

Uncertainty analysis associated to the 2008 Romanian Greenhouse Gas Inventory

Description of methodology used for the uncertainty calculation

In order to help prioritise efforts to improve the accuracy of the inventory in the future and to guide decisions on methodological choice and also in order to allow for a complete emissions inventory, Romania built the uncertainty analysis.

According to the provisions in Chapter 6 of the IPCC Good Practice Guidance (2000), in the Chapter 5 of the IPCC Good Practice Guidance for Land-Use, Land-Use Change and Forestry and also taking into account local conditions, Romania carried out the uncertainty analysis on the basis of the Tier 1 method.

The uncertainty calculation was performed using the framework provided in the IPCC Good Practice Guidance (2000) and also in the IPCC Good Practice Guidance for LULUCF 2003. Except two particular cases specific to the Waste sector, the disaggregation of the inventory into categories is equivalent to the key category analysis splitting.

The emissions estimates uncertainty calculations are presented in the next tables.

GHG Sector	IPCC source category	GHG	1989 emissions	2006 emissions	AD uncertainty	EF uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year 2006	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by EF uncertainty	Uncertainty in trend in national emissions introduced by AD uncertainty	Uncertainty introduced into the trend in total national emissions
			[Gg CO2 equiv.]	[Gg CO2 equiv.]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Energy	Fugitive emissions -oil and natural gas	CH4	21810.766	8769.128	5	300	300.042	16.793	-0.012	0.031	-3.566	0.220	3.573
	Fugitive emissions -solid fuels	CH4	6382.366	2598.498	5	250	250.050	4.147	-0.003	0.009	-0.841	0.065	0.844
	Mobile combustion -civil aviation	CO2	25.687	11.890	5	5	7.071	0.001	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -civil aviation	N2O	0.225	0.104	5	200	200.062	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -civil aviation	CH4	0.004	0.002	5	40	40.311	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -navigation	CO2	257.175	39.844	5	5	7.071	0.002	0.000	0.000	-0.002	0.001	0.002
	Mobile combustion -navigation	N2O	0.628	0.101	5	200	200.062	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -navigation	CH4	0.355	0.057	5	40	40.311	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -railways	CO2	919.754	223.277	5	5	7.071	0.010	-0.001	0.001	-0.005	0.006	0.008
	Mobile combustion -railways	N2O	2.529	0.566	5	200	200.062	0.001	0.000	0.000	-0.001	0.000	0.001
	Mobile combustion -railways	CH4	1.393	0.320	5	40	40.311	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -road	CO2	4574.478	11952.897	5	5	7.071	0.539	0.033	0.042	0.167	0.300	0.343
	Mobile combustion -road	CH4	13.581	37.957	5	40	40.311	0.010	0.000	0.000	0.004	0.001	0.004
	Mobile combustion -road	N2O	11.836	30.768	5	200	200.062	0.039	0.000	0.000	0.017	0.001	0.017
	Other transportation -other (pipeline)	CO2	7.459	53.987	5	5	7.071	0.002	0.000	0.000	0.001	0.001	0.002
	Stationary combustion -biomass	CH4	153.165	736.559	5	20	20.616	0.097	0.002	0.003	0.046	0.018	0.050
	Stationary combustion -biomass	N2O	32.694	163.956	5	200	200.062	0.209	0.001	0.001	0.103	0.004	0.104
	Stationary combustion gaseous fuels	CO2	61915.056	30032.432	5	5	7.071	1.355	-0.016	0.107	-0.078	0.753	0.757
	Stationary combustion gaseous fuels	CH4	53.085	38.615	5	20	20.616	0.005	0.000	0.000	0.001	0.001	0.001
	Stationary combustion gaseous fuels	N2O	34.385	16.679	5	200	200.062	0.021	0.000	0.000	-0.002	0.000	0.002
Stationary combustion liquid fuels	CO2	32831.544	13902.561	5	5	7.071	0.627	-0.015	0.049	-0.077	0.349	0.357	
Stationary combustion liquid fuels	N2O	82.966	36.126	5	200	200.062	0.046	0.000	0.000	-0.007	0.001	0.007	
Stationary combustion liquid fuels	CH4	34.879	16.175	5	20	20.616	0.002	0.000	0.000	0.000	0.000	0.000	
Stationary combustion solid fuels	CO2	58887.582	36600.364	5	5	7.071	1.652	0.014	0.130	0.069	0.918	0.921	
Stationary combustion solid fuels	N2O	233.272	151.178	5	200	200.062	0.193	0.000	0.001	0.015	0.004	0.016	
Stationary combustion solid fuels	CH4	143.427	17.477	5	20	20.616	0.002	0.000	0.000	-0.004	0.000	0.004	

GHG Sector	IPCC source category	GHG	1989 emissions	2006 emissions	AD uncertainty	EF uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year 2006	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by EF uncertainty	Uncertainty in trend in national emissions introduced by AD uncertainty	Uncertainty introduced into the trend in total national emissions
Industrial Processes	Chemical industry-other	CH4	41.160	26.733	7.5	30	30.923	0.005	0.000	0.000	0.000	0.001	0.001
	Ammonia production	CO2	5005.500	2370.000	5	42.5	42.793	0.647	-0.001	0.008	-0.062	0.059	0.086
	Cement production	CO2	5571.720	3631.212	2	6	6.325	0.147	0.002	0.013	0.011	0.036	0.038
	Lime production	CO2	3810.034	1974.762	7.5	2	7.762	0.098	-0.001	0.007	-0.001	0.074	0.074
	Aluminium production	CO2	398.310	383.736	3	30	30.150	0.074	0.001	0.001	0.017	0.006	0.018
	Carbide production	CO2	136.800	15.200	5	10	11.180	0.001	0.000	0.000	-0.002	0.000	0.002
	Ferroalloys production	CO2	338.300	95.904	5	37.5	37.832	0.023	0.000	0.000	-0.012	0.002	0.012
	Iron and steel production	CO2	15831.127	8128.883	5	5	7.071	0.367	-0.002	0.029	-0.012	0.204	0.204
	Limestone and dolomite use	CO2	1709.912	945.582	7.5	30	30.923	0.187	0.000	0.003	-0.001	0.036	0.036
	Soda ash production and use	CO2	142.178	71.089	7.5	30	30.923	0.014	0.000	0.000	-0.001	0.003	0.003
	Mineral products - other	CO2	109.750	30.100	5	20	20.616	0.004	0.000	0.000	-0.002	0.001	0.002
	Solvent and other product use	CO2	645.800	208.496	30	50	58.310	0.078	-0.001	0.001	-0.027	0.031	0.041
	Consumption of halocarbons	HFC+PFC+	0.000	21.815	30	50	58.310	0.008	0.000	0.000	0.004	0.003	0.005
	Adipic acid production	N2O	677.691	0.000	2	10	10.198	0.000	-0.001	0.000	-0.013	0.000	0.013
	Nitric acid production	N2O	6762.314	2507.007	3	40	40.112	0.642	-0.004	0.009	-0.178	0.038	0.182
Aluminium production	PFC	3349.518	609.629	30	50	58.310	0.227	-0.004	0.002	-0.222	0.092	0.240	
Agriculture	CH4 from enteric fermentation	CH4	11075.95183	5645.74731	20	50	53.852	1.940	-0.002	0.020	-0.090	0.566	0.574
	CH4 from manure management	CH4	4258.863654	2093.88222	20	20	28.284	0.378	-0.001	0.007	-0.019	0.210	0.211
	N2O from manure management	N2O	3165.09416	1772.849597	53.85	100	113.577	1.285	0.000	0.006	0.005	0.479	0.479
	CH4 from rice production	CH4	207.06	23.52	5	40	40.311	0.006	0.000	0.000	-0.013	0.001	0.013
	Direct N2O emissions from agricultural soils	N2O	11234.24862	5521.9166	20	80	82.462	2.906	-0.003	0.020	-0.205	0.554	0.591
	Agricultural soils: animal production	N2O	2990.234978	1538.443953	53.85	100	113.577	1.115	0.000	0.005	-0.044	0.416	0.418
	Indirect N2O emissions from agricultural soils	N2O	7533.82968	3489.914837	30	50	58.310	1.299	-0.002	0.012	-0.124	0.525	0.540
	CH4 from field burning of agricultural residues	CH4	102.035539	74.36962893	10	20	22.361	0.011	0.000	0.000	0.001	0.004	0.004
	N2O from field burning of agricultural residues	N2O	37.93344756	29.96029167	10	20	22.361	0.004	0.000	0.000	0.001	0.002	0.002
Waste	CH4 from managed solid waste disposal	CH4		2705.985898	30	42	51.614	0.891	0.010	0.010	0.403	0.407	0.573
	CH4 from unmanaged solid waste dispos	CH4	2347.532318	3180.317017	30	73	78.924	1.602	0.007	0.011	0.486	0.479	0.682
	CH4 from industrial wastewater	CH4	4100.054491	1833.884341	144	30	147.092	1.722	-0.002	0.007	-0.047	1.325	1.326
	CH4 from domestic and commercial wast	CH4	1302.305586	1260.22062	30	30	42.426	0.341	0.002	0.004	0.057	0.190	0.198
	N2O from wastewater handling	N2O	599.364358	718.4463195	30	30	42.426	0.195	0.001	0.003	0.041	0.108	0.116
	CO2 from waste incineration	CO2		338.8931722	10	30	31.623	0.068	0.001	0.001	0.036	0.017	0.040
	Total			281894.913	156680.020				18.140				

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			[Gg CO2 equiv.]	[Gg CO2 equiv.]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
Energy	Fugitive emissions -oil and natural gas	CH4	21810.766	8769.128	5	300	300.042	22.076	-0.007	0.035	-1.996	0.249	2.012
	Fugitive emissions -solid fuels	CH4	6382.366	2598.498	5	250	250.050	5.452	-0.002	0.010	-0.455	0.074	0.461
	Mobile combustion -civil aviation	CO2	25.687	11.890	5	5	7.071	0.001	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -civil aviation	N2O	0.225	0.104	5	200	200.062	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -civil aviation	CH4	0.004	0.002	5	40	40.311	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -navigation	CO2	257.175	39.844	5	5	7.071	0.002	0.000	0.000	-0.002	0.001	0.002
	Mobile combustion -navigation	N2O	0.628	0.101	5	200	200.062	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -navigation	CH4	0.355	0.057	5	40	40.311	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -railways	CO2	919.754	223.277	5	5	7.071	0.013	-0.001	0.001	-0.004	0.006	0.008
	Mobile combustion -railways	N2O	2.529	0.566	5	200	200.062	0.001	0.000	0.000	-0.001	0.000	0.001
	Mobile combustion -railways	CH4	1.393	0.320	5	40	40.311	0.000	0.000	0.000	0.000	0.000	0.000
	Mobile combustion -road	CO2	4574.478	11952.897	5	5	7.071	0.709	0.039	0.048	0.196	0.339	0.392
	Mobile combustion -road	CH4	13.581	37.957	5	40	40.311	0.013	0.000	0.000	0.005	0.001	0.005
	Mobile combustion -road	N2O	11.836	30.768	5	200	200.062	0.052	0.000	0.000	0.020	0.001	0.020
	Other transportation -other (pipeline)	CO2	7.459	53.987	5	5	7.071	0.003	0.000	0.000	0.001	0.002	0.002
	Stationary combustion -biomass	CH4	153.165	736.559	5	20	20.616	0.127	0.003	0.003	0.053	0.021	0.057
	Stationary combustion -biomass	N2O	32.694	163.956	5	200	200.062	0.275	0.001	0.001	0.119	0.005	0.119
	Stationary combustion gaseous fuels	CO2	61915.056	30032.432	5	5	7.071	1.782	0.002	0.120	0.009	0.852	0.852
	Stationary combustion gaseous fuels	CH4	53.085	38.615	5	20	20.616	0.007	0.000	0.000	0.001	0.001	0.002
	Stationary combustion gaseous fuels	N2O	34.385	16.679	5	200	200.062	0.028	0.000	0.000	0.000	0.000	0.001
Stationary combustion liquid fuels	CO2	32831.544	13902.561	5	5	7.071	0.825	-0.007	0.056	-0.036	0.394	0.396	
Stationary combustion liquid fuels	N2O	82.966	36.126	5	200	200.062	0.061	0.000	0.000	-0.003	0.001	0.003	
Stationary combustion liquid fuels	CH4	34.879	16.175	5	20	20.616	0.003	0.000	0.000	0.000	0.000	0.000	
Stationary combustion solid fuels	CO2	58887.582	36600.364	5	5	7.071	2.171	0.034	0.147	0.169	1.038	1.052	
Stationary combustion solid fuels	N2O	233.272	151.178	5	200	200.062	0.254	0.000	0.001	0.032	0.004	0.032	
Stationary combustion solid fuels	CH4	143.427	17.477	5	20	20.616	0.003	0.000	0.000	-0.004	0.000	0.004	

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Industrial Processes	Chemical industry-other	CH4	41.160	26.733	7.5	30	30.923	0.007	0.000	0.000	0.001	0.001	0.001
	Ammonia production	CO2	5005.500	2370.000	5	42.5	42.793	0.851	0.000	0.010	-0.004	0.067	0.067
	Cement production	CO2	5571.720	3631.212	2	6	6.325	0.193	0.004	0.015	0.023	0.041	0.047
	Lime production	CO2	3810.034	1974.762	7.5	2	7.762	0.129	0.001	0.008	0.001	0.084	0.084
	Aluminium production	CO2	398.310	383.736	3	30	30.150	0.097	0.001	0.002	0.023	0.007	0.024
	Carbide production	CO2	136.800	15.200	5	10	11.180	0.001	0.000	0.000	-0.002	0.000	0.002
	Ferrous alloys production	CO2	338.300	95.904	5	37.5	37.832	0.030	0.000	0.000	-0.010	0.003	0.010
	Iron and steel production	CO2	15831.127	8128.883	5	5	7.071	0.482	0.002	0.033	0.011	0.231	0.231
	Limestone and dolomite use	CO2	1709.912	945.582	7.5	30	30.923	0.245	0.001	0.004	0.015	0.040	0.043
	Soda ash production and use	CO2	142.178	71.089	7.5	30	30.923	0.018	0.000	0.000	0.000	0.003	0.003
	Mineral products - other	CO2	109.750	30.100	5	20	20.616	0.005	0.000	0.000	-0.002	0.001	0.002
	Solvent and other product use	CO2	645.800	208.496	30	50	58.310	0.102	0.000	0.001	-0.020	0.035	0.041
	Consumption of halocarbons	HFC+PFC+	0.000	21.815	30	50	58.310	0.011	0.000	0.000	0.004	0.004	0.006
	Adipic acid production	N2O	677.691	0.000	2	10	10.198	0.000	-0.001	0.000	-0.013	0.000	0.013
	Nitric acid production	N2O	6762.314	2507.007	3	40	40.112	0.844	-0.003	0.010	-0.117	0.043	0.124
Aluminium production	PFC	3349.518	609.629	30	50	58.310	0.298	-0.004	0.002	-0.199	0.104	0.224	
Agriculture	CH4 from enteric fermentation	CH4	11075.95183	5645.74731	20	50	53.852	2.551	0.001	0.023	0.070	0.641	0.644
	CH4 from manure management	CH4	4258.863654	2093.88222	20	20	28.284	0.497	0.000	0.008	0.005	0.238	0.238
	N2O from manure management	N2O	3165.09416	1772.849597	53.85	100	113.577	1.689	0.001	0.007	0.104	0.542	0.552
	CH4 from rice production	CH4	207.06	23.52	5	40	40.311	0.008	0.000	0.000	-0.012	0.001	0.012
	Direct N2O emissions from agricultural soils	N2O	11234.24862	5521.9166	20	80	82.462	3.821	0.001	0.022	0.048	0.627	0.628
	Agricultural soils: animal production	N2O	2990.234978	1538.443953	53.85	100	113.577	1.466	0.000	0.006	0.044	0.470	0.472
	Indirect N2O emissions from agricultural soils	N2O	7533.82968	3489.914837	30	50	58.310	1.707	0.000	0.014	-0.023	0.594	0.594
	CH4 from field burning of agricultural residues	CH4	102.035539	74.36962893	10	20	22.361	0.014	0.000	0.000	0.002	0.004	0.005
	N2O from field burning of agricultural residues	N2O	37.93344756	29.96029167	10	20	22.361	0.006	0.000	0.000	0.001	0.002	0.002
Waste	CH4 from managed solid waste disposal	CH4		2705.985898	30	42	51.614	1.172	0.011	0.011	0.456	0.461	0.648
	CH4 from unmanaged solid waste disposal	CH4	2347.532318	3180.317017	30	73	78.924	2.106	0.008	0.013	0.603	0.541	0.810
	CH4 from industrial wastewater	CH4	4100.054491	1833.884341	144	30	147.092	2.263	-0.001	0.007	-0.015	1.498	1.498
	CH4 from domestic and commercial waste	CH4	1302.305586	1260.22062	30	30	42.426	0.449	0.003	0.005	0.077	0.215	0.228
	N2O from wastewater handling	N2O	599.364358	718.4463195	30	30	42.426	0.256	0.002	0.003	0.052	0.122	0.133
	CO2 from waste incineration	CO2		338.8931722	10	30	31.623	0.090	0.001	0.001	0.041	0.019	0.045
LULUCF	CO2 from Forest Land remaining Forest Land	CO2	-32641.41699	-37497.24908	45	60	75	-23.596	-0.088	-0.150	-5.276	-9.574	10.931
	CH4 from Forest Land remaining Forest Land	CH4	0.21108024	2.14711728	45	60	75	0.001	0.000	0.000	0.000	0.001	0.001
	N2O from Forest Land remaining Forest Land	N2O	0.021422147	0.217906843	45	60	75	0.000	0.000	0.000	0.000	0.000	0.000
Total			249253.728	119185.136				33.548					11.454