9	xea	-19%	-8%	-6%	-2%
10	idn	30%	21%	-1%	6%
11	mys	16%	18%	4%	-4%
12	phl	0%	-11%	9%	-7%
13	sgp	27%	11%	0%	-9%
14	tha	20%	25%	11%	3%
15	vnm	47%	42%	42%	26%
16	xse	-56%	6%	-53%	7%
17	bgd	-1%	6%	8%	35%
18	ind	8%	9%	8%	11%
19	lka	26%	85%	20%	26%
20	xsa	-17%	-8%	29%	29%
21	can	9%	16%	-9%	1%
22	usa	-1%	-4%	8%	3%
23	mex	10%	16%	10%	42%
24	xna	4%	20%	20%	25%
25	col	1%	48%	6%	3%
26	per	56%	16%	14%	3%
27	ven	-11%	2%	-13%	1%
28	xap	7%	-11%	8%	13%
29	arg	-13%	-12%	-21%	-25%
30	bra	6%	12%	0%	14%
31	chl	7%	13%	4%	-14%
32	ury	-19%	-15%	-50%	-21%
33	xsm	20%	19%	32%	0%
34	xca	-1%	-16%	31%	7%
35	xfa	19%	18%	39%	40%
36	xcb	34%	31%	76%	26%
37	aut	25%	21%	9%	-6%
38	bel	20%	11%	5%	12%
39	dnk	25%	37%	9%	15%
40	fin	14%	13%	-1%	10%
41	fra	19%	6%	1%	0%
42	deu	13%	6%	1%	13%

43	gbr	13%	-3%	11%	2%
44	grc	16%	14%	-12%	6%
45	irl	28%	4%	15%	10%
46	ita	11%	11%	10%	19%
47	lux	21%	29%	31%	67%
48	nld	21%	8%	7%	7%
49	prt	15%	10%	15%	-2%
50	esp	29%	37%	22%	-1%
51	swe	13%	31%	16%	11%
52	che	7%	21%	13%	-9%
53	xef	4%	13%	-15%	7%
54	xer	28%	22%	23%	10%
55	alb	25%	28%	32%	16%
56	bgr	15%	19%	17%	-7%
57	hrv	16%	17%	30%	5%
58	cyp	18%	31%	38%	22%
59	cze	23%	-10%	28%	15%
60	hun	15%	11%	29%	12%
61	mlt	25%	22%	24%	7%
62	pol	11%	9%	8%	11%
63	rom	10%	-5%	-21%	-10%
64	svk	18%	19%	34%	21%
65	svn	19%	15%	14%	4%
66	est	28%	-21%	1%	1%
67	lva	19%	4%	23%	-2%
68	ltu	25%	11%	24%	4%
69	rus	18%	18%	39%	8%
70	xsu	-46%	-33%	-53%	-2%
71	tur	24%	34%	29%	11%
72	xme	9%	20%	5%	10%
73	mar	16%	13%	25%	9%
74	tun	11%	7%	6%	-7%
75	xnf	-12%	12%	8%	8%
76	bwa	9%	21%	7%	-4%
77	zaf	31%	-3%	27%	-22%
78	xsc	64%	46%	35%	4%
79	mwi	-1%	11%	7%	-7%
80	moz	17%	31%	33%	5%
81	tza	4%	-6%	5%	-8%
82	zmb	29%	8%	13%	-3%
83	zwe	-17%	11%	-3%	2%
84	xsd	15%	11%	91%	5%
85	mdg	-6%	113%	6%	-10%
86	uga	27%	23%	12%	0%
87	xss	-9%	-5%	12%	6%

Development of future non-CO₂ emissions datasets

Significant time and resources were required to develop the detailed 2001 emissions data for the GTAP version 6 non-CO₂ emissions database (Rose et al., 2007). Given that version 7's base year (2004) is only three years later than version 6's base year (2001), growth rates based on near-term projections were considered a reasonable and practical alternative to fully reproducing the effort involved for version 6. However, as a result, the estimated version 7 emissions can differ from reported 2004 emissions for those countries reporting emissions.

The reliability of the growth rate approach we using here for version 7 declines further out in time. Therefore, subsequent datasets for future GTAP releases should consider using reported emissions for reporting countries and directly estimating emissions for non-reporting countries every other or every third version (i.e., versions 8, 10, etc. or versions 9, 12, etc.).

One final note: additional emissions categories are be added to the version 6 and 7 datasets, including biomass combustion non-CO₂ emissions and other CO₂ emissions not attributable to fossil fuel combustion. See Rose and Lee (2009) for details.

References

Rose, S., S. Finn, E. Scheele, J. Mangino, K. Delhotal, J. Siedenburger, H. Perez, 2007. "Detailed greenhouse gas emissions data for global economic modeling", United States Environmental Protection Agency, Washington, DC.

Rose, Steven and Huey-Lin Lee, 2009. "Non-CO₂ Greenhouse Gas Emissions Data for Climate Change Economic Analysis" in Thomas W. Hertel, Steven Rose, Richard Tol (eds.), *Economic Analysis of Land Use in Global Climate Change Policy*, Routledge Publishing.

USEPA, 2006. *Global Emissions of Non-CO₂ Greenhouse Gases: 1990-2020*. United States Environmental Protection Agency (US-EPA), Washington, D.C., EPA Report 430-R-06-003, <http://www.epa.gov/nonco2/econ-inv/international.html>

Appendix – Figures in MtCO₂eq

Figure A1: Global N₂O, CH₄, and F-gas version 6 and version 7 emissions

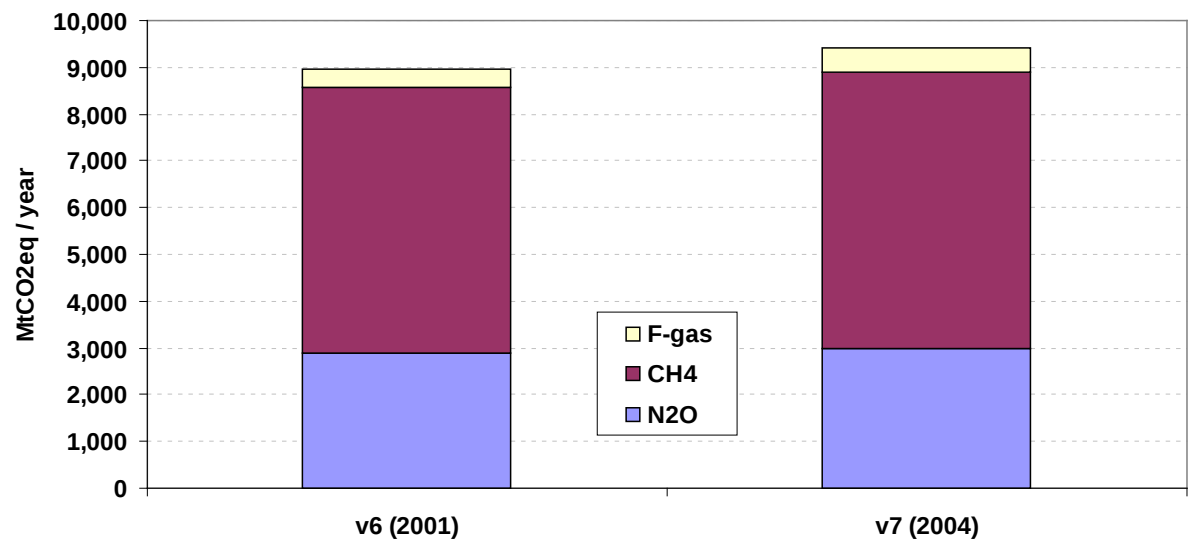


Figure A2: Global N₂O emissions by sector

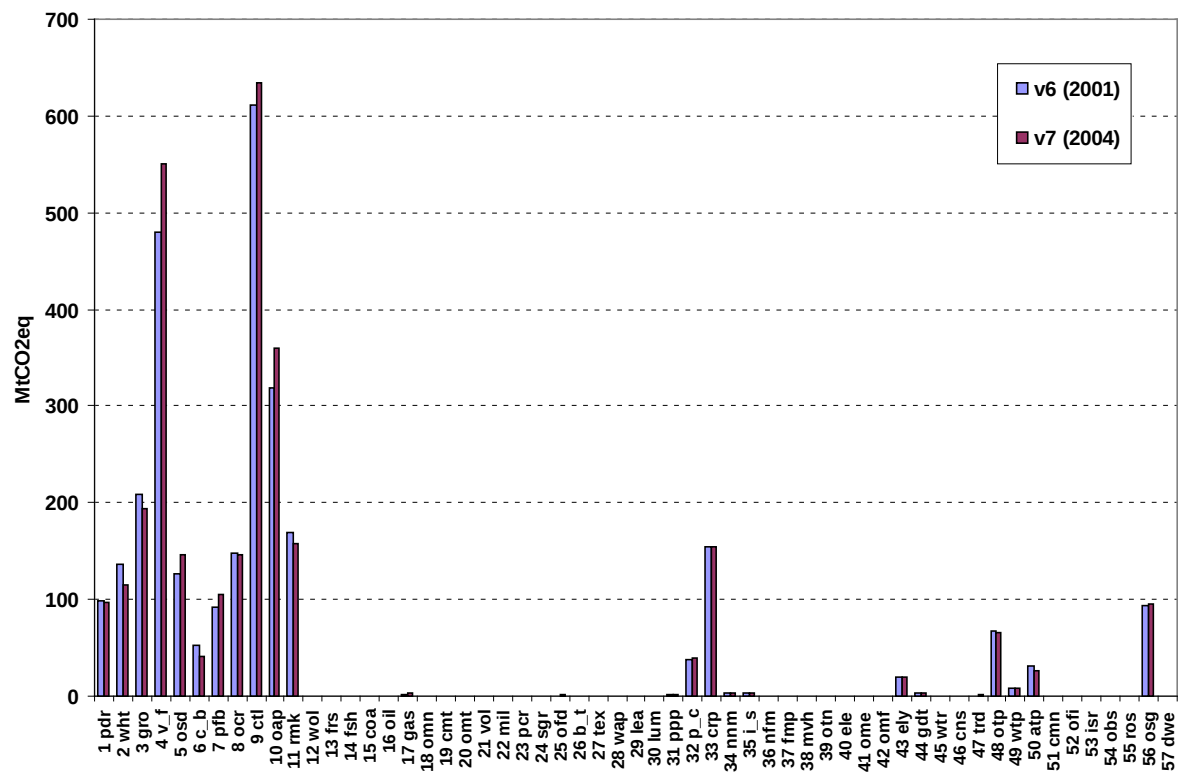


Figure A3: Global CH4 emissions by sector

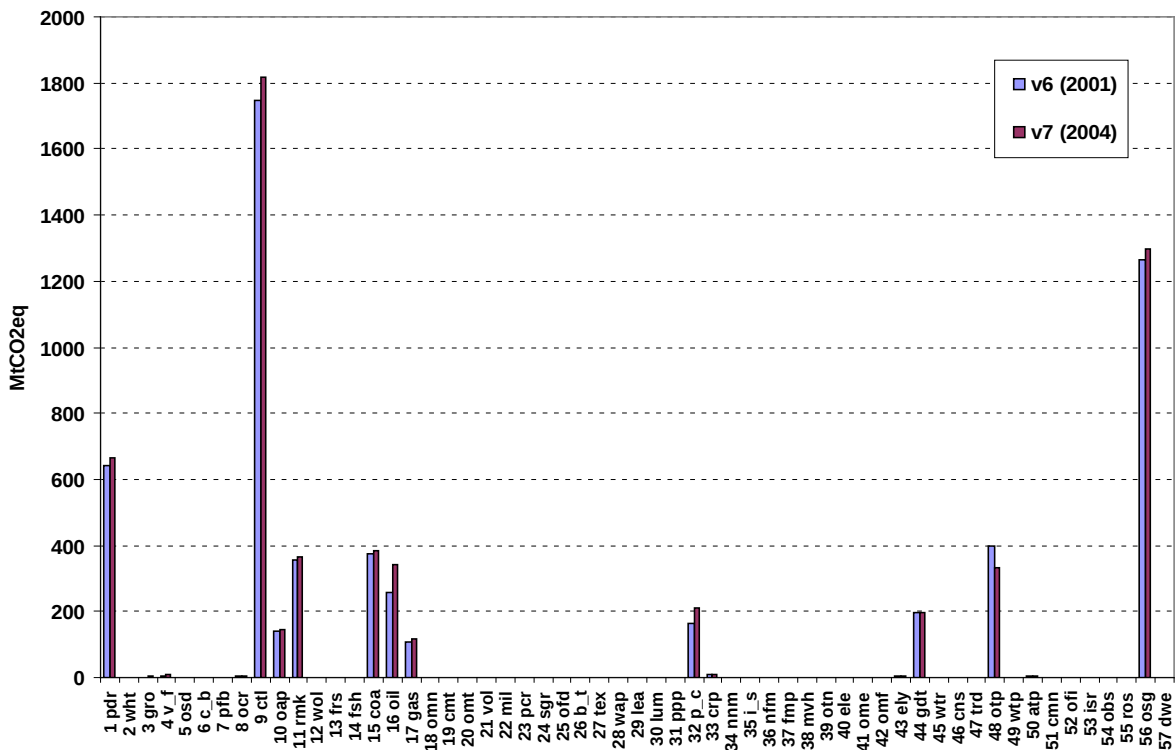


Figure A4: Global F-gas emissions by sector

