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Adjusted historic emission data, projections, and optimized emission reduction targets for 2030 – A comparison with COM data 2013

Part B: Results for Member States

TSAP Report #16B

Version 1.1

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Executive Summary

To provide a realistic chance for local and national authorities to take effective measures for achieving compliance with air quality limit values, the Clean Air Policy Package presented by the European Commission includes a proposal for amending the Directive on National Emission Ceilings. It contains national emission reduction commitments for the five main precursor emissions of fine particulate matter in ambient air and for methane.

The proposal of the European Commission has been informed by quantitative modelling of baseline emissions and associated impacts, the scope for further emission reduction options, and cost-effective emission reduction strategies. The analysis was based on statistical information that has been collected in 2012. However, after 2012, many Member States have come forward with revised statistical information on emission inventories for the year 2005, with numerous significant changes compared to the 2012 submission. Between March and July 2014 IIASA held bilateral meetings with all 28 Member States involving more than 110 experts to review and update input data in view of new statistical information.

With the new statistical information, an updated emission control scenario has been developed that results in the same relative reduction in premature mortality as the original Commission proposal (52% by 2030 compared to 2005) with the same gap closure of 67%. This report, which forms Part B of TSAP Report #16, provides results of the revised scenario for all Member States, and lists the main factors that lead to differences compared to the original Commission proposal.

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List of acronyms

CH_4	Methane
CLE	Current legislation
CO_2	Carbon dioxide
COM	European Commission
EF	Emission factors
EU	European Union
GAINS	Greenhouse gas - Air pollution Interactions and Synergies model
IED	Industrial Emissions Directive
IIASA	International Institute for Applied Systems Analysis
kt	kilotons = 10^3 tons
MCP	Mid-size Combustion Plants
MTFR	Maximum technically feasible emission reductions
NEC	National Emission Ceilings
NH_3	Ammonia
NMVOC	Non-methane volatile organic compounds
NO_x	Nitrogen oxides
PJ	Petajoule = 10^{15} joule
PM10	Fine particles with an aerodynamic diameter of less than 10 µm
PM2.5	Fine particles with an aerodynamic diameter of less than 2.5 µm
PRIMES	Energy Systems Model of the National Technical University of Athens
SO_2	Sulphur dioxide
TSAP	Thematic Strategy on Air Pollution
VOC	Volatile organic compounds
WPE	Working Party on Environment of the European Council

Introduction

To provide a realistic chance for local and national authorities to take effective measures for achieving compliance with air quality limit values, the Clean Air Policy Package presented by the European Commission in 2013 (EC 2013) includes a proposal for amending the Directive on National Emission Ceilings. It contains national emission reduction commitments for the five main precursor emissions of fine particulate matter in ambient air and for methane.

The proposal of the European Commission has been informed by quantitative modelling of baseline emissions and associated impacts, the scope for further emission reduction options, and cost-effective emission reduction strategies. The analysis was based on statistical information that has been collected in 2012 (Amann et al. 2014). However, after 2012, many Member States have come forward with revised statistical information on emission inventories for the year 2005, with numerous significant changes compared to the 2012 submission. Between March and July 2014 IIASA held bilateral meetings with all 28 Member States involving more than 110 experts to review and update input data in view of new statistical information.

With the new statistical information, an updated emission control scenario has been developed that results in the same relative reduction in premature mortality as the original Commission proposal (52% by 2030 compared to 2005) with the same gap closure of 67% as the original Commission proposal. This report, which forms Part B of TSAP Report #16, presents results of the re-optimized scenario for all Member States, and lists the main factors that lead to differences compared to the original Commission proposal.

In particular, the report provides, for each Member State, a summary table that compares the re-optimized emission reduction commitments for 2030 with those of the original proposal, and puts them into perspective with the reductions that have already been achieved in 2012 and the targets for 2020 as they are laid down in the revised Gothenburg Protocol. It provides tables specifying – by sector - for the year 2030, for each pollutant and Member State, the changes in emissions that result from the foreseen changes in emission generating activity levels, the emission reductions that will result from the ongoing implementation of current emission control legislation, and the additional emission reductions that are implied by the re-optimized scenario. The information provided in these tables show the results of the cost-effective emission reduction calculations by GAINS and as such should be considered as indicative: the sectorial reductions indicated should not be interpreted as sectorial emission reduction commitments.

Furthermore, the main factors that have emerged during the bilateral consultations and that lead to differences from the original proposal are also listed for each pollutant and Member State. These include, inter alia, new statistical data on the structure and composition of emission sources in 2005, as well as updated information on the applicability and effectiveness of emission control measures.

1 Austria

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for Austria the overall emission reduction requirement (ERR) in terms of PMeq is four percentage points lower than in the initial COM scenario. This translates into lower reductions for all pollutants. Most significantly, the ERR relative to 2005 is nine percentage points less for SO_2, mainly due to updated statistics on industrial process emissions that also affects the CLE level in 2030. Eliminating the most expensive measures (also as a result of increased constraints to the applicability of several measures) , ERRs for VOC and PM2.5 decline by eight and six percentage points, respectively. [] Emission control costs (on top of CLE) decline by more than 75%.

1.1 Summary

Table 1.1: Summary table for Austria. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	27	-36%	-26%	-47%	-50%	-55%	-38%	-41%	-52%	-9%	-9%	-3%
NO_x	237	-24%	-38%	-72%	-72%	-76%	-71%	-71%	-77%	-1%	-1%	0%
PM2.5	22	-16%	-20%	-34%	-55%	-62%	-38%	-49%	-60%	+4%	-6%	-2%
NH_3	63	-1%	-1%	8%	-19%	-26%	12%	-18%	-31%	-4%	0%	+5%
VOC	165	-18%	-22%	-40%	-48%	-70%	-38%	-40%	-65%	-2%	-8%	-5%
PMeq	60	-27%	-28%	-37%	-51%	-58%	-36%	-47%	-57%	0%	-4%	0%

1.2 Sectoral emission reductions

Table 1.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Austria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-3.3**	**0.0**	**0.0**	**-3.3**
Domestic combustion		**-3.9**	**-0.4**	**0.0**	**-4.3**
Industry		**0.9**	**-2.8**	**-0.8**	**-2.8**
of which	Refineries	0.0	-1.0	-0.3	-1.2
	Other industries	0.9	-1.9	-0.6	-1.6
Road transport		**0.0**	**-0.5**	**0.0**	**-0.5**
of which	Light duty	0.0	-0.3	0.0	-0.3
	Heavy duty	0.0	-0.3	0.0	-0.2
Non-road mobile		**0.0**	**0.0**	**0.0**	**0.0**
Other sectors		**-0.1**	**-0.2**	**0.0**	**-0.3**
TOTAL		**-6.4**	**-4.0**	**-0.9**	**-11.2**

Table 1.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Austria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-5.1**	**-0.2**	**0.0**	**-5.3**
Domestic combustion		**-4.9**	**-0.1**	**0.0**	**-5.0**
Industry		**-0.1**	**-4.1**	**0.0**	**-4.2**
of which	Refineries	-0.7	-1.4	0.0	-2.0
	Other industries	0.5	-2.7	0.0	-2.2
Road transport		**4.8**	**-139.0**	**0.0**	**-134.2**
of which	Light duty	-7.1	-32.1	0.0	-39.1
	Heavy duty	11.9	-106.9	0.0	-95.0
Non road mobile		**-2.3**	**-11.6**	**-1.2**	**-15.2**
Other sectors		**0.3**	**0.0**	**0.0**	**0.3**
TOTAL		**-7.3**	**-154.9**	**-1.3**	**-163.6**

Table 1.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Austria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.4**	**-0.1**	**-1.2**	**-1.0**
Domestic combustion		**-1.4**	**-1.5**	**-0.1**	**-3.0**
Industry		**0.2**	**0.0**	**-0.3**	**-0.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.2	0.0	-0.3	-0.1
Road transport		**1.0**	**-5.1**	**0.0**	**-4.1**
of which	Light duty	0.4	-2.9	0.0	-2.4
	Heavy duty	0.5	-2.2	0.0	-1.7
Non road mobile		**-0.3**	**-1.4**	**-0.2**	**-1.9**
Other sectors		**0.0**	**0.0**	**-0.5**	**-0.5**
TOTAL		**0.0**	**-8.2**	**-2.4**	**-10.6**

Table 1.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Austria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-0.5**	**0.0**	**-4.3**	**-4.9**
Poultry		**-0.3**	**-0.6**	**-1.1**	**-2.0**
Cattle		**9.4**	**-0.1**	**-11.5**	**-2.2**
of which	Dairy	8.1	-0.1	-7.8	0.2
	Meat	1.4	0.0	-3.8	-2.4
Other animals		**0.0**	**0.0**	**0.0**	**0.0**
Mineral fertilizers		**1.0**	**0.0**	**-1.4**	**-0.4**
Other non -agricultural sources		**-1.6**	**-0.1**	**-0.1**	**-1.8**
TOTAL		**8.0**	**-0.8**	**-18.5**	**-11.3**

Table 1.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Austria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.4**	**0.0**	**0.0**	**-0.4**
Domestic combustion		**-5.6**	**-9.5**	**-1.1**	**-16.1**
Industry (combustion and processes, excluding solvent use)		**1.0**	**-0.5**	**-0.3**	**0.2**
Road transport		**-6.8**	**-13.9**	**0.0**	**-20.7**
of which	Light duty	-7.2	-9.2	0.0	-16.3
	Heavy duty	0.4	-4.8	0.0	-4.4
Non road mobile		**-0.8**	**-4.9**	**-0.3**	**-6.0**
Refineries (processes)		**-0.4**	**0.0**	**0.0**	**-0.4**
Production, storage and distribution of oil products		**-1.2**	**-0.2**	**0.0**	**-1.4**
Solvent use		**-2.3**	**-19.4**	**-0.8**	**-22.5**
Other sectors		**-0.1**	**0.0**	**-0.6**	**-0.6**
of which	ban of agr. waste burning	0.0	0.0	-0.1	-0.1
TOTAL		**-16.6**	**-48.3**	**-3.2**	**-68.0**

1.3 Differences to the 2013 Commission proposal

Table 1.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Austria (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	24.6	27.4	+2.8	+11%	Improved calibration to inventory – higher emissions from industrial process gases and from the residential/commercial sector
Change 2005 to 2030 CLE	-11.5	-10.4	-1.1	-9%	New information on emissions from process gases in industry (updated emission factors) and from biomass waste (black liquor – updated activities)
2030 Current legislation (CLE)	13.2	17.0	+3.9	+29%	
Additional reduction potential to MTFR	-2.0	-3.8	+1.8	+87%	New information on emissions from process gases in industry and from biomass waste (black liquor); Larger reduction potential for waste gases
2030 Maximum technical feasible reductions (MTFR)	11.1	13.2	+2.1	+19%	
Additional reduction in the optimized scenario	-0.9	-0.9	+0.0	-0%	
2030 optimized scenario	12.3	16.2	+3.9	+32%	

Table 1.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Austria (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	230.3	229.7	-0.6	-0%	More detailed information on fuel use in the power sector (biomass vs. waste fuels, gas use in boilers vs. CCGT plants) lead to lower EFs and emissions; revised (higher) estimate of emissions from pipeline compressors
Change 2005 to 2030 CLE	-164.8	-162.3	-2.6	-2%	Lower emissions from biomass and waste use in the power sector, higher emissions from NRMM and pipeline compressors (adjusted activity levels and uptake of control measures)
2030 Current legislation (CLE)	65.5	67.4	+1.9	+3%	
Additional reduction potential to MTFR	-11.2	-13.6	+2.4	+22%	Consequence of modified activities and controls as in CLE. Higher reduction potential from NRMM (Stage 5) and pipeline compressors due to higher activities
2030 Maximum technical feasible reductions (MTFR)	54.3	53.8	-0.5	-1%	
Additional reduction in the optimized scenario	-1.7	-1.3	-0.5	-27%	
2030 optimized scenario	63.7	66.2	+2.4	+4%	

Table 1.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Austria (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	24.4	21.7	-2.8	-11%	Improved calibration to inventory (lower emissions from industrial combustion, processes, domestic sector and road transport, higher emissions for non-road mobile sources)
Change 2005 to 2030 CLE	-8.2	-8.2	-0.0	-0%	Consequence of improved calibration; different split of diesel fuel consumption LD vs. HD road vehicles; higher emissions from NRMM; changes compensate each other
2030 Current legislation (CLE)	16.2	13.5	-2.8	-17%	
Additional reduction potential to MTFR	-7.0	-4.9	-2.1	-31%	Consequence of improved calibration; different split of combustion devices in the domestic sector and revised applicabilities of measures
2030 Maximum technical feasible reductions (MTFR)	9.2	8.6	-0.6	-7%	
Additional reduction in the optimized scenario	-5.3	-2.4	-2.9	-55%	
2030 optimized scenario	10.9	11.1	+0.2	+1%	

Table 1.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Austria (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	63.0	61.8	-1.2	-2%	Small adjustments to reflect recent inventory submissions.
Change 2005 to 2030 CLE	4.8	7.3	-2.5	+51%	Higher share of loose housing for cattle
2030 Current legislation (CLE)	67.8	69.1	+1.3	+2%	
Additional reduction potential to MTFR	-21.1	-26.2	+5.1	+24%	Higher share of loose housing for cattle and updated (during consultations) applicability rates, especially for slurry storage and application.
2030 Maximum technical feasible reductions (MTFR)	46.7	42.9	-3.8	-8%	
Additional reduction in the optimized scenario	-16.5	-18.5	+2.0	+12%	
2030 optimized scenario	51.3	50.5	-0.8	-2%	

Table 1.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Austria (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	170.8	170.1	-0.7	-0%	Small adjustments to reflect recent inventory submissions.
Change 2005 to 2030 CLE	-68.8	-64.9	-3.9	-6%	Updated projections of paint use
2030 Current legislation (CLE)	102.0	105.2	+3.2	+3%	
Additional reduction potential to MTFR	-50.1	-45.3	-4.8	-10%	New information provided on future paint use and resulting updates of application limits in the coating and degreasing sector
2030 Maximum technical feasible reductions (MTFR)	52.0	60.0	+8.0	+15%	
Additional reduction in the optimized scenario	12.7	3.2	-9.6	-75%	
2030 optimized scenario	89.3	102.1	+12.8	+14%	

Table 1.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Austria (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	60.9	58.7	-2.2	-4%
Change 2005 to 2030 CLE	-22.4	-21.3	+1.0	-5%
2030 Current legislation (CLE)	38.6	37.4	-1.2	-3%
Additional reduction potential to MTFR	-12.9	-12.4	+0.5	-4%
2030 Maximum technical feasible reductions (MTFR)	25.7	25.0	-0.7	-3%
Additional reduction in the optimized scenario	-9.0	-6.4	-2.6	-29%
2030 optimized scenario	29.6	31.0	+1.4	+5%

Table 1.13: Emission control costs for Austria (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1983	1906	-77	-4%
Additional costs for MTFR	1099	813	-286	-26%
2030 MTFR	3082	2718	-363	-12%
Additional costs in the optimized scenario (compared to CLE)	66	16	-50	-75%
Total costs in the optimized scenario in 2030	2049	1922	-127	-6%

2 Belgium

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for Belgium the overall emission reduction requirement (ERR) in terms of PMeq is four percentage points lower than in the initial COM scenario. This translates into lower reductions for all pollutants. The largest differences emerge from the new emission inventory with much larger use of non-commercial biomass in households, which results in higher CLE emissions for VOC and PM2.5. This contributes to ERRs for VOC being ten percentage points lower than before, and for PM2.5 being six percentage points lower than before. Emission control costs (on top of CLE) decline by more than 20%.

2.1 Summary

Table 2.1: Summary table for Belgium. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	144	-66%	-43%	-59%	-68%	-68%	-58%	-66%	-68%	-1%	-2%	-0%
NO_x	290	-33%	-38%	-55%	-63%	-68%	-56%	-59%	-67%	+2%	-4%	-1%
PM2.5	36	-11%	-20%	-33%	-47%	-53%	-15%	-41%	-51%	-18%	-6%	-2%
NH_3	72	-6%	-2%	-1%	-16%	-19%	0%	-13%	-22%	-1%	-3%	+3%
VOC	146	-28%	-20%	-37%	-44%	-57%	-25%	-35%	-46%	-12%	-10%	-12%
PMeq	113	-31%	-33%	-43%	-54%	-57%	-36%	-50%	-56%	-7%	-4%	-1%

2.2 Sectoral emission reductions

Table 2.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Belgium (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-18.7**	**-6.2**	**0.0**	**-24.9**
Domestic combustion		**-13.9**	**-6.1**	**-3.4**	**-23.5**
Industry		**-15.1**	**-12.3**	**-7.7**	**-35.1**
of which	Refineries	-7.6	-8.3	-0.1	-16.0
	Other industries	-7.5	-4.0	-7.6	-19.1
Road transport		**0.1**	**-0.6**	**0.0**	**-0.6**
of which	Light duty	0.0	-0.4	0.0	-0.3
	Heavy duty	0.0	-0.2	0.0	-0.2
Non-road mobile		**-1.9**	**-0.1**	**0.0**	**-2.0**
Other sectors		**-6.2**	**0.0**	**0.0**	**-6.2**
TOTAL		**-55.7**	**-25.3**	**-11.2**	**-92.2**

Table 2.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Belgium (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-14.7**	**-6.9**	**-3.2**	**-24.8**
Domestic combustion		**-4.9**	**-1.2**	**0.0**	**-6.1**
Industry		**5.4**	**-20.2**	**-3.7**	**-18.5**
of which	Refineries	0.5	-0.8	-0.7	-1.0
	Other industries	4.9	-19.4	-3.0	-17.5
Road transport		**9.7**	**-124.9**	**0.0**	**-115.2**
of which	Light duty	-0.8	-39.6	0.0	-40.4
	Heavy duty	10.5	-85.3	0.0	-74.8
Non road mobile		**-2.9**	**-12.7**	**-1.9**	**-17.4**
Other sectors		**2.7**	**0.0**	**0.0**	**2.7**
TOTAL		**-4.6**	**-165.9**	**-8.9**	**-179.4**

Table 2.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Belgium (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.2**	**-0.1**	**-0.8**	**-0.7**
Domestic combustion		**6.2**	**-2.5**	**-6.1**	**-2.4**
Industry		**-1.3**	**-0.4**	**-1.9**	**-3.6**
of which	Refineries	-0.2	-0.3	-0.1	-0.5
	Other industries	-1.1	-0.1	-1.8	-3.1
Road transport		**0.9**	**-6.9**	**0.0**	**-6.0**
of which	Light duty	0.4	-4.6	0.0	-4.2
	Heavy duty	0.4	-2.3	0.0	-1.9
Non road mobile		**-0.5**	**-1.3**	**-0.2**	**-2.0**
Other sectors		**0.3**	**-0.1**	**-0.7**	**-0.5**
TOTAL		**5.7**	**-11.2**	**-9.8**	**-15.2**

Table 2.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Belgium (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-1.6**	**-1.0**	**-4.5**	**-7.0**
Poultry		**-0.1**	**-0.1**	**-0.6**	**-0.8**
Cattle		**3.1**	**-0.6**	**-2.9**	**-0.4**
of which	Dairy	6.0	-0.4	-2.9	2.7
	Meat	-2.9	-0.2	0.0	-3.1
Other animals		**-0.2**	**0.0**	**0.0**	**-0.2**
Mineral fertilizers		**0.2**	**0.0**	**-0.2**	**0.1**
Other non -agricultural sources		**-0.3**	**0.2**	**-0.9**	**-0.9**
TOTAL		**1.1**	**-1.4**	**-9.0**	**-9.3**

Table 2.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Belgium (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.7**	**-0.1**	**-0.9**	**-0.4**
Domestic combustion		**9.2**	**-5.0**	**-10.9**	**-6.6**
Industry (combustion and processes, excluding solvent use)		**5.4**	**-4.5**	**-1.3**	**-0.3**
Road transport		**-9.7**	**-10.7**	**0.0**	**-20.3**
of which	Light duty	-10.2	-6.7	0.0	-16.9
	Heavy duty	0.5	-4.0	0.0	-3.4
Non road mobile		**-0.8**	**-3.4**	**-0.2**	**-4.4**
Refineries (processes)		**-0.6**	**-1.3**	**0.0**	**-1.9**
Production, storage and distribution of oil products		**-1.6**	**-1.4**	**0.0**	**-2.9**
Solvent use		**4.0**	**-17.0**	**-1.0**	**-14.0**
Other sectors		**-0.9**	**0.0**	**-0.8**	**-1.7**
of which	ban of agr. waste burning	0.0	0.0	-0.4	-0.4
TOTAL		**5.9**	**-43.3**	**-15.0**	**-52.4**

2.3 Differences to the 2013 Commission proposal

Table 2.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Belgium (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	139.9	140.3	+0.4	+0%	Adjustments to inventory numbers for power sector, refineries and industrial flaring
Change 2005 to 2030 CLE	-82.3	-81.0	-1.4	-2%	More accurate representation of emissions from industrial flaring
2030 Current legislation (CLE)	57.5	59.3	+1.8	+3%	
Additional reduction potential to MTFR	-13.3	-14.8	+1.5	+12%	Inclusion of sulphur-free light fuel oil as reduction option in domestic sector
2030 Maximum technical feasible reductions (MTFR)	44.3	44.5	+0.2	+1%	
Additional reduction in the optimized scenario	-12.6	-11.2	-1.4	-11%	
2030 optimized scenario	44.9	48.1	+3.2	+7%	

Table 2.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Belgium (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	295.3	303.4	+8.1	+3%	Lower emissions from power plants (more gas allocated to gas CCGT plants), higher emissions from industrial sources, more diesel allocated to HDT and thus higher emissions
Change 2005 to 2030 CLE	-161.1	-170.5	+9.4	+6%	Higher reductions from industry and road transport (different fuel allocation); higher emissions from NRMM (lower fleet turnover, higher EF for Stage 4)
2030 Current legislation (CLE)	134.1	132.9	-1.3	-1%	
Additional reduction potential to MTFR	-39.2	-33.2	-6.0	-15%	Less potential for industrial process sources (lower applicabilities) and non-road mobile sources (revised Stage 5 EF)
2030 Maximum technical feasible reductions (MTFR)	94.9	99.7	+4.8	+5%	
Additional reduction in the optimized scenario	-26.1	-8.9	+17.3	-66%	
2030 optimized scenario	108.0	124.0	+16.0	+15%	

Table 2.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Belgium (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	28.4	37.1	+8.7	+31%	Improved representation of new national 2005 inventory (2014 submission 32% higher than in 2012); inclusion of non-commercial biomass use in the domestic sector (not in Eurostat statistics)
Change 2005 to 2030 CLE	-9.4	-5.5	-3.9	-42%	Emissions from non-commercial biomass use in domestic sector
2030 Current legislation (CLE)	19.0	31.6	+12.6	+67%	
Additional reduction potential to MTFR	-5.7	-13.3	+7.6	+134%	Additional potential in the domestic sector (from non-commercial biomass)
2030 Maximum technical feasible reductions (MTFR)	13.3	18.3	+5.0	+38%	
Additional reduction in the optimized scenario	-4.0	-9.8	+5.7	+141%	
2030 optimized scenario	14.9	21.9	+6.9	+46%	

Table 2.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Belgium (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	74.2	71.7	-2.5	-3%	Minor adjustments for non-agricultural sources (primarily waste water treatment) based on the latest inventory submission
Change 2005 to 2030 CLE	-0.7	-0.3	-0.4	-57%	Impact of the changes for non-agricultural sources in the base year
2030 Current legislation (CLE)	73.5	71.4	-2.1	-3%	
Additional reduction potential to MTFR	-13.4	-15.2	+1.8	+13%	Impact of the updated livestock farm structure and consequent harmonization of application limits and emission factors
2030 Maximum technical feasible reductions (MTFR)	60.1	56.1	-3.9	-7%	
Additional reduction in the optimized scenario	-25.1	-13.9	-11.2	-45%	
2030 optimized scenario	48.4	57.5	+9.1	+19%	

Table 2.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Belgium (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	157.5	151.3	-6.2	-4%	Adjusted control level of two stroke engines to match inventory
Change 2005 to 2030 CLE	-58.1	-37.4	-20.7	-36%	Higher biomass use in residential sector (see comments to PM2.5).
2030 Current legislation (CLE)	99.4	113.9	+14.5	+15%	
Additional reduction potential to MTFR	-32.2	-31.9	-0.2	-1%	The higher potential in the residential sector is compensated by lower potentials for solvent use due to updated applicabilities, especially in the coating sector
2030 Maximum technical feasible reductions (MTFR)	67.2	82.0	+14.8	+22%	.
Additional reduction in the optimized scenario	-11.4	-15.0	+3.6	+31%	
2030 optimized scenario	88.0	98.9	+11.0	+12%	

Table 2.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Belgium (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	105.7	114.5	+8.8	+8%
Change 2005 to 2030 CLE	-45.4	-41.4	-4.0	-9%
2030 Current legislation (CLE)	60.3	73.1	+12.8	+21%
Additional reduction potential to MTFR	-15.2	-23.2	+8.0	+53%
2030 Maximum technical feasible reductions (MTFR)	45.1	49.9	+4.8	+11%
Additional reduction in the optimized scenario	-11.8	-15.6	+3.7	+31%
2030 optimized scenario	48.4	57.5	+9.1	+19%

Table 2.13: Emission control costs for Belgium (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	2469	2409	-60	-2%
Additional costs for MTFR	853	793	-60	-7%
2030 MTFR	3322	3202	-120	-4%
Additional costs in the optimized scenario (compared to CLE)	110	87	-23	-21%
Total costs in the optimized scenario in 2030	2578	2496	-82.7	-3%

3 Bulgaria

For Bulgaria, the overall reductions of the re-optimized scenario in terms of PMeq remain the same as in the initial scenario. Significant changes to the 2005 GAINS estimates, especially for solid fuel combustion in the residential sector and for agricultural NH_3 emissions, imply larger baseline declines of PM2.5, NH_3 and VOC emissions. While this relaxes the need for further cuts of these substances, the resulting emission reduction requirements relative to 2005 are higher than in the initial COM proposal. In turn, this releases the need for measures for SO_2 and NO_x. Emission control costs (on top of CLE) decline by 33%.

3.1 Summary

Table 3.1: Summary table for Bulgaria. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	776	-58%	-78%	-87%	-94%	-94%	-87%	-93%	-94%	-1%	-1%	0%
NO_x	154	-20%	-41%	-64%	-65%	-75%	-62%	-63%	-74%	-1%	-3%	-1%
PM2.5	27	10%	-20%	-30%	-64%	-75%	-41%	-66%	-72%	+11%	+2%	-3%
NH_3	48	-21%	-3%	-1%	-10%	-12%	-6%	-18%	-25%	+4%	+8%	+12%
VOC	85	-4%	-38%	-51%	-62%	-77%	-59%	-69%	-77%	+7%	+7%	0%
PMeq	279	-11%	-44%	-77%	-86%	-88%	-77%	-86%	-89%	0%	0%	0%

3.2 Sectoral emission reductions

Table 3.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Bulgaria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-488.5**	**-168.9**	**0.0**	**-657.4**
Domestic combustion		**-7.7**	**0.0**	**-1.9**	**-9.7**
Industry		**-9.9**	**-5.4**	**-15.1**	**-30.4**
of which	Refineries	-2.4	-0.6	-4.1	-7.1
	Other industries	-7.5	-4.8	-11.0	-23.3
Road transport		**0.2**	**-1.5**	**0.0**	**-1.3**
of which	Light duty	0.3	-0.8	0.0	-0.5
	Heavy duty	-0.1	-0.7	0.0	-0.8
Non-road mobile		**-0.1**	**-0.9**	**0.0**	**-1.0**
Other sectors		**22.3**	**0.0**	**-33.3**	**-11.0**
TOTAL		**-483.7**	**-176.7**	**-50.3**	**-710.7**

Table 3.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Bulgaria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-25.8**	**-5.7**	**-0.1**	**-31.5**
Domestic combustion		**-0.6**	**0.0**	**0.0**	**-0.6**
Industry		**2.4**	**-10.2**	**-0.2**	**-8.0**
of which	Refineries	-1.1	-1.4	-0.1	-2.7
	Other industries	3.5	-8.8	-0.1	-5.3
Road transport		**-6.3**	**-36.6**	**0.0**	**-42.9**
of which	Light duty	-2.5	-16.4	0.0	-18.9
	Heavy duty	-3.8	-20.2	0.0	-24.1
Non road mobile		**-1.7**	**-6.6**	**0.0**	**-8.3**
Other sectors		**1.9**	**-11.5**	**-0.2**	**-9.8**
TOTAL		**-30.2**	**-70.5**	**-0.5**	**-101.2**

Table 3.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Bulgaria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.1**	**0.0**	**-0.1**	**-0.2**
Domestic combustion		**-5.1**	**-7.0**	**-2.5**	**-14.7**
Industry		**-0.4**	**-0.3**	**-1.2**	**-1.9**
of which	Refineries	0.0	0.0	0.0	-0.1
	Other industries	-0.4	-0.3	-1.1	-1.8
Road transport		**0.9**	**-2.8**	**0.0**	**-1.9**
of which	Light duty	1.0	-1.7	0.0	-0.7
	Heavy duty	-0.1	-1.1	0.0	-1.2
Non road mobile		**-0.2**	**-0.6**	**0.0**	**-0.8**
Other sectors		**-0.1**	**-0.2**	**-5.9**	**-6.2**
TOTAL		**-5.0**	**-11.0**	**-9.6**	**-25.6**

Table 3.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Bulgaria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-1.5**	**-0.5**	**-0.7**	**-2.7**
Poultry		**0.3**	**-2.2**	**-0.4**	**-2.3**
Cattle		**-0.8**	**0.0**	**-0.9**	**-1.7**
of which	Dairy	-0.9	0.0	-0.7	-1.6
	Meat	0.1	0.0	-0.2	-0.1
Other animals		**-0.7**	**0.0**	**-0.1**	**-0.8**
Mineral fertilizers		**3.3**	**0.0**	**-1.6**	**1.7**
Other non -agricultural sources		**-0.1**	**0.1**	**-1.2**	**-1.2**
TOTAL		**0.4**	**-2.6**	**-4.8**	**-7.0**

Table 3.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Bulgaria (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.2**	**0.0**	**0.0**	**-0.2**
Domestic combustion		**-4.2**	**-14.3**	**-4.9**	**-23.4**
Industry (combustion and processes, excluding solvent use)		**0.4**	**-1.3**	**0.0**	**-0.9**
Road transport		**-13.8**	**-27.0**	**0.0**	**-40.7**
of which	Light duty	-14.4	-23.4	0.0	-37.8
	Heavy duty	0.7	-3.6	0.0	-3.0
Non road mobile		**0.5**	**-1.1**	**0.0**	**-0.6**
Refineries (processes)		**-1.4**	**-2.3**	**0.0**	**-3.7**
Production, storage and distribution of oil products		**-1.5**	**-0.9**	**0.0**	**-2.3**
Solvent use		**3.8**	**-12.3**	**0.0**	**-8.5**
Other sectors		**0.0**	**0.0**	**-7.8**	**-7.8**
of which	ban of agr. waste burning	0.0	0.0	-7.2	-7.2
TOTAL		**-16.3**	**-59.1**	**-12.7**	**-88.1**

3.3 Differences to the 2013 Commission proposal

Table 3.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Bulgaria (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	889.6	761.7	-127.9	-14%	Lower emission factors for coal and lignite in the power plant and domestic sectors as well as for process sources
Change 2005 to 2030 CLE	-777.9	-660.4	-117.5	-15%	Updated emission factors as above
2030 Current legislation (CLE)	111.7	101.3	-10.4	-9%	
Additional reduction potential to MTFR	-60.1	-58.7	-1.4	-2%	Less potential from additional measures due to lower unabated emission factors
2030 Maximum technical feasible reductions (MTFR)	51.6	42.6	-9.0	-17%	
Additional reduction in the optimized scenario	-58.2	-50.3	-8.0	-14%	
2030 optimized scenario	53.4	51.0	-2.4	-5%	

Table 3.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Bulgaria (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	166.8	161.2	-5.5	-3%	New emission inventory for the power sector
Change 2005 to 2030 CLE	-106.3	-100.7	-5.6	-5%	Lower emissions from power sector (lower EFs), higher from industry; higher abated emission factors for NRMM
2030 Current legislation (CLE)	60.5	60.5	+0.1	+0%	
Additional reduction potential to MTFR	-19.3	-18.9	-0.3	-2%	Less potential in the power sector (lower CLE EFs)
2030 Maximum technical feasible reductions (MTFR)	41.2	41.6	+0.4	+1%	
Additional reduction in the optimized scenario	-2.7	-0.5	-2.2	-82%	
2030 optimized scenario	57.7	60.0	+2.3	+4%	

Table 3.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Bulgaria (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	34.5	38.9	+4.3	+13%	Higher emissions from domestic sector (adjusted structure of combustion devices), lower EFs and more controls for industrial combustion and processes
Change 2005 to 2030 CLE	-10.5	-16.0	+5.5	+53%	Consequence of changes for 2005
2030 Current legislation (CLE)	24.0	22.9	-1.2	-5%	
Additional reduction potential to MTFR	-15.3	-11.9	-3.5	-23%	Less potential in industry and domestic sector due to adjusted structure
2030 Maximum technical feasible reductions (MTFR)	8.7	11.0	+2.3	+27%	
Additional reduction in the optimized scenario	-11.5	-9.6	-1.8	-16%	
2030 optimized scenario	12.6	13.2	+0.6	+5%	

Table 3.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Bulgaria (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	65.2	39.0	-26.1	-40%	Improved representation of new national 2005 inventory (2014 submission estimate 20% lower than in 2012). Revised emission factors for livestock, adjustment of non-agricultural sources of NH_3. Significant difference for dairy cattle remains where Bulgaria uses Tier I method.
Change 2005 to 2030 CLE	-0.8	-2.2	+1.4	+178%	Impact of the adjustments for 2005, including the harmonization/update of emission factors
2030 Current legislation (CLE)	64.4	36.9	-27.5	-43%	
Additional reduction potential to MTFR	-7.3	-7.5	+0.2	+3%	Mitigation potential remains similar;
2030 Maximum technical feasible reductions (MTFR)	57.1	29.4	-27.7	-49%	Changes in absolute levels caused by adjustments to the base year parameterization
Additional reduction in the optimized scenario	-5.6	-4.8	-0.7	-13%	
2030 optimized scenario	58.8	32.0	-26.8	-46%	

Table 3.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Bulgaria (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	138.9	128.2	-10.7	-8%	Updated emission factors for combustion and the solvent sector. Differences for transport remain; IIASA considers that emissions from old cars are underestimated in the national inventory.
Change 2005 to 2030 CLE	-71.5	-75.4	+4.0	+6%	Impact of the adjustments for 2005, including the harmonization/update of emission factors
2030 Current legislation (CLE)	67.4	52.8	-14.7	-22%	
Additional reduction potential to MTFR	-35.2	-23.1	-12.0	-34%	Updated structure of residential combustion sector and harmonization of application limits for coating and industrial cleaning sectors
2030 Maximum technical feasible reductions (MTFR)	32.2	29.6	-2.6	-8%	
Additional reduction in the optimized scenario	-15.0	-12.7	-2.3	-15%	
2030 optimized scenario	52.4	40.0	-12.4	-24%	

Table 3.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Bulgaria (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	324.7	285.4	-39.3	-12%
Change 2005 to 2030 CLE	-250.2	-220.6	-29.6	-12%
2030 Current legislation (CLE)	74.5	64.7	-9.7	-13%
Additional reduction potential to MTFR	-36.3	-32.3	-4.0	-11%
2030 Maximum technical feasible reductions (MTFR)	38.2	32.5	-5.7	-15%
Additional reduction in the optimized scenario	-30.2	-25.7	-4.5	-15%
2030 optimized scenario	44.3	39.0	-5.2	-12%

Table 3.13: Emission control costs for Bulgaria (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1212	1179	-32	-3%
Additional costs for MTFR	752	485	-267	-36%
2030 MTFR	1964	1664	-300	-15%
Additional costs in the optimized scenario (compared to CLE)	67	45	-22	-33%
Total costs in the optimized scenario in 2030	1279	1224	-54.4	-4%

4 Croatia

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for Croatia the overall emission reduction requirement (ERR) in terms of PMeq is four percentage points lower than in the initial COM scenario.

Differences are largest for VOC, where the revised 2005 GAINS estimate, which is 27% higher, implies a six percentage points larger baseline reduction for 2030. This relaxes the need for additional measures, also for other pollutants. Emission control costs (on top of CLE) decline by more than 15%.

4.1 Summary

Table 4.1: Summary table for Croatia. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	64	-60%	-55%	-70%	-87%	-91%	-72%	-86%	-91%	+2%	-1%	0%
NO_x	81	-27%	-32%	-56%	-66%	-81%	-50%	-62%	-79%	-6%	-4%	-3%
PM2.5	11	-10%	-18%	-28%	-66%	-82%	-26%	-62%	-75%	-2%	-4%	-7%
NH_3	44	-6%	-1%	2%	-24%	-36%	3%	-23%	-38%	-1%	-1%	+2%
VOC	101	-32%	-34%	-39%	-48%	-68%	-45%	-50%	-73%	+6%	+2%	+4%
PMeq	45	-29%	-35%	-46%	-70%	-80%	-43%	-65%	-76%	-3%	-4%	-4%

4.2 Sectoral emission reductions

Table 4.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Croatia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-18.5**	**-0.9**	**0.0**	**-19.3**
Domestic combustion		**-3.1**	**-1.4**	**-0.1**	**-4.6**
Industry		**-7.1**	**-5.0**	**-9.2**	**-21.3**
of which	Refineries	-3.3	-4.2	-4.6	-12.1
	Other industries	-3.8	-0.8	-4.6	-9.2
Road transport		**2.9**	**-11.6**	**0.0**	**-8.7**
of which	Light duty	1.5	-4.8	0.0	-3.3
	Heavy duty	1.4	-6.8	0.0	-5.4
Non-road mobile		**-0.2**	**-1.9**	**0.0**	**-2.1**
Other sectors		**0.0**	**0.0**	**-0.1**	**-0.1**
TOTAL		**-26.0**	**-20.7**	**-9.4**	**-56.2**

Table 4.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Croatia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-5.2**	**-2.1**	**-0.1**	**-7.4**
Domestic combustion		**-0.6**	**0.0**	**0.0**	**-0.6**
Industry		**-3.2**	**-0.4**	**-6.5**	**-10.1**
of which	Refineries	-1.6	-0.3	-0.6	-2.4
	Other industries	-1.6	-0.2	-6.0	-7.7
Road transport		**5.1**	**-29.6**	**0.0**	**-24.5**
of which	Light duty	0.7	-8.3	0.0	-7.5
	Heavy duty	4.4	-21.4	0.0	-17.0
Non road mobile		**-1.1**	**-5.8**	**-0.5**	**-7.3**
Other sectors		**2.2**	**0.0**	**-2.3**	**0.0**
TOTAL		**-2.7**	**-37.8**	**-9.4**	**-50.0**

Table 4.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Croatia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.3**	**0.0**	**0.0**	**-0.4**
Domestic combustion		**-0.4**	**-0.7**	**-0.2**	**-1.2**
Industry		**0.4**	**-1.2**	**-1.8**	**-2.6**
of which	Refineries	-0.1	0.0	-0.1	-0.2
	Other industries	0.5	-1.1	-1.7	-2.4
Road transport		**0.3**	**-1.3**	**0.0**	**-0.9**
of which	Light duty	0.2	-0.6	0.0	-0.4
	Heavy duty	0.2	-0.7	0.0	-0.5
Non road mobile		**-0.1**	**-0.7**	**-0.1**	**-0.8**
Other sectors		**0.2**	**0.0**	**-3.1**	**-3.0**
TOTAL		**0.0**	**-3.8**	**-5.3**	**-9.0**

Table 4.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Croatia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**3.4**	**0.0**	**-1.2**	**2.1**
Poultry		**-0.6**	**0.0**	**-1.4**	**-2.0**
Cattle		**2.8**	**0.0**	**-2.0**	**0.7**
of which	Dairy	2.2	0.0	-1.9	0.3
	Meat	0.6	0.0	-0.1	0.4
Other animals		**-0.1**	**0.0**	**0.0**	**-0.1**
Mineral fertilizers		**-2.7**	**0.0**	**-4.9**	**-7.6**
Other non -agricultural sources		**-1.2**	**-0.3**	**-0.6**	**-2.1**
TOTAL		**1.5**	**-0.3**	**-10.2**	**-9.0**

Table 4.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Croatia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.1**	**0.0**	**0.0**	**-0.1**
Domestic combustion		**-1.3**	**-2.0**	**-0.5**	**-3.9**
Industry (combustion and processes, excluding solvent use)		**-2.6**	**-0.1**	**0.0**	**-2.7**
Road transport		**-3.0**	**-7.9**	**0.0**	**-10.9**
of which	Light duty	-3.0	-6.5	0.0	-9.5
	Heavy duty	0.0	-1.4	0.0	-1.4
Non road mobile		**-0.2**	**-1.2**	**-0.1**	**-1.5**
Refineries (processes)		**-0.6**	**-0.5**	**0.0**	**-1.0**
Production, storage and distribution of oil products		**0.2**	**-1.4**	**0.0**	**-1.2**
Solvent use		**-15.0**	**-8.4**	**0.0**	**-23.5**
Other sectors		**-1.1**	**0.0**	**-4.1**	**-5.2**
of which	ban of agr. waste burning	0.0	0.0	-3.4	-3.4
TOTAL		**-23.7**	**-21.5**	**-4.8**	**-49.9**

4.3 Differences to the 2013 Commission proposal

Table 4.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Croatia (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	67.7	65.3	-2.5	-4%	Improved match with inventory for power sector, industry and road transport
Change 2005 to 2030 CLE	-47.4	-46.7	-0.7	-1%	CLE controls based on national assessment
2030 Current legislation (CLE)	20.3	18.5	-1.8	-9%	
Additional reduction potential to MTFR	-14.2	-12.8	-1.4	-10%	Consequence of changes in CLE
2030 Maximum technical feasible reductions (MTFR)	6.2	5.8	-0.4	-6%	
Additional reduction in the optimized scenario	-11.4	-9.4	-2.0	-17%	
2030 optimized scenario	8.9	9.1	+0.2	+2%	

Table 4.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Croatia (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	75.9	80.3	+4.4	+6%	Improved representation of national inventory for power and industrial sectors
Change 2005 to 2030 CLE	-42.6	-40.6	-2.0	-5%	Higher CLE EFs from mineral products industry and for NRMM (higher Stage 4 EFs)
2030 Current legislation (CLE)	33.3	39.8	+6.4	+19%	
Additional reduction potential to MTFR	-19.2	-22.6	+3.4	+18%	Higher potential for industry, lower for NRMM (change in EFs)
2030 Maximum technical feasible reductions (MTFR)	14.2	17.2	+3.0	+21%	
Additional reduction in the optimized scenario	-7.6	-9.4	+1.8	+24%	
2030 optimized scenario	25.7	30.3	+4.6	+18%	

Table 4.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Croatia (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	15.0	14.5	-0.5	-3%	Improved representation of 2005 inventory (2014 submission lower than 2012) – main differences in domestic sector and industrial combustion
Change 2005 to 2030 CLE	-4.2	-3.7	-0.5	-11%	Consequence of changes for 2005
2030 Current legislation (CLE)	10.9	10.8	-0.0	-0%	
Additional reduction potential to MTFR	-8.1	-7.2	-0.9	-11%	Less potential in domestic sector (more uptake of controls in CLE, lower applicabilities)
2030 Maximum technical feasible reductions (MTFR)	2.8	3.6	+0.9	+31%	
Additional reduction in the optimized scenario	-5.8	-5.3	-0.5	-9%	
2030 optimized scenario	5.1	5.6	+0.5	+9%	

Table 4.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Croatia (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	29.3	39.6	+10.2	35%	Harmonization of livestock and mineral fertilizer statistics with the national inventory; update of emission factors for agricultural sources
Change 2005 to 2030 CLE	0.5	1.2	+0.7	122%	Impact of adjustments for 2005, including the harmonization/update of emission factors
2030 Current legislation (CLE)	29.9	40.8	+10.9	36%	
Additional reduction potential to MTFR	-11.2	-16.2	-5.0	44%	Impact of the updated livestock structure, i.e., animals kept on liquid/solid manure systems and the following harmonization of application limits and emission factors.
2030 Maximum technical feasible reductions (MTFR)	18.7	24.6	+5.9	32%	
Additional reduction in the optimized scenario	7.6	10.2	+2.6	34%	
2030 optimized scenario	22.3	30.6	8.3	37%	

Table 4.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Croatia (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	79.1	100.8	+21.8	+27%	Updated information for the solvent use sector; new detailed information provided during bilateral consultations
Change 2005 to 2030 CLE	-30.8	-45.2	+14.3	+47%	Impact of the changes for 2005
2030 Current legislation (CLE)	48.3	55.7	+7.4	+15%	
Additional reduction potential to MTFR	-23.3	-28.0	+4.7	+20%	Impact of the adjusted emission factors for solvent use sectors and the harmonization of application limits for coating and industrial cleaning sectors
2030 Maximum technical feasible reductions (MTFR)	25.0	27.7	+2.7	+11%	
Additional reduction in the optimized scenario	-6.9	-4.8	-2.2	-31%	
2030 optimized scenario	41.3	50.9	+9.6	+23%	

Table 4.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Croatia (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	46.7	48.0	+1.2	+3%
Change 2005 to 2030 CLE	-21.3	-20.5	-0.8	-4%
2030 Current legislation (CLE)	25.4	27.4	+2.0	+8%
Additional reduction potential to MTFR	-16.0	-15.9	-0.1	-0%
2030 Maximum technical feasible reductions (MTFR)	9.4	11.5	+2.1	+22%
Additional reduction in the optimized scenario	-11.2	-10.7	-0.5	-4%
2030 optimized scenario	14.2	16.7	+2.5	+18%

Table 4.13: Emission control costs for Croatia (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	423	418	-5	-1%
Additional costs for MTFR	440	365	-76	-17%
2030 MTFR	864	783	-81	-9%
Additional costs in the optimized scenario (compared to CLE)	26	22	-5	-17%
Total costs in the optimized scenario in 2030	449	439	-10	-2%

5 Cyprus

Overall, in terms of PMeq, the re-optimized emission reduction requirement relative to 2005 (ERR) is not very different from the initial COM scenario. However, the updated emission inventory information (inter alia, on agricultural waste burning) suggests a larger potential for low-cost measures for PM2.5 and NH_3, which relieves the need for additional VOC reductions.

5.1 Summary

Table 5.1: Summary table for Cyprus. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	38	-57%	-83%	-95%	-95%	-98%	-94%	-95%	-99%	0%	0%	0%
NO_x	21	-1%	-45%	-70%	-70%	-81%	-69%	-70%	-80%	-1%	0%	0%
PM2.5	3	-39%	-46%	-70%	-72%	-75%	-69%	-78%	-80%	-1%	+5%	+5%
NH_3	6	-17%	-10%	-4%	-18%	-31%	-6%	-21%	-41%	+3%	+3%	+10%
VOC	14	-35%	-55%	-53%	-54%	-69%	-47%	-50%	-65%	-6%	-4%	-4%
PMeq	17	-60%	-73%	-82%	-83%	-88%	-81%	-84%	-90%	0%	+1%	+1%

5.2 Sectoral emission reductions

Table 5.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Cyprus (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-33.7**	**-0.1**	**0.0**	**-33.9**
Domestic combustion		**-0.1**	**-0.1**	**0.0**	**-0.2**
Industry		**-1.3**	**-0.3**	**0.0**	**-1.6**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-1.3	-0.3	0.0	-1.6
Road transport		**0.0**	**-0.4**	**0.0**	**-0.4**
of which	Light duty	0.0	-0.3	0.0	-0.2
	Heavy duty	0.0	-0.1	0.0	-0.1
Non-road mobile		**-0.1**	**0.0**	**0.0**	**-0.2**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**-35.2**	**-1.0**	**0.0**	**-36.2**

Table 5.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Cyprus (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-5.9**	**0.0**	**0.0**	**-5.9**
Domestic combustion		**-0.1**	**0.0**	**0.0**	**-0.1**
Industry		**-0.2**	**-0.1**	**0.0**	**-0.3**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-0.2	-0.1	0.0	-0.3
Road transport		**-0.2**	**-6.5**	**0.0**	**-6.7**
of which	Light duty	0.4	-3.8	0.0	-3.4
	Heavy duty	-0.6	-2.7	0.0	-3.2
Non road mobile		**-1.4**	**-0.3**	**0.0**	**-1.7**
Other sectors		**0.0**	**0.0**	**-0.1**	**0.0**
TOTAL		**-7.8**	**-6.9**	**-0.1**	**-14.8**

Table 5.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Cyprus (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.4**	**0.0**	**0.0**	**-0.4**
Domestic combustion		**0.0**	**0.0**	**0.0**	**0.0**
Industry		**-0.1**	**-1.0**	**0.0**	**-1.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-0.1	-1.0	0.0	-1.1
Road transport		**0.1**	**-0.6**	**0.0**	**-0.5**
of which	Light duty	0.1	-0.5	0.0	-0.3
	Heavy duty	0.0	-0.1	0.0	-0.1
Non road mobile		**-0.1**	**0.0**	**0.0**	**-0.2**
Other sectors		**0.0**	**0.0**	**-0.3**	**-0.3**
TOTAL		**-0.5**	**-1.6**	**-0.3**	**-2.4**

Table 5.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Cyprus (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**0.6**	**-0.3**	**-0.5**	**-0.2**
Poultry		**-0.2**	**-0.2**	**-0.1**	**-0.5**
Cattle		**0.2**	**0.0**	**-0.2**	**0.0**
of which	Dairy	0.2	0.0	-0.2	0.0
	Meat	0.0	0.0	0.0	0.0
Other animals		**0.0**	**0.0**	**0.0**	**0.0**
Mineral fertilizers		**-0.2**	**0.0**	**0.0**	**-0.2**
Other non -agricultural sources		**0.0**	**-0.2**	**-0.1**	**-0.3**
TOTAL		**0.4**	**-0.8**	**-0.9**	**-1.3**

Table 5.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Cyprus (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.3**	**0.0**	**0.0**	**-0.3**
Domestic combustion		**-0.1**	**0.0**	**0.0**	**-0.1**
Industry (combustion and processes, excluding solvent use)		**0.1**	**0.0**	**0.0**	**0.1**
Road transport		**-0.4**	**-2.8**	**0.0**	**-3.2**
of which	Light duty	-0.4	-2.5	0.0	-2.8
	Heavy duty	-0.1	-0.3	0.0	-0.4
Non road mobile		**-0.2**	**0.0**	**0.0**	**-0.3**
Refineries (processes)		**0.0**	**0.0**	**0.0**	**0.0**
Production, storage and distribution of oil products		**-0.1**	**-0.5**	**0.0**	**-0.6**
Solvent use		**0.7**	**-1.6**	**0.0**	**-1.0**
Other sectors		**0.0**	**0.0**	**-0.4**	**-0.4**
of which	ban of agr. waste burning	0.0	0.0	-0.4	-0.4
TOTAL		**-0.3**	**-5.0**	**-0.4**	**-5.7**

5.3 Differences to the 2013 Commission proposal

Table 5.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Cyprus (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	38.24	38.28	0.04	+0%	
Change 2005 to 2030 CLE	-36.15	-36.15	0.00	0%	
2030 Current legislation (CLE)	2.09	2.13	0.04	+2%	
Additional reduction potential to MTFR	-1.48	-1.57	0.09	+6%	Availability of S-free heating oil for the domestic sector
2030 Maximum technical feasible reductions (MTFR)	0.62	0.56	-0.06	-9%	
Additional reduction in the optimized scenario	0.00	-0.03	0.02		
2030 optimized scenario	2.09	2.10	0.01	+1%	

Table 5.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Cyprus (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	21.19	21.32	0.13	+1%	Higher emissions from industrial combustion (higher EFs) and agricultural waste burning (higher activity)
Change 2005 to 2030 CLE	-14.84	-14.77	-0.06	-0%	Higher emissions from NRMM (higher Stage 4 EFs)
2030 Current legislation (CLE)	6.35	6.54	0.19	+3%	
Additional reduction potential to MTFR	-2.30	-2.37	0.07	+3%	Higher reductions due to enforcement of ban for agricultural waste burning, higher effects of Stage 5 for NRMM)
2030 Maximum technical feasible reductions (MTFR)	4.06	4.18	0.12	+3%	
Additional reduction in the optimized scenario	-0.01	-0.06	0.05		
2030 optimized scenario	6.34	6.48	0.14	+2%	

Table 5.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Cyprus (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	2.69	3.16	0.46	+17%	Higher emissions from mineral products industry (higher EF) and agricultural waste burning; lower non-exhaust EFs from road transport
Change 2005 to 2030 CLE	-1.88	-2.17	0.29	+15%	Consequence of changes for 2005
2030 Current legislation (CLE)	0.81	0.99	0.18	+22%	
Additional reduction potential to MTFR	-0.14	-0.36	0.21	+148%	Higher effects of enforcement of ban for agricultural waste burning
2030 Maximum technical feasible reductions (MTFR)	0.67	0.63	-0.04	-5%	
Additional reduction in the optimized scenario	-0.07	-0.28	0.21		
2030 optimized scenario	0.75	0.71	-0.04	-5%	

Table 5.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Cyprus (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	6.17	6.04	-0.14	-2%	Updated statistical data for mineral fertilizers and cattle
Change 2005 to 2030 CLE	-0.24	-0.39	0.15	+65%	Impact of changes for 2005
2030 Current legislation (CLE)	5.94	5.65	-0.29	-5%	
Additional reduction potential to MTFR	-1.71	-2.10	0.40	+23%	Impact of changes for 2005
2030 Maximum technical feasible reductions (MTFR)	4.23	3.54	-0.69	-16%	
Additional reduction in the optimized scenario	-0.90	-0.88	-0.02	-2%	
2030 optimized scenario	5.04	4.76	-0.27	-5%	

Table 5.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Cyprus (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	8.8	11.4	2.6	30%	Improved representation of the national inventory for the solvent use sector with largest changes for coating and glue application
Change 2005 to 2030 CLE	-4.6	-5.3	-0.7	15%	Impact of the changes for 2005
2030 Current legislation (CLE)	4.1	6.1	1.9	47%	
Additional reduction potential to MTFR	-1.4	-2.1	-0.7	51%	Impact of changes for historical years and harmonization of application limits; primarily in the coating sector
2030 Maximum technical feasible reductions (MTFR)	2.7	3.9	1.2	45%	
Additional reduction in the optimized scenario	0.1	0.4	0.3	414%	
2030 optimized scenario	4.1	5.7	1.7	41%	

Table 5.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Cyprus (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	16.79	17.27	0.48	+3%
Change 2005 to 2030 CLE	-13.74	-14.06	-0.32	+2%
2030 Current legislation (CLE)	3.05	3.21	0.16	+5%
Additional reduction potential to MTFR	-1.08	-1.41	-0.33	+30%
2030 Maximum technical feasible reductions (MTFR)	1.97	1.80	-0.17	-8%
Additional reduction in the optimized scenario	-0.24	-0.47	-0.22	+92%
2030 optimized scenario	2.81	2.74	-0.06	-2%

Table 5.13: Emission control costs for Cyprus (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	138	141	2	2%
Additional costs for MTFR	47	54	7	15%
2030 MTFR	185	194	9	5%
Additional costs in the optimized scenario (compared to CLE)	0.3	0.3	0.0	0
Total costs in the optimized scenario in 2030	138	141	2	2%

6 Czech Republic

Overall, i.e., in terms of PMeq, the difference in emission reductions requirement (relative to 2005) between the re-optimized scenario and the initial COM proposal is rather small (one percentage point). The largest difference emerges for VOC, where new statistical information on a number of sources (e.g., fuel wood consumption, solvent sector, especially for car manufacturing, and on the age distribution of vehicles) results in lower absolute baseline emissions and in less additional reductions that are to be expected for 2030. On the other hand, new data for agricultural sources indicate a larger low cost reduction potential for 2030, so that the revised least-cost solution implies less reductions of VOC and more for NH_3. Emission control costs (on top of CLE) decline by more almost 60%.

6.1 Summary

Table 6.1: Summary table for Czech Republic. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	219	-28%	-45%	-64%	-72%	-73%	-68%	-73%	-75%	+3%	+1%	+2%
NO_x	278	-24%	-35%	-62%	-66%	-72%	-61%	-64%	-71%	-1%	-2%	-1%
PM2.5	21	-4%	-17%	-25%	-51%	-65%	-28%	-50%	-56%	+3%	-2%	-8%
NH_3	68	-6%	-7%	-22%	-35%	-36%	-20%	-38%	-42%	-2%	+3%	+6%
VOC	182	-29%	-9%	-44%	-57%	-72%	-43%	-50%	-68%	-1%	-7%	-5%
PMeq	120	-14%	-32%	-47%	-61%	-66%	-52%	-62%	-66%	+4%	+1%	0%

6.2 Sectoral emission reductions

Table 6.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Czech Republic (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-90.9**	**-13.9**	**-0.1**	**-104.9**
Domestic combustion		**-18.7**	**-0.1**	**-3.4**	**-22.2**
Industry		**-15.0**	**-9.9**	**-8.6**	**-33.6**
of which	Refineries	0.2	0.0	-2.1	-2.0
	Other industries	-15.2	-9.9	-6.5	-31.6
Road transport		**0.1**	**-1.0**	**0.0**	**-0.9**
of which	Light duty	-0.1	-0.5	0.0	-0.5
	Heavy duty	0.1	-0.5	0.0	-0.4
Non-road mobile		**0.0**	**-0.4**	**0.0**	**-0.4**
Other sectors		**0.6**	**0.0**	**-0.4**	**0.2**
TOTAL		**-124.0**	**-25.3**	**-12.4**	**-161.7**

Table 6.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Czech Republic (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-63.4**	**-17.8**	**-1.5**	**-82.7**
Domestic combustion		**0.4**	**0.0**	**0.0**	**0.4**
Industry		**-2.0**	**-4.1**	**-5.3**	**-11.5**
of which	Refineries	-0.4	-0.1	-0.2	-0.6
	Other industries	-1.7	-4.0	-5.2	-10.9
Road transport		**23.0**	**-100.0**	**0.0**	**-77.1**
of which	Light duty	-1.5	-23.9	0.0	-25.4
	Heavy duty	24.5	-76.1	0.0	-51.6
Non road mobile		**-1.3**	**-15.5**	**-0.1**	**-16.9**
Other sectors		**1.3**	**0.0**	**-0.8**	**0.5**
TOTAL		**-42.1**	**-137.5**	**-7.7**	**-187.3**

Table 6.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Czech Republic (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-1.5**	**-0.1**	**-0.4**	**-2.0**
Domestic combustion		**-2.0**	**-0.1**	**-1.5**	**-3.7**
Industry		**-0.2**	**-0.1**	**-1.5**	**-1.9**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-0.2	-0.1	-1.5	-1.9
Road transport		**2.0**	**-5.0**	**0.0**	**-3.0**
of which	Light duty	1.0	-2.4	0.0	-1.4
	Heavy duty	1.0	-2.6	0.0	-1.6
Non road mobile		**-0.1**	**-1.4**	**0.0**	**-1.6**
Other sectors		**-0.8**	**0.0**	**-3.9**	**-4.6**
TOTAL		**-2.6**	**-6.8**	**-7.4**	**-16.8**

Table 6.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for the Czech Republic (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-5.1**	**-2.5**	**-2.3**	**-9.9**
Poultry		**1.5**	**-5.1**	**-0.8**	**-4.5**
Cattle		**1.1**	**-5.8**	**-1.2**	**-5.9**
of which	Dairy	4.0	-5.0	-0.9	-1.9
	Meat	-2.9	-0.8	-0.3	-4.1
Other animals		**0.1**	**0.0**	**0.0**	**0.1**
Mineral fertilizers		**2.4**	**0.0**	**-7.4**	**-5.0**
Other non -agricultural sources		**-0.6**	**-0.6**	**-0.8**	**-2.0**
TOTAL		**-0.6**	**-14.0**	**-12.6**	**-27.1**

Table 6.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for the Czech Republic (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-2.8**	**0.0**	**0.0**	**-2.9**
Domestic combustion		**-0.4**	**-0.3**	**-5.4**	**-6.1**
Industry (combustion and processes, excluding solvent use)		**-2.0**	**-1.0**	**0.0**	**-3.0**
Road transport		**-10.6**	**-30.7**	**0.0**	**-41.3**
of which	Light duty	-12.1	-24.8	0.0	-36.9
	Heavy duty	1.6	-6.0	0.0	-4.4
Non road mobile		**-0.3**	**-4.2**	**0.0**	**-4.5**
Refineries (processes)		**0.1**	**-0.6**	**-0.4**	**-0.9**
Production, storage and distribution of oil products		**-1.6**	**-2.6**	**0.0**	**-4.2**
Solvent use		**7.8**	**-34.0**	**-2.4**	**-28.6**
Other sectors		**-0.8**	**0.0**	**-5.0**	**-5.8**
of which	ban of agr. waste burning	-0.8	0.0	-4.2	-5.1
TOTAL		**-10.7**	**-73.5**	**-13.2**	**-97.4**

6.3 Differences to the 2013 Commission proposal

Table 6.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Czech Republic (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	207.6	220.7	+13.2	+6%	Updated EF (higher EF) for lignite use in domestic sector based on new inventory
Change 2005 to 2030 CLE	-133.7	-149.3	+15.6	+12%	Higher CLE reductions in domestic sector
2030 Current legislation (CLE)	73.9	71.5	-2.4	-3%	
Additional reduction potential to MTFR	-18.0	-15.4	-2.6	-14%	Less additional potential in domestic sector
2030 Maximum technical feasible reductions (MTFR)	55.9	56.1	+0.1	+0%	
Additional reduction in the optimized scenario	-15.4	-12.4	-2.9	-19%	
2030 optimized scenario	58.5	59.0	+0.5	+1%	

Table 6.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Czech Republic (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	296.0	294.4	-1.6	-1%	Different source distribution based on new information provided by CZ: less emissions from power sector, more from industrial combustion, road transport and NRMM
Change 2005 to 2030 CLE	-184.1	-179.6	-4.5	-2%	Higher emissions from mineral products industry (corrected activity data) and NRMM (higher EFs)
2030 Current legislation (CLE)	111.8	114.8	+2.9	+3%	
Additional reduction potential to MTFR	-29.3	-29.3	-0.1	-0%	
2030 Maximum technical feasible reductions (MTFR)	82.5	85.5	+3.0	+4%	
Additional reduction in the optimized scenario	-10.8	-7.7	-3.1	-29%	
2030 optimized scenario	101.0	107.1	+6.1	+6%	

Table 6.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Czech Republic (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	42.9	33.8	-9.1	-21%	Lower emissions from domestic sector due to adjusted source structure; lower non-exhaust EFs for road sources
Change 2005 to 2030 CLE	-10.8	-9.4	-1.4	-13%	As for 2005
2030 Current legislation (CLE)	32.0	24.3	-7.7	-24%	
Additional reduction potential to MTFR	-16.8	-9.6	-7.3	-43%	Less additional potential in domestic sector (adjusted source structure and applicabilities)
2030 Maximum technical feasible reductions (MTFR)	15.2	14.7	-0.4	-3%	
Additional reduction in the optimized scenario	-11.2	-7.4	-3.8	-34%	
2030 optimized scenario	20.9	17.0	-3.9	-19%	

Table 6.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Czech Republic (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	79.9	71.4	-8.4	-11%	Updated statistical data for poultry, rabbits and mineral fertilizers; harmonization of emission factors for urea
Change 2005 to 2030 CLE	-17.7	-14.6	-3.1	-18%	Impact of changes for the base year
2030 Current legislation (CLE)	62.1	56.8	-5.3	-9%	
Additional reduction potential to MTFR	-11.0	-15.3	+4.3	+39%	Impact of the changes for 2005 and the updated farm structure and consequent harmonization of application limits and emission factors
2030 Maximum technical feasible reductions (MTFR)	51.1	41.5	-9.6	-19%	
Additional reduction in the optimized scenario	-10.4	-12.6	+2.2	+21%	
2030 optimized scenario	51.8	44.3	-7.5	-15%	

Table 6.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Czech Republic (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	251.3	195.8	-55.5	-22%	Lower fuel wood consumption, lower emissions from road transport due to the new information about the vehicle age distribution, update of the solvent sector, especially the latest activity data for the car manufacturing industry
Change 2005 to 2030 CLE	-111.7	-84.1	-27.5	-25%	Impact of changes in the base year and revised projections for car manufacturing
2030 Current legislation (CLE)	139.6	111.7	-27.9	-20%	
Additional reduction potential to MTFR	-70.5	-48.7	-21.7	-31%	See CLE and base year
2030 Maximum technical feasible reductions (MTFR)	69.1	62.9	-6.2	-9%	
Additional reduction in the optimized scenario	-31.1	-13.2	-17.9	-58%	
2030 optimized scenario	108.5	98.5	-10.0	-9%	

Table 6.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Czech Republic (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	142.3	134.9	-7.4	-5%
Change 2005 to 2030 CLE	-67.5	-69.6	+2.1	+3%
2030 Current legislation (CLE)	74.8	65.3	-9.5	-13%
Additional reduction potential to MTFR	-26.9	-19.5	-7.4	-27%
2030 Maximum technical feasible reductions (MTFR)	47.9	45.8	-2.1	-4%
Additional reduction in the optimized scenario	-18.7	-14.1	-4.6	-25%
2030 optimized scenario	56.1	51.2	-4.9	-9%

Table 6.13: Emission control costs for the Czech Republic (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1936	2133	196	10%
Additional costs for MTFR	1269	975	-294	-23%
2030 MTFR	3205	3108	-97	-3%
Additional costs in the optimized scenario (compared to CLE)	106	43	-63	-60%
Total costs in the optimized scenario in 2030	2042	2176	133	7%

7 Denmark

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for Denmark the overall emission reduction requirement (ERR) in terms of PMeq is six percentage points lower than in the initial COM scenario.

For Denmark, new statistical data on shipping suggest for 2030 larger baseline reductions for SO_2, which leads to a larger ERR for SO_2 (although no additional measures are required in Denmark. This larger decline contributes to relaxations of the ERRs for the other pollutants. For VOC, the ERR drops with -10 percentage points and for PM2.5 ERR drops with-9 percentage points. Emission control costs (on top of CLE) decline by almost 90%.

7.1 Summary

Table 7.1: Summary table for Denmark. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	25	-49%	-35%	-56%	-58%	-63%	-62%	-62%	-68%	+6%	+4%	+5%
NO_x	186	-38%	-56%	-66%	-69%	-75%	-64%	-66%	-73%	-2%	-3%	-2%
PM2.5	26	-14%	-33%	-53%	-64%	-75%	-53%	-56%	-69%	0%	-9%	-7%
NH_3	88	-13%	-33%	-31%	-37%	-47%	-27%	-32%	-46%	-4%	-5%	-1%
VOC	114	-31%	-36%	-51%	-59%	-73%	-48%	-49%	-68%	-3%	-10%	-6%
PMeq	64	-32%	-50%	-51%	-58%	-67%	-50%	-53%	-64%	-1%	-6%	-3%

7.2 Sectoral emission reductions

Table 7.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Denmark (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-5.6**	**-0.2**	**0.0**	**-5.9**
Domestic combustion		**-1.6**	**-0.2**	**0.0**	**-1.8**
Industry		**-3.9**	**-0.6**	**0.0**	**-4.5**
of which	Refineries	-0.7	0.0	0.0	-0.7
	Other industries	-3.2	-0.6	0.0	-3.8
Road transport		**0.0**	**0.0**	**0.0**	**0.0**
of which	Light duty	0.0	0.0	0.0	0.0
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**-0.7**	**-2.2**	**0.0**	**-2.9**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**-11.8**	**-3.2**	**-0.1**	**-15.1**

Table 7.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Denmark (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-17.8**	**-6.7**	**-1.4**	**-25.9**
Domestic combustion		**-1.9**	**0.0**	**0.0**	**-1.9**
Industry		**-4.0**	**-1.5**	**-1.4**	**-6.9**
of which	Refineries	-3.9	-0.1	-1.4	-5.4
	Other industries	-0.1	-1.4	0.0	-1.5
Road transport		**-0.8**	**-55.1**	**0.0**	**-55.8**
of which	Light duty	-2.6	-21.0	0.0	-23.6
	Heavy duty	1.8	-34.0	0.0	-32.2
Non road mobile		**-7.0**	**-19.0**	**-0.3**	**-26.3**
Other sectors		**0.1**	**0.0**	**-0.1**	**0.0**
TOTAL		**-31.5**	**-82.2**	**-3.1**	**-116.8**

Table 7.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Denmark (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.3**	**-0.1**	**0.0**	**-0.4**
Domestic combustion		**-2.5**	**-6.6**	**-0.2**	**-9.4**
Industry		**0.0**	**0.0**	**-0.1**	**-0.2**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.0	0.0	-0.1	-0.2
Road transport		**0.7**	**-2.8**	**0.0**	**-2.1**
of which	Light duty	0.7	-1.9	0.0	-1.2
	Heavy duty	0.1	-0.9	0.0	-0.9
Non road mobile		**-0.7**	**-1.9**	**0.0**	**-2.6**
Other sectors		**-0.2**	**0.0**	**-0.4**	**-0.6**
TOTAL		**-3.1**	**-11.4**	**-0.7**	**-15.3**

Table 7.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Denmark (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-3.4**	**-9.6**	**-2.1**	**-15.1**
Poultry		**0.8**	**-2.0**	**-0.7**	**-1.9**
Cattle		**-0.8**	**-3.1**	**-0.6**	**-4.5**
of which	Dairy	0.0	-2.8	-0.6	-3.4
	Meat	-0.8	-0.2	0.0	-1.0
Other animals		**0.5**	**0.0**	**0.0**	**0.5**
Mineral fertilizers		**-0.8**	**0.0**	**0.0**	**-0.8**
Other non -agricultural sources		**-2.1**	**-0.4**	**-0.4**	**-2.9**
TOTAL		**-5.9**	**-15.0**	**-3.8**	**-24.7**

Table 7.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Denmark (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.5**	**0.0**	**-0.4**	**-0.9**
Domestic combustion		**-2.6**	**-7.6**	**-0.1**	**-10.3**
Industry (combustion and processes, excluding solvent use)		**0.4**	**0.0**	**0.0**	**0.4**
Road transport		**-11.1**	**-10.3**	**0.0**	**-21.4**
of which	Light duty	-11.3	-8.4	0.0	-19.7
	Heavy duty	0.2	-1.8	0.0	-1.7
Non road mobile		**-5.2**	**-4.0**	**-0.2**	**-9.4**
Refineries (processes)		**-0.6**	**-0.1**	**0.0**	**-0.7**
Production, storage and distribution of oil products		**-1.1**	**-0.1**	**0.0**	**-1.2**
Solvent use		**-1.9**	**-9.2**	**0.0**	**-11.2**
Other sectors		**-0.1**	**0.0**	**-0.4**	**-0.6**
of which	ban of agr. waste burning	-0.1	0.0	-0.3	-0.4
TOTAL		**-22.8**	**-31.4**	**-1.1**	**-55.3**

7.3 Differences to the 2013 Commission proposal

Table 7.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Denmark (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	20.6	24.3	+3.7	+18%	Improved representation of recent national inventory (2014 submission 7% higher than in 2012); adjustment of emissions from power sector, industry and shipping (less controls)
Change 2005 to 2030 CLE	-11.5	-15.1	+3.6	+31%	Some control measures in industry, power sector and shipping introduced after 2005 rather than before as previously estimated
2030 Current legislation (CLE)	9.1	9.2	+0.1	+1%	
Additional reduction potential to MTFR	-1.4	-1.4	+0.1	+4%	
2030 Maximum technical feasible reductions (MTFR)	7.7	7.8	+0.1	+1%	
Additional reduction in the optimized scenario	-0.5	-0.1	-0.4	-84%	
2030 optimized scenario	8.6	9.1	+0.5	+6%	

Table 7.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Denmark (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	182.3	177.1	-5.2	-3%	Different allocation of fuels to road vehicles and NRMM; corrected activities in mineral products industry
Change 2005 to 2030 CLE	-120.8	-113.7	-7.1	-6%	Higher CLE emissions from mineral products industry, higher NRMM EF for Stage 4
2030 Current legislation (CLE)	61.5	63.4	+1.9	+3%	
Additional reduction potential to MTFR	-15.9	-15.8	-0.1	-1%	
2030 Maximum technical feasible reductions (MTFR)	45.6	47.7	+2.1	+5%	
Additional reduction in the optimized scenario	-4.6	-3.1	-1.5	-32%	
2030 optimized scenario	56.9	60.3	+3.4	+6%	

Table 7.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Denmark (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	28.0	27.4	-0.6	-2%	Improved representation of the inventory: lower emissions from power sector and industry, lower non-exhaust emissions from road sector, revised fuel allocation for NRMM
Change 2005 to 2030 CLE	-14.9	-14.6	-0.4	-2%	Lower CLE emissions from road sector (adjusted non-exhaust emissions)
2030 Current legislation (CLE)	13.1	12.9	-0.2	-2%	
Additional reduction potential to MTFR	-6.2	-4.4	-1.9	-30%	Lower potential in domestic sector due to adjusted applicabilities
2030 Maximum technical feasible reductions (MTFR)	6.9	8.5	+1.6	+24%	
Additional reduction in the optimized scenario	-3.1	-0.7	-2.4	-76%	
2030 optimized scenario	10.0	12.1	+2.1	+21%	

Table 7.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Denmark (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	73.4	77.0	+3.6	+5%	New statistical data for agriculture, shares of solid liquid systems, and emission factors for mineral fertilizers, horses and sheep.
Change 2005 to 2030 CLE	-22.8	-20.9	-1.9	-9%	Impact of changes for the base year and updated CLE control strategy
2030 Current legislation (CLE)	50.6	56.1	+5.5	+11%	
Additional reduction potential to MTFR	-11.5	-14.5	+3.0	+26%	See base year and CLE
2030 Maximum technical feasible reductions (MTFR)	39.1	41.6	+2.5	+6%	
Additional reduction in the optimized scenario	-4.5	-3.8	-0.7	-16%	
2030 optimized scenario	46.1	52.3	+6.2	+14%	

Table 7.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Denmark (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	129.9	112.1	-17.8	-14%	Earlier discrepancies for emissions from gas engines resolved by harmonizing emission factors with data for Germany; good match with national inventory
Change 2005 to 2030 CLE	-66.7	-54.1	-12.6	-19%	Impact of the changes of emission factors (see 2005)
2030 Current legislation (CLE)	63.2	57.9	-5.2	-8%	
Additional reduction potential to MTFR	-28.6	-21.8	-6.8	-24%	Consequence of base year changes
2030 Maximum technical feasible reductions (MTFR)	34.6	36.2	+1.6	+5%	
Additional reduction in the optimized scenario	-9.7	-1.1	-8.5	-88%	
2030 optimized scenario	53.5	56.8	+3.3	+6%	

Table 7.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Denmark (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	61.8	62.5	+0.7	+1%
Change 2005 to 2030 CLE	-31.5	-31.2	-0.3	-1%
2030 Current legislation (CLE)	30.3	31.3	+1.0	+3%
Additional reduction potential to MTFR	-10.2	-8.8	-1.3	-13%
2030 Maximum technical feasible reductions (MTFR)	20.1	22.4	+2.3	+11%
Additional reduction in the optimized scenario	-4.5	-1.7	-2.8	-62%
2030 optimized scenario	25.8	29.6	+3.8	+15%

Table 7.13: Emission control costs for Denmark (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1117	1170	+54	+5%
Additional costs for MTFR	814	677	-137	-17%
2030 MTFR	1931	1848	-83	-4%
Additional costs in the optimized scenario (compared to CLE)	18	2	-16	-88%
Total costs in the optimized scenario in 2030	1135	1172	+38	+3%

8 Estonia

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for Estonia the overall emission reduction requirement (ERR) in terms of PMeq is four percentage points lower than in the initial COM scenario.

For Estonia, new statistical information on oil shale suggest for 2030 larger baseline reductions for SO_2, which leads to two percentage points larger ERR for SO_2. This larger SO_2 reduction suggests relaxations of the ERRs for the other pollutants, especially for NOx (-15 percentage points) and PM2.5 (-11 percentage points). Emission control costs (on top of CLE) decline by 75%.

8.1 Summary

Table 8.1: Summary table for Estonia. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	76	-47%	-32%	-67%	-71%	-78%	-72%	-72%	-89%	+5%	+2%	+11%
NO_x	37	-12%	-20%	-61%	-61%	-74%	-46%	-46%	-71%	-15%	-15%	-3%
PM2.5	20	-14%	-15%	-41%	-52%	-85%	-35%	-41%	-76%	-6%	-11%	-9%
NH_3	10	11%	-1%	9%	-8%	-29%	15%	-1%	-26%	-6%	-7%	-4%
VOC	40	-16%	-18%	-31%	-37%	-75%	-24%	-28%	-66%	-6%	-9%	-10%
PMeq	47	-26%	-25%	-51%	-58%	-78%	-51%	-54%	-80%	0%	-4%	+1%

8.2 Sectoral emission reductions

Table 8.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Estonia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-38.1**	**-16.9**	**0.0**	**-55.0**
Domestic combustion		**-1.3**	**0.0**	**0.0**	**-1.3**
Industry		**2.4**	**-0.1**	**-0.3**	**2.0**
of which	Refineries	1.8	0.0	-0.3	1.5
	Other industries	0.5	0.0	0.0	0.5
Road transport		**-0.1**	**-0.4**	**0.0**	**-0.4**
of which	Light duty	-0.1	-0.3	0.0	-0.3
	Heavy duty	0.0	-0.1	0.0	-0.1
Non-road mobile		**0.1**	**-0.3**	**0.0**	**-0.2**
Other sectors		**1.5**	**-1.1**	**-0.1**	**0.3**
TOTAL		**-35.5**	**-18.8**	**-0.4**	**-54.7**

Table 8.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Estonia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-4.6**	**-0.1**	**0.0**	**-4.8**
Domestic combustion		**0.3**	**0.0**	**0.0**	**0.3**
Industry		**-0.4**	**-0.5**	**0.0**	**-0.9**
of which	Refineries	0.3	0.0	0.0	0.2
	Other industries	-0.6	-0.5	0.0	-1.1
Road transport		**1.5**	**-12.1**	**0.0**	**-10.6**
of which	Light duty	-1.1	-4.2	0.0	-5.3
	Heavy duty	2.5	-7.9	0.0	-5.3
Non road mobile		**2.3**	**-4.8**	**-0.1**	**-2.6**
Other sectors		**3.2**	**-1.8**	**-0.2**	**1.2**
TOTAL		**2.3**	**-19.3**	**-0.3**	**-17.2**

Table 8.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Estonia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-6.2**	**-0.5**	**0.0**	**-6.7**
Domestic combustion		**2.8**	**-3.1**	**0.0**	**-0.3**
Industry		**0.0**	**-0.5**	**-0.4**	**-0.8**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.0	-0.5	-0.4	-0.9
Road transport		**0.2**	**-0.7**	**0.0**	**-0.5**
of which	Light duty	0.1	-0.4	0.0	-0.3
	Heavy duty	0.1	-0.3	0.0	-0.2
Non road mobile		**0.2**	**-0.6**	**0.0**	**-0.4**
Other sectors		**2.6**	**-1.5**	**-0.9**	**0.2**
TOTAL		**-0.4**	**-6.7**	**-1.3**	**-8.4**

Table 8.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Estonia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**0.7**	**-0.1**	**-0.4**	**0.1**
Poultry		**-0.2**	**0.0**	**0.0**	**-0.2**
Cattle		**0.6**	**0.0**	**-1.1**	**-0.5**
of which	Dairy	0.8	0.0	-0.9	-0.1
	Meat	-0.1	0.0	-0.2	-0.3
Other animals		**0.0**	**0.0**	**0.0**	**0.0**
Mineral fertilizers		**0.7**	**0.0**	**0.0**	**0.7**
Other non -agricultural sources		**0.0**	**-0.1**	**-0.2**	**-0.3**
TOTAL		**1.8**	**-0.3**	**-1.6**	**-0.1**

Table 8.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Estonia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.4**	**0.0**	**0.0**	**-0.4**
Domestic combustion		**4.9**	**-6.3**	**0.0**	**-1.4**
Industry (combustion and processes, excluding solvent use)		**0.2**	**-0.3**	**0.0**	**0.0**
Road transport		**-1.3**	**-4.2**	**0.0**	**-5.5**
of which	Light duty	-1.4	-3.6	0.0	-5.0
	Heavy duty	0.1	-0.6	0.0	-0.5
Non road mobile		**0.4**	**-0.9**	**0.0**	**-0.5**
Refineries (processes)		**0.7**	**-0.3**	**0.0**	**0.4**
Production, storage and distribution of oil products		**2.5**	**-1.1**	**0.0**	**1.4**
Solvent use		**0.6**	**-3.7**	**0.0**	**-3.0**
Other sectors		**0.0**	**0.0**	**-1.1**	**-1.1**
of which	ban of agr. waste burning	0.0	0.0	-1.1	-1.1
TOTAL		**7.7**	**-16.8**	**-1.2**	**-10.3**

8.3 Differences to the 2013 Commission proposal

Table 8.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Estonia (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	66.0	75.7	+9.7	+15%	National data about technologies related to oil shale implemented
Change 2005 to 2030 CLE	-43.9	-54.3	+10.4	+24%	New national data about technologies related to oil shale
2030 Current legislation (CLE)	22.1	21.4	-0.7	-3%	
Additional reduction potential to MTFR	-7.4	-12.8	+5.3	+71%	Higher potential to reduce emissions from waste gases produced in shale oil industry
2030 Maximum technical feasible reductions (MTFR)	14.7	8.6	-6.0	-41%	
Additional reduction in the optimized scenario	-2.8	-0.4	-2.4	-85%	
2030 optimized scenario	19.3	21.0	+1.7	+9%	

Table 8.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Estonia (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	40.1	37.3	-2.8	-7%	Improved representation of inventory: higher emissions from power plants and industry (oil shale EFs), lower emissions from mobile sources (adjusted fuel allocation)
Change 2005 to 2030 CLE	-24.3	-17.0	-7.3	-30%	Higher emissions in the power sector and industry; slower fleet turnover in the road sector and thus higher emissions; higher NRMM emissions due to re-assessment of fuel use based on national sources and higher Stage 4 EFs
2030 Current legislation (CLE)	15.8	20.3	+4.5	+28%	
Additional reduction potential to MTFR	-5.4	-9.4	+4.0	+75%	Higher reduction potential for power sector, industry and NRMM (due to higher activity levels)
2030 Maximum technical feasible reductions (MTFR)	10.5	10.9	+0.5	+5%	
Additional reduction in the optimized scenario	-0.2	-0.3	+0.1	+27%	
2030 optimized scenario	15.6	20.1	+4.4	+28%	

Table 8.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Estonia (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	20.0	20.4	+0.5	+2%	Higher emissions from shale oil production
Change 2005 to 2030 CLE	-8.2	-7.2	-1.1	-13%	Higher 2030 emissions from shale oil production - adjusted activity levels
2030 Current legislation (CLE)	11.7	13.3	+1.6	+13%	
Additional reduction potential to MTFR	-8.8	-8.5	-0.3	-4%	Less potential in domestic sector due to different structure of combustion devices and applicabilities of measures; higher potential from adjusted shale oil activities
2030 Maximum technical feasible reductions (MTFR)	2.9	4.8	+1.9	+66%	
Additional reduction in the optimized scenario	-2.1	-1.3	-0.9	-40%	
2030 optimized scenario	9.6	12.0	+2.4	+25%	

Table 8.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Estonia (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	11.8	10.2	-1.6	-14%	Updated statistical data for horses and urea; revised emission factors for pigs; harmonization of non-agricultural sources with the national inventory.
Change 2005 to 2030 CLE	1.0	1.5	-0.5	+49%	Impact of changes in the base year
2030 Current legislation (CLE)	12.8	11.7	-1.1	-9%	
Additional reduction potential to MTFR	-4.5	-4.2	-0.3	-7%	Impact of changes in the base year
2030 Maximum technical feasible reductions (MTFR)	8.3	7.5	-0.8	-9%	
Additional reduction in the optimized scenario	-2.0	-1.6	-0.3	-17%	
2030 optimized scenario	10.8	10.1	-0.8	-7%	

Table 8.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Estonia (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	38.4	37.4	-1.1	-3%	Harmonization of data for solvent use sector and oil terminals
Change 2005 to 2030 CLE	-11.9	-9.2	-2.7	-23%	Updates of solvent use sector, including emission factors for printing and industrial cleaning, and activity data for coating operations; new projection for oil terminals
2030 Current legislation (CLE)	26.5	28.2	+1.7	+6%	
Additional reduction potential to MTFR	-17.1	-15.4	-1.7	-10%	Impact of the base year changes and CLE updates
2030 Maximum technical feasible reductions (MTFR)	9.4	12.8	+3.4	+36%	
Additional reduction in the optimized scenario	-2.2	-1.2	-1.1	-49%	
2030 optimized scenario	24.3	27.1	+2.8	+11%	

Table 8.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Estonia (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	44.9	47.8	+2.9	+6%
Change 2005 to 2030 CLE	-22.9	-24.3	+1.4	+6%
2030 Current legislation (CLE)	22.1	23.5	+1.5	+7%
Additional reduction potential to MTFR	-12.4	-13.8	+1.4	+12%
2030 Maximum technical feasible reductions (MTFR)	9.7	9.7	+0.0	+0%
Additional reduction in the optimized scenario	-3.4	-1.7	-1.6	-48%
2030 optimized scenario	18.7	21.8	+3.1	+17%

Table 8.13: Emission control costs for Estonia (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	298	334	36	12%
Additional costs for MTFR	363	291	-72	-20%
2030 MTFR	660	625	-36	-5%
Additional costs in the optimized scenario (compared to CLE)	4	1	-3	-84%
Total costs in the optimized scenario in 2030	302	334	33	11%

9 Finland

The re-optimized scenario results in only small changes in total emission reduction requirements in terms of PMeq. However, the corrected treatment of coke use in blast furnaces implies slightly larger baseline emission reductions (relative to 20050 for SO_2, which in turn relieves the ERRs for the other pollutants, especially for PM2.5 and NO_x. Emission control costs (on top of CLE) decline by 40%.

9.1 Summary

Table 9.1: Summary table for Finland. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	69	-26%	-30%	-29%	-30%	-35%	-34%	-34%	-42%	+5%	+5%	+8%
NO_x	169	-14%	-35%	-51%	-51%	-59%	-47%	-47%	-58%	-3%	-3%	-1%
PM2.5	41	-10%	-30%	-30%	-39%	-62%	-28%	-34%	-48%	-2%	-5%	14%
NH_3	38	-3%	-20%	-8%	-15%	-29%	-9%	-15%	-29%	+1%	0%	+1%
VOC	136	-23%	-35%	-44%	-46%	-72%	-47%	-48%	-67%	+3%	+1%	-5%
PMeq	82	-18%	-43%	-32%	-36%	-49%	-31%	-35%	-47%	-1%	-1%	-3%

9.2 Sectoral emission reductions

Table 9.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Finland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-6.6**	**-7.3**	**0.0**	**-13.9**
Domestic combustion		**-2.2**	**0.0**	**0.0**	**-2.2**
Industry		**-0.7**	**-6.1**	**-0.4**	**-7.2**
of which	Refineries	0.4	-1.5	0.0	-1.1
	Other industries	-1.1	-4.6	-0.4	-6.1
Road transport		**0.0**	**0.0**	**0.0**	**0.0**
of which	Light duty	0.0	0.0	0.0	0.0
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**-0.8**	**0.0**	**0.0**	**-0.8**
Other sectors		**0.5**	**0.0**	**0.0**	**0.4**
TOTAL		**-9.8**	**-13.4**	**-0.5**	**-23.6**

Table 9.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Finland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-2.0**	**-0.3**	**0.0**	**-2.4**
Domestic combustion		**-1.9**	**0.0**	**0.0**	**-1.9**
Industry		**1.6**	**-1.7**	**0.0**	**-0.1**
of which	Refineries	0.3	0.0	0.0	0.2
	Other industries	1.3	-1.6	0.0	-0.3
Road transport		**-4.6**	**-49.5**	**0.0**	**-54.1**
of which	Light duty	-5.1	-17.6	0.0	-22.7
	Heavy duty	0.5	-31.8	0.0	-31.4
Non road mobile		**-6.6**	**-22.8**	**0.0**	**-29.4**
Other sectors		**0.7**	**0.0**	**-0.1**	**0.6**
TOTAL		**-12.9**	**-74.3**	**-0.1**	**-87.3**

Table 9.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Finland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.0**	**-1.1**	**0.0**	**-1.1**
Domestic combustion		**-1.1**	**-0.5**	**-1.4**	**-3.0**
Industry		**0.6**	**0.0**	**-0.2**	**0.4**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.7	0.0	-0.2	0.4
Road transport		**1.1**	**-3.2**	**0.0**	**-2.1**
of which	Light duty	1.0	-2.1	0.0	-1.1
	Heavy duty	0.1	-1.1	0.0	-1.0
Non road mobile		**-0.7**	**-2.5**	**0.0**	**-3.2**
Other sectors		**-1.4**	**-1.0**	**-0.4**	**-2.9**
TOTAL		**-1.4**	**-8.4**	**-2.1**	**-11.9**

Table 9.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Finland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-0.9**	**-0.8**	**-0.9**	**-2.5**
Poultry		**-0.2**	**-0.1**	**-0.1**	**-0.4**
Cattle		**-0.4**	**-0.3**	**-1.2**	**-1.8**
of which	Dairy	0.7	-0.2	-1.2	-0.7
	Meat	-1.0	-0.1	0.0	-1.1
Other animals		**0.1**	**0.0**	**0.0**	**0.1**
Mineral fertilizers		**-0.1**	**0.0**	**0.0**	**-0.1**
Other non -agricultural sources		**-0.7**	**-0.3**	**0.0**	**-1.1**
TOTAL		**-2.1**	**-1.5**	**-2.3**	**-5.8**

Table 9.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Finland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.4**	**0.0**	**0.0**	**0.3**
Domestic combustion		**-2.0**	**-0.7**	**0.0**	**-2.8**
Industry (combustion and processes, excluding solvent use)		**0.9**	**-0.4**	**0.0**	**0.5**
Road transport		**-14.3**	**-15.5**	**0.0**	**-29.8**
of which	Light duty	-14.5	-13.1	0.0	-27.6
	Heavy duty	0.2	-2.4	0.0	-2.1
Non road mobile		**-1.2**	**-15.8**	**0.0**	**-17.0**
Refineries (processes)		**0.0**	**-0.2**	**0.0**	**-0.2**
Production, storage and distribution of oil products		**-1.4**	**-0.2**	**0.0**	**-1.6**
Solvent use		**0.0**	**-4.9**	**-0.2**	**-5.1**
Other sectors		**0.0**	**0.0**	**-0.4**	**-0.5**
of which	ban of agr. waste burning	0.0	0.0	0.0	-0.1
TOTAL		**-17.6**	**-37.8**	**-0.6**	**-56.0**

9.3 Differences to the 2013 Commission proposal

Table 9.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Finland (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	89.6	68.8	-20.8	-23%	Emission factors for coke use in blast furnaces harmonized with PRIMES/EUROSTAT fuel reporting practices; improved match with reported emissions from power plants
Change 2005 to 2030 CLE	-25.8	-23.2	-2.7	-10%	Consequence of changes for 2005
2030 Current legislation (CLE)	63.8	45.7	-18.1	-28%	
Additional reduction potential to MTFR	-5.1	-5.9	+0.7	+14%	S-free heating oil considered as an option for the domestic sector. No difference for other sectors
2030 Maximum technical feasible reductions (MTFR)	58.7	39.8	-18.9	-32%	
Additional reduction in the optimized scenario	-0.7	-0.5	-0.2	-34%	
2030 optimized scenario	63.1	45.2	-17.9	-28%	

Table 9.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Finland (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	201.2	184.1	-17.1	-8%	Improved match with national inventory - lower emissions from power sector and road transport (lower EFs), higher emission factors for NRMM
Change 2005 to 2030 CLE	-102.1	-87.2	-15.0	-15%	Larger reductions in the power sector due to updated distribution between gas boilers and CCGT plants, less CLE control measures for NRMM
2030 Current legislation (CLE)	99.1	97.0	-2.1	-2%	
Additional reduction potential to MTFR	-17.4	-20.1	+2.6	+15%	Higher potential to reduce emissions from the power sector due to higher share of CCGT plants, lower from NRMM (less stringent Stages 4 and 5)
2030 Maximum technical feasible reductions (MTFR)	81.7	76.9	-4.8	-6%	
Additional reduction in the optimized scenario	-0.1	-0.1	-0.0	-21%	
2030 optimized scenario	99.0	96.9	-2.1	-2%	

Table 9.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Finland (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	28.5	34.7	+6.1	+22%	Improved representation of new national 2005 inventory (2014 submission estimate 13% higher than in 2012). Higher emission factor for pit mining and handling, as well as for non-exhaust emissions in road transport (studded tyres)
Change 2005 to 2030 CLE	-8.7	-9.8	+1.1	+13%	Same as for 2005
2030 Current legislation (CLE)	19.8	24.9	+5.0	+25%	
Additional reduction potential to MTFR	-9.0	-6.9	-2.1	-24%	Lower potential in domestic sector due to different structure of combustion devices and applicabilities of control measures
2030 Maximum technical feasible reductions (MTFR)	10.8	18.0	+7.2	+66%	
Additional reduction in the optimized scenario	-2.4	-2.1	-0.3	-13%	
2030 optimized scenario	17.4	22.8	+5.4	+31%	

Table 9.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Finland (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	33.9	39.6	+5.6	+17%	Updated emission factors for livestock and shares of animals kept on solid/liquid systems.
Change 2005 to 2030 CLE	-2.6	-3.6	+1.0	+37%	Impact of the changes for the base year and update of the CLE control strategy
2030 Current legislation (CLE)	31.3	36.0	+4.7	+15%	
Additional reduction potential to MTFR	-7.1	-8.1	+1.0	+14%	Impact of base year changes and updated application limits for manure storage and application techniques
2030 Maximum technical feasible reductions (MTFR)	24.2	27.9	+3.7	+15%	
Additional reduction in the optimized scenario	2.5	2.3	+0.2	-9%	
2030 optimized scenario	28.8	33.7	+4.9	+17%	

Table 9.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Finland (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	172.6	117.8	-54.8	-32%	Updated emission factors for residential combustion and harmonization of solvent use sector; GAINS factors still different from official submission in 2014, but national experts confirmed the total to be consistent with the forthcoming 2015 submission.
Change 2005 to 2030 CLE	-76.5	-55.4	-21.1	-28%	Impact of the changes to residential combustion and solvent sector; see base year comments
2030 Current legislation (CLE)	96.1	62.4	-33.7	-35%	
Additional reduction potential to MTFR	-48.2	-23.3	-24.9	-52%	See base year and CLE
2030 Maximum technical feasible reductions (MTFR)	47.9	39.1	-8.8	-18%	
Additional reduction in the optimized scenario	-3.7	-0.6	-3.1	-84%	
2030 optimized scenario	92.4	61.8	-30.6	-33%	

Table 9.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Finland (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	76.9	76.3	-0.6	-1%
Change 2005 to 2030 CLE	-24.4	-23.7	-0.7	-3%
2030 Current legislation (CLE)	52.4	52.5	+0.1	+0%
Additional reduction potential to MTFR	-13.5	-11.8	-1.8	-13%
2030 Maximum technical feasible reductions (MTFR)	38.9	40.8	+1.9	+5%
Additional reduction in the optimized scenario	-3.2	-2.7	-0.5	-15%
2030 optimized scenario	49.3	49.8	+0.6	+1%

Table 9.13: Emission control costs (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1422	1409	-13	-1%
Additional costs for MTFR	1035	799	-237	-23%
2030 MTFR	2458	2208	-250	-10%
Additional costs in the optimized scenario (compared to CLE)	5	3	-2	-35%
Total costs in the optimized scenario in 2030	1427	1412	-15	-1%

10 France

For France, the updated information results for the re-optimized scenario in slightly higher (two percentage points) overall emission reduction requirements (in terms of PMeq), although emission control costs will be lower. The main factor responsible for the larger reduction is the new statistical information on PM2.5 emissions, especially for industrial processes, which result in 11 percentage points higher baseline emission reduction in 2030. This relieves the need for additional control measures, and overall leads to less additional control for PM2.5, NO_x, VOC and especially NH_3, although for PM2.5 and VOC still resulting in stricter ERR. Emission control costs (on top of CLE) decline by more than 50%.

10.1 Summary

Table 10.1: Summary table for France. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	460	-50%	-55%	-74%	-78%	-79%	-71%	-77%	-80%	-2%	-1%	+1%
NO_x	1404	-30%	-50%	-67%	-70%	-75%	-67%	-69%	-74%	0%	-1%	-1%
PM2.5	246	-26%	-26%	-38%	-48%	-61%	-48%	-56%	-63%	+11%	+8%	+3%
NH_3	686	-1%	-4%	-5%	-29%	-37%	-8%	-23%	-32%	+3%	-7%	-5%
VOC	1261	-44%	-43%	-47%	-50%	-65%	-51%	-52%	-64%	+4%	+2%	-1%
PMeq	621	-42%	-44%	-43%	-54%	-62%	-48%	-55%	-62%	+5%	+2%	0%

10.2 Sectoral emission reductions

Table 10.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for France (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-114.1**	**-1.0**	**0.0**	**-115.1**
Domestic combustion		**-32.2**	**0.0**	**-0.6**	**-32.7**
Industry		**-87.3**	**-61.4**	**-23.5**	**-172.3**
of which	Refineries	-49.8	-26.4	-13.9	-90.1
	Other industries	-37.5	-35.0	-9.6	-82.2
Road transport		**-1.2**	**-2.1**	**0.0**	**-3.3**
of which	Light duty	-1.3	-1.6	0.0	-2.9
	Heavy duty	0.0	-0.5	0.0	-0.5
Non-road mobile		**-2.9**	**-24.9**	**0.0**	**-27.8**
Other sectors		**-4.0**	**0.0**	**-1.8**	**-5.8**
TOTAL		**-241.7**	**-89.4**	**-26.0**	**-357.1**

Table 10.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for France (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-68.8**	**-12.0**	**-4.8**	**-85.6**
Domestic combustion		**-39.8**	**0.0**	**0.0**	**-39.8**
Industry		**-17.5**	**-30.4**	**-12.3**	**-60.2**
of which	Refineries	-7.8	-0.2	-0.2	-8.2
	Other industries	-9.7	-30.2	-12.1	-52.0
Road transport		**-35.3**	**-590.0**	**0.0**	**-625.3**
of which	Light duty	-56.9	-229.2	0.0	-286.1
	Heavy duty	21.7	-360.8	0.0	-339.2
Non road mobile		**-21.4**	**-122.0**	**-9.5**	**-152.9**
Other sectors		**-1.0**	**0.0**	**-1.0**	**-2.0**
TOTAL		**-183.8**	**-754.4**	**-27.6**	**-965.8**

Table 10.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for France (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-3.5**	**0.0**	**-0.6**	**-4.1**
Domestic combustion		**-28.1**	**-37.4**	**-1.1**	**-66.5**
Industry		**-2.9**	**-2.7**	**-10.9**	**-16.6**
of which	Refineries	-0.5	0.0	-0.4	-0.9
	Other industries	-2.4	-2.7	-10.6	-15.7
Road transport		**5.3**	**-37.3**	**0.0**	**-31.9**
of which	Light duty	2.7	-27.1	0.0	-24.4
	Heavy duty	2.6	-10.1	0.0	-7.6
Non road mobile		**-2.0**	**-12.8**	**-1.2**	**-16.0**
Other sectors		**3.9**	**-0.8**	**-5.5**	**-2.4**
TOTAL		**-27.3**	**-90.9**	**-19.3**	**-137.6**

Table 10.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for France (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**7.2**	**-2.2**	**-14.8**	**-9.8**
Poultry		**4.4**	**-23.8**	**-20.2**	**-39.5**
Cattle		**-1.8**	**-1.6**	**-37.3**	**-40.7**
of which	Dairy	15.4	-0.8	-23.0	-8.4
	Meat	-17.2	-0.9	-14.3	-32.3
Other animals		**-9.3**	**0.0**	**-3.8**	**-13.1**
Mineral fertilizers		**-21.9**	**0.0**	**-23.8**	**-45.7**
Other non -agricultural sources		**-4.5**	**-2.1**	**-1.1**	**-7.8**
TOTAL		**-26.0**	**-29.7**	**-101.0**	**-156.7**

Table 10.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for France (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.5**	**0.0**	**-0.1**	**-0.6**
Domestic combustion		**-56.4**	**-147.3**	**-2.3**	**-206.0**
Industry (combustion and processes, excluding solvent use)		**20.9**	**-10.2**	**-3.8**	**6.9**
Road transport		**-126.9**	**-108.1**	**0.0**	**-235.0**
of which	Light duty	-128.2	-87.1	0.0	-215.3
	Heavy duty	1.3	-21.0	0.0	-19.7
Non road mobile		**1.6**	**-62.7**	**-2.3**	**-63.3**
Refineries (processes)		**-4.8**	**0.0**	**0.0**	**-4.8**
Production, storage and distribution of oil products		**-12.1**	**-0.6**	**0.0**	**-12.7**
Solvent use		**43.1**	**-158.4**	**0.0**	**-115.3**
Other sectors		**-0.7**	**0.0**	**-6.4**	**-7.1**
of which	ban of agr. waste burning	0.3	0.0	-3.3	-3.0
TOTAL		**-135.9**	**-487.3**	**-14.9**	**-638.0**

10.3 Differences to the 2013 Commission proposal

Table 10.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for France (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	443.7	464.7	+21.0	+5%	Improved representation of inventory: higher EFs and emissions from refineries, industry and domestic sector
Change 2005 to 2030 CLE	-327.0	-331.1	+4.2	+1%	Higher CLE emissions from industrial combustion , refineries and domestic sector, lower from power sector and processes due to different EFs
2030 Current legislation (CLE)	116.7	133.6	+16.8	+14%	
Additional reduction potential to MTFR	-24.8	-41.3	+16.6	+67%	Higher potential for further reductions beyond CLE in industrial combustion and domestic sector; the latter through availability of S-free light heating oil
2030 Maximum technical feasible reductions (MTFR)	92.0	92.2	+0.2	+0%	
Additional reduction in the optimized scenario	-19.8	-26.0	+6.1	+31%	
2030 optimized scenario	96.9	107.6	+10.7	+11%	

Table 10.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for France (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1351.4	1398.6	+47.2	+3%	Improved representation of recent emission inventory: higher emissions from power sector, industry and domestic sector; higher emissions from road sector due to reallocation of fuels and adjustment of age structure of vehicles
Change 2005 to 2030 CLE	-910.5	-938.2	+27.8	+3%	Mainly consequence of higher 2005 emissions; for NRMM 2030 emissions higher in absolute terms due to slower stock turnover and higher Stage 4 EF
2030 Current legislation (CLE)	441.0	460.3	+19.4	+4%	
Additional reduction potential to MTFR	-109.4	-101.9	-7.4	-7%	Lower potential to reduce emissions from power sector and industry (revised applicabilities), higher from inland waterways and other NRMM (Stages 4 and 5)
2030 Maximum technical feasible reductions (MTFR)	331.6	358.4	+26.8	+8%	
Additional reduction in the optimized scenario	-39.6	-27.6	-12.1	-30%	
2030 optimized scenario	401.3	432.8	+31.5	+8%	

Table 10.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for France (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	271.0	244.7	-26.3	-10%	Improved representation of new national 2005 inventory (2014 submission estimate 24% lower than in 2012) - lower emissions from processes, higher from domestic sector and road transport (non-exhaust emissions, reallocation of fuels, adjustment of age structure)
Change 2005 to 2030 CLE	-102.0	-118.2	+16.2	+16%	Lower CLE emissions from process sources (lower EFs) , higher from road transport (non-exhaust)
2030 Current legislation (CLE)	169.0	126.5	-42.5	-25%	
Additional reduction potential to MTFR	-62.0	-36.9	-25.1	-41%	Less potential from process sources (lower applicabilities) and domestic sector (different structure of combustion devices)
2030 Maximum technical feasible reductions (MTFR)	107.0	89.6	-17.4	-16%	
Additional reduction in the optimized scenario	-28.3	-19.3	-9.0	-32%	
2030 optimized scenario	140.7	107.2	-33.5	-24%	

Table 10.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for France (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	674.8	693.6	+18.7	+3%	Updated statistical data for livestock and shares of animals kept on solid/liquid systems.
Change 2005 to 2030 CLE	-36.0	-55.7	+19.6	+55%	Mostly due to the changes of the base year estimate. Some small changes for fertilizer production and poultry owing to lower emission factors.
2030 Current legislation (CLE)	638.8	637.9	-0.9	-0%	
Additional reduction potential to MTFR	-214.3	-169.3	-45.0	-21%	Modified shares of solid/liquid systems and the resulting application limits for liquid and solid manure and urea
2030 Maximum technical feasible reductions (MTFR)	424.5	468.6	+44.1	+10%	
Additional reduction in the optimized scenario	-162.8	-101.0	+61.8	-38%	
2030 optimized scenario	476.0	536.9	+60.9	+13%	

Table 10.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for France (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1117.0	1216.5	+99.5	+9%	Updated emission factors for heating stoves and domestic solvent use, activity data for some solvent use sectors and oil production
Change 2005 to 2030 CLE	-525.5	-623.2	+97.6	+19%	A number of compensating factors; e.g., lower emissions from oil production, car manufacturing, glue application are compensated by projected increases in domestic solvent and paint use, printing and emissions from heating stoves.
2030 Current legislation (CLE)	591.4	593.3	+1.9	+0%	
Additional reduction potential to MTFR	-195.9	-151.4	-44.5	-23%	See CLE; consequences of modified distributions of sectorial contributions and resulting application limits
2030 Maximum technical feasible reductions (MTFR)	395.5	441.9	+46.3	+12%	
Additional reduction in the optimized scenario	-35.4	-14.9	-20.6	-58%	
2030 optimized scenario	556.0	578.4	+22.4	+4%	

Table 10.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for France (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	634.7	622.4	-12.3	-2%
Change 2005 to 2030 CLE	-272.1	-296.2	+24.0	+9%
2030 Current legislation (CLE)	362.6	326.2	-36.3	-10%
Additional reduction potential to MTFR	-120.0	-90.2	-29.8	-25%
2030 Maximum technical feasible reductions (MTFR)	242.6	236.0	-6.5	-3%
Additional reduction in the optimized scenario	-68.8	-48.6	-20.1	-29%
2030 optimized scenario	293.8	277.6	-16.2	-6%

Table 10.13: Emission control costs for France (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	12208	11999	-209	-2%
Additional costs for MTFR	7828	6373	-1455	-19%
2030 MTFR	20036	18372	-1664	-8%
Additional costs in the optimized scenario (compared to CLE)	289	132	-158	-55%
Total costs in the optimized scenario in 2030	12497	12131	-366	-3%

11 Germany

While the updated information does not change the overall emission reduction requirement (ERR) relative to 2005 in terms of PMeq, changes to the CLE GAINS baseline data on lignite power plants and industrial sources suggest for 2030 a larger baseline reduction of SO_2 with two percentage points, as well as a slightly larger low-cost potential for further measures in industry. As a consequence, the ERR for SO_2 is four percentage points larger than in the initial scenario. In turn, this partially also contributes to a relaxation of the ERRs for other pollutants, particularly for NO_x and VOC, overall being lower by five and eight percentage points, respectively. Emission control costs (on top of CLE) decline by 35%.

11.1 Summary

Table 11.1: Summary table for Germany. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	460	-7%	-21%	-46%	-53%	-55%	-49%	-57%	-62%	+2%	+4%	+7%
NO_x	1565	-19%	-43%	-62%	-69%	-73%	-60%	-64%	-71%	-2%	-5%	-2%
PM2.5	125	-10%	-26%	-32%	-43%	-49%	-33%	-42%	-47%	+1%	-1%	-2%
NH_3	572	-5%	-5%	-5%	-39%	-50%	-7%	-38%	-47%	+2%	-1%	-4%
VOC	1124	-15%	-13%	-32%	-43%	-59%	-31%	-35%	-56%	-1%	-8%	-3%
PMeq	488	-13%	-33%	-36%	-50%	-56%	-37%	-50%	-56%	+1%	0%	0%

11.2 Sectoral emission reductions

Table 11.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Germany (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-105.5**	**-8.6**	**-9.2**	**-123.3**
Domestic combustion		**-34.7**	**-8.8**	**-2.9**	**-46.5**
Industry		**-49.8**	**-14.6**	**-26.7**	**-91.1**
of which	Refineries	-25.7	-1.0	-3.2	-29.9
	Other industries	-24.1	-13.6	-23.6	-61.2
Road transport		**-0.3**	**0.0**	**0.0**	**-0.3**
of which	Light duty	-0.3	0.0	0.0	-0.3
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**0.0**	**-0.6**	**0.0**	**-0.6**
Other sectors		**-0.5**	**0.0**	**-0.2**	**-0.7**
TOTAL		**-190.7**	**-32.6**	**-39.1**	**-262.4**

Table 11.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Germany (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-83.7**	**-9.8**	**-31.7**	**-125.2**
Domestic combustion		**-25.3**	**0.0**	**0.0**	**-25.3**
Industry		**-13.8**	**-4.6**	**-12.7**	**-31.1**
of which	Refineries	-11.5	-1.7	-4.0	-17.2
	Other industries	-2.3	-2.9	-8.7	-13.9
Road transport		**-67.9**	**-578.2**	**0.0**	**-646.2**
of which	Light duty	-82.4	-157.8	0.0	-240.3
	Heavy duty	14.5	-420.4	0.0	-405.9
Non road mobile		**-20.8**	**-54.4**	**-3.0**	**-78.2**
Other sectors		**-3.2**	**0.0**	**-0.5**	**-3.7**
TOTAL		**-214.8**	**-647.0**	**-47.9**	**-909.6**

Table 11.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Germany (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-3.4**	**0.0**	**-3.2**	**-6.6**
Domestic combustion		**2.6**	**-3.3**	**-2.6**	**-3.3**
Industry		**-0.3**	**-0.8**	**-2.7**	**-3.8**
of which	Refineries	-0.8	0.0	-0.3	-1.1
	Other industries	0.5	-0.8	-2.4	-2.6
Road transport		**1.6**	**-24.1**	**0.0**	**-22.5**
of which	Light duty	0.5	-13.3	0.0	-12.8
	Heavy duty	1.1	-10.8	0.0	-9.6
Non road mobile		**-2.1**	**-7.7**	**-0.2**	**-10.0**
Other sectors		**-1.7**	**-0.9**	**-2.8**	**-5.4**
TOTAL		**-3.2**	**-36.8**	**-11.5**	**-51.5**

Table 11.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Germany (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**7.5**	**-9.5**	**-32.9**	**-34.9**
Poultry		**-1.5**	**-5.5**	**-18.3**	**-25.3**
Cattle		**-31.1**	**-3.7**	**-63.3**	**-98.1**
of which	Dairy	-0.1	-2.4	-48.4	-50.9
	Meat	-30.9	-1.4	-14.9	-47.2
Other animals		**-2.5**	**0.0**	**-0.8**	**-3.2**
Mineral fertilizers		**15.7**	**0.0**	**-59.9**	**-44.2**
Other non -agricultural sources		**-9.6**	**-2.1**	**-6.4**	**-18.0**
TOTAL		**-21.4**	**-20.8**	**-181.6**	**-223.7**

Table 11.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Germany (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**4.3**	**0.0**	**-3.2**	**1.1**
Domestic combustion		**-2.5**	**-14.5**	**-8.2**	**-25.2**
Industry (combustion and processes, excluding solvent use)		**1.1**	**0.0**	**0.0**	**1.1**
Road transport		**-105.4**	**-72.4**	**0.0**	**-177.9**
of which	Light duty	-108.1	-52.5	0.0	-160.6
	Heavy duty	2.6	-19.9	0.0	-17.3
Non road mobile		**-11.5**	**-11.0**	**-1.7**	**-24.2**
Refineries (processes)		**-11.5**	**-0.5**	**0.0**	**-12.0**
Production, storage and distribution of oil products		**-15.2**	**-0.6**	**-0.1**	**-15.9**
Solvent use		**21.8**	**-148.5**	**-31.9**	**-158.5**
Other sectors		**0.0**	**0.0**	**-2.6**	**-2.6**
of which	ban of agr. waste burning	0.0	0.0	-0.3	-0.3
TOTAL		**-119.0**	**-247.4**	**-47.7**	**-414.2**

11.3 Differences to the 2013 Commission proposal

Table 11.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Germany (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	549.4	457.5	-92.0	-17%	Adjustment to 2014 submission of national inventory – differences for lignite power plants, refineries and metallurgy
Change 2005 to 2030 CLE	-254.8	-223.3	-31.5	-12%	Consequence of emission factors adjustments for industrial combustion and processes
2030 Current legislation (CLE)	294.7	234.2	-60.5	-21%	
Additional reduction potential to MTFR	-48.9	-61.2	+12.4	+25%	Consequence of lower emission factors for industry and processes
2030 Maximum technical feasible reductions (MTFR)	245.8	173.0	-72.8	-30%	
Additional reduction in the optimized scenario	-36.6	-39.1	+2.5	+7%	
2030 optimized scenario	258.1	195.1	-62.9	-24%	

Table 11.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Germany (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1396.8	1429.9	+33.1	+2%	Adjustment to latest inventory submission. Updated distribution of fuels and higher emissions from power sector and industry; reallocation of diesel fuel between HDT and cars (higher emissions), higher activity for shipping, newer NRMM stock
Change 2005 to 2030 CLE	-866.6	-861.8	-4.9	-1%	Higher CLE emissions from power sector (higher EFs) and mineral products industry (higher activities). Higher activity levels for shipping and NRMM based on national assessment (missing fuel taken from industry and/or domestic sector), higher NRMM abated emission factors (slower turnover and lower efficiency of Stage 4)
2030 Current legislation (CLE)	530.2	568.1	+37.9	+7%	
Additional reduction potential to MTFR	-150.0	-154.3	+4.3	+3%	Higher potential in power sector (lower uptake of controls in CLE) and by NRMM (Stage 5)
2030 Maximum technical feasible reductions (MTFR)	380.2	413.8	+33.6	+9%	
Additional reduction in the optimized scenario	-91.4	-47.9	-43.5	-48%	
2030 optimized scenario	438.8	520.3	+81.5	+19%	

Table 11.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Germany (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	122.6	122.0	-0.6	-1%	Lower emissions from road transport (reallocation of diesel between HDT and LDV), higher emissions from NRMM (higher activities and emission factors according to national assessment)
Change 2005 to 2030 CLE	-39.0	-40.0	+1.1	+3%	As for 2005
2030 Current legislation (CLE)	83.7	82.0	-1.7	-2%	
Additional reduction potential to MTFR	-21.7	-17.7	-4.0	-18%	Less potential in domestic sector (adjusted structure of combustion devices and applicabilities of measures)
2030 Maximum technical feasible reductions (MTFR)	62.0	64.2	+2.3	+4%	
Additional reduction in the optimized scenario	-13.9	-11.5	-2.4	-17%	
2030 optimized scenario	69.8	70.5	+0.7	+1%	

Table 11.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Germany (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	593.1	587.5	-5.6	-1%	Updated statistical data and emission factors for livestock; harmonized assumptions for solid/liquid manure shares and mineral fertilizer emission factors.
Change 2005 to 2030 CLE	-28.2	-42.2	+13.9	+49%	Impact of changes for the base year and update of the CLE control strategy
2030 Current legislation (CLE)	564.9	545.4	-19.5	-3%	
Additional reduction potential to MTFR	-271.3	-232.5	-38.8	-14%	Updated solid/liquid manure shares and livestock farm structure, and their impacts on application limits and emission factors
2030 Maximum technical feasible reductions (MTFR)	293.6	312.9	+19.3	+7%	
Additional reduction in the optimized scenario	-202.6	-181.6	-21.1	-10%	
2030 optimized scenario	362.3	363.8	+1.5	+0%	

Table 11.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Germany (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1235.4	1184.7	-50.7	-4%	Updated structure and emission factors for residential combustion, solvent use sector, transport, and fugitive emissions from liquid fuel distribution
Change 2005 to 2030 CLE	-395.1	-366.5	-28.7	-7%	Updated structure of the residential combustion sector and solvent use activities
2030 Current legislation (CLE)	840.3	818.2	-22.1	-3%	
Additional reduction potential to MTFR	-338.4	-295.5	-42.9	-13%	Lower potential due to updated structure in residential combustion and solvent use sector
2030 Maximum technical feasible reductions (MTFR)	501.9	522.7	+20.8	+4%	
Additional reduction in the optimized scenario	-132.6	-47.7	-84.9	-64%	
2030 optimized scenario	707.7	770.5	+62.8	+9%	

Table 11.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Germany (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	506.2	478.8	-27.4	-5%
Change 2005 to 2030 CLE	-182.0	-175.8	-6.2	-3%
2030 Current legislation (CLE)	324.2	303.0	-21.2	-7%
Additional reduction potential to MTFR	-102.0	-94.1	-7.9	-8%
2030 Maximum technical feasible reductions (MTFR)	222.2	208.9	-13.3	-6%
Additional reduction in the optimized scenario	-71.4	-62.0	-9.4	-13%
2030 optimized scenario	252.8	241.0	-11.7	-5%

Table 11.13: Emission control costs for Germany (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	13535	13125	-411	-3%
Additional costs for MTFR	5702	5531	-170	-3%
2030 MTFR	19237	18656	-581	-3%
Additional costs in the optimized scenario (compared to CLE)	489	316	-173	-35%
Total costs in the optimized scenario in 2030	14024	13440	-584	-4%

12 Greece

For Greece, the re-optimized scenario does not change the overall emission reduction requirement (ERR) relative to 2005 in terms of PMeq. However, the new statistical data on NH_3 emission sources suggest a five percentage points higher NH_3 reduction for the current legislation case in 2030, which translates into a five percentage points stricter ERR for NH_3. In turn, this larger cut in NH_3 emissions allows relaxing the NO_x and VOC ERRs by three percentage points. Emission control costs (on top of CLE) decline by more than 20%.

12.1 Summary

Table 12.1: Summary table for Greece. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	541	-55%	-74%	-90%	-92%	-95%	-90%	-92%	-95%	0%	0%	0%
NO_x	417	-38%	-31%	-69%	-72%	-77%	-68%	-69%	-75%	-1%	-3%	-2%
PM2.5			-35%	-51%	-71%	-77%	-51%	-71%	-75%	0%	0%	-2%
NH_3	68	-9%	-22%	-16%	-26%	-32%	-21%	-31%	-38%	+5%	+5%	+6%
VOC	220	-31%	-54%	-59%	-67%	-79%	-56%	-64%	-75%	-3%	-3%	-4%
PMeq	204	-18%	-27%	-75%	-82%	-86%	-76%	-82%	-86%	+1%	0%	0%

12.2 Sectoral emission reductions

Table 12.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Greece (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-348.7**	**-22.7**	**-3.4**	**-374.8**
Domestic combustion		**-10.6**	**-5.7**	**0.0**	**-16.4**
Industry		**-33.0**	**-33.2**	**-4.1**	**-70.3**
of which	Refineries	-10.3	-13.9	-1.5	-25.7
	Other industries	-22.7	-19.3	-2.6	-44.6
Road transport		**0.0**	**-0.5**	**0.0**	**-0.5**
of which	Light duty	0.0	-0.1	0.0	-0.1
	Heavy duty	0.0	-0.4	0.0	-0.4
Non-road mobile		**0.4**	**-22.1**	**0.0**	**-21.7**
Other sectors		**-2.3**	**0.0**	**-1.0**	**-3.3**
TOTAL		**-394.3**	**-84.2**	**-8.5**	**-487.0**

Table 12.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Greece (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-116.2**	**-2.0**	**-3.8**	**-122.0**
Domestic combustion		**-4.0**	**0.0**	**0.0**	**-4.0**
Industry		**-2.7**	**-11.5**	**0.0**	**-14.3**
of which	Refineries	-1.1	-0.3	0.0	-1.4
	Other industries	-1.6	-11.3	0.0	-12.9
Road transport		**-11.6**	**-96.2**	**0.0**	**-107.7**
of which	Light duty	-15.8	-18.6	0.0	-34.5
	Heavy duty	4.3	-77.5	0.0	-73.3
Non road mobile		**1.3**	**-29.5**	**0.0**	**-28.2**
Other sectors		**0.6**	**0.0**	**-1.5**	**-0.9**
TOTAL		**-132.5**	**-139.3**	**-5.3**	**-277.1**

Table 12.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Greece (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-15.8**	**-2.2**	**-0.2**	**-18.2**
Domestic combustion		**-2.7**	**-2.1**	**-4.1**	**-8.9**
Industry		**-0.1**	**0.0**	**-0.4**	**-0.6**
of which	Refineries	-0.1	0.0	-0.1	-0.2
	Other industries	-0.1	0.0	-0.3	-0.4
Road transport		**0.5**	**-5.2**	**0.0**	**-4.7**
of which	Light duty	0.2	-1.4	0.0	-1.1
	Heavy duty	0.3	-3.9	0.0	-3.6
Non road mobile		**-0.4**	**-2.9**	**0.0**	**-3.3**
Other sectors		**-0.2**	**0.0**	**-7.2**	**-7.4**
TOTAL		**-18.6**	**-12.4**	**-11.9**	**-43.0**

Table 12.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Greece (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-1.2**	**-0.1**	**-1.3**	**-2.6**
Poultry		**-0.1**	**-2.6**	**-0.4**	**-3.2**
Cattle		**0.7**	**0.0**	**-1.7**	**-1.1**
of which	Dairy	0.1	0.0	-1.0	-0.9
	Meat	0.5	0.0	-0.7	-0.2
Other animals		**-0.4**	**0.0**	**-0.6**	**-1.0**
Mineral fertilizers		**-4.5**	**0.0**	**-0.4**	**-5.0**
Other non -agricultural sources		**-2.5**	**-1.1**	**-1.4**	**-5.1**
TOTAL		**-8.1**	**-3.9**	**-5.9**	**-17.9**

Table 12.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Greece (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-8.2**	**-0.4**	**0.0**	**-8.6**
Domestic combustion		**-6.3**	**-6.3**	**-13.4**	**-25.9**
Industry (combustion and processes, excluding solvent use)		**0.3**	**-0.1**	**0.0**	**0.1**
Road transport		**-33.5**	**-44.1**	**0.0**	**-77.6**
of which	Light duty	-34.2	-35.4	0.0	-69.6
	Heavy duty	0.7	-8.7	0.0	-8.1
Non road mobile		**-0.6**	**-20.3**	**0.0**	**-21.0**
Refineries (processes)		**-0.8**	**-2.4**	**0.0**	**-3.2**
Production, storage and distribution of oil products		**-5.9**	**-2.1**	**0.0**	**-7.9**
Solvent use		**8.0**	**-24.1**	**-0.1**	**-16.1**
Other sectors		**0.0**	**0.0**	**-9.5**	**-9.5**
of which	ban of agr. waste burning	0.0	0.0	-8.6	-8.6
TOTAL		**-46.9**	**-99.7**	**-23.0**	**-169.7**

12.3 Differences to the 2013 Commission proposal

Table 12.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Greece (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	505.3	529.2	+23.9	+5%	Improved match with inventory – higher emission factors for industrial combustion sources and shipping
Change 2005 to 2030 CLE	-454.9	-478.5	+23.6	+5%	Higher CLE emission reductions in the power sector
2030 Current legislation (CLE)	50.4	50.7	+0.2	+0%	
Additional reduction potential to MTFR	-25.0	-25.3	+0.3	+1%	
2030 Maximum technical feasible reductions (MTFR)	25.5	25.4	-0.1	-0%	
Additional reduction in the optimized scenario	-12.3	-8.5	-3.8	-31%	
2030 optimized scenario	38.1	42.2	+4.1	+11%	

Table 12.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Greece (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	406.8	401.5	-5.3	-1%	Improved match with inventory: lower emissions from power plants (lower EFs), higher from industry and road transport (adjusted fuel allocation, inclusion of vehicles driving on light heating oil)
Change 2005 to 2030 CLE	-280.8	-271.8	-9.0	-3%	Lower CLE emissions from power plants, higher from domestic sector (adjusted structure of combustion devices); higher emissions from road transport (reallocation of diesel) and NRMM (higher abated emission factors)
2030 Current legislation (CLE)	126.0	129.7	+3.7	+3%	
Additional reduction potential to MTFR	-34.4	-30.6	-3.8	-11%	Lower potential due to reasons as in the CLE
2030 Maximum technical feasible reductions (MTFR)	91.6	99.1	+7.5	+8%	
Additional reduction in the optimized scenario	-13.9	-5.3	-8.6	-62%	
2030 optimized scenario	112.1	124.4	+12.3	+11%	

Table 12.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Greece (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	61.9	60.5	-1.3	-2%	Lower emissions from the power sector and industrial combustion (lower EFs); higher emissions from road transport (see NO_x)
Change 2005 to 2030 CLE	-31.8	-31.1	-0.7	-2%	Lower CLE emissions from industrial combustion and road transport
2030 Current legislation (CLE)	30.1	29.4	-0.6	-2%	
Additional reduction potential to MTFR	-16.0	-14.3	-1.7	-11%	Less potential for further measures in domestic sector
2030 Maximum technical feasible reductions (MTFR)	14.1	15.2	+1.1	+8%	
Additional reduction in the optimized scenario	-12.3	-11.9	-0.4	-3%	
2030 optimized scenario	17.7	17.5	-0.2	-1%	

Table 12.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Greece (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	56.8	57.9	+1.0	+2%	New statistical data on energy use, industrial production, and transport sector
Change 2005 to 2030 CLE	-9.1	-12.0	+2.9	+32%	As for 2005
2030 Current legislation (CLE)	47.7	45.9	-1.9	-4%	
Additional reduction potential to MTFR	-9.2	-10.1	+0.9	+10%	As for 2005
2030 Maximum technical feasible reductions (MTFR)	38.5	35.7	-2.8	-7%	
Additional reduction in the optimized scenario	-5.6	-5.9	+0.3	+6%	
2030 optimized scenario	42.1	40.0	-2.2	-5%	

Table 12.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Greece (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	282.7	263.2	-19.5	-7%	Adjustments for transport, lower emission factors for large combustion plants
Change 2005 to 2030 CLE	-167.1	-146.7	-20.4	-12%	Impact of the changes for the base year
2030 Current legislation (CLE)	115.6	116.5	+0.9	+1%	
Additional reduction potential to MTFR	-55.6	-51.0	-4.6	-8%	See 2005 and CLE; Harmonization of application limits for industrial coating and cleaning
2030 Maximum technical feasible reductions (MTFR)	60.0	65.5	+5.5	+9%	
Additional reduction in the optimized scenario	-23.0	-23.0	-0.0	-0%	
2030 optimized scenario	92.6	93.5	+0.9	+1%	

Table 12.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Greece (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	253.3	258.7	+5.4	+2%
Change 2005 to 2030 CLE	-189.4	-195.5	+6.1	+3%
2030 Current legislation (CLE)	63.9	63.2	-0.7	-1%
Additional reduction potential to MTFR	-28.0	-26.3	-1.8	-6%
2030 Maximum technical feasible reductions (MTFR)	35.8	36.9	+1.1	+3%
Additional reduction in the optimized scenario	-18.2	-16.2	-2.1	-11%
2030 optimized scenario	45.6	47.0	+1.4	+3%

Table 12.13: Emission control costs for Greece (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1723	1765	42	2%
Additional costs for MTFR	1142	936	-206	-18%
2030 MTFR	2865	2701	-164	-6%
Additional costs in the optimized scenario (compared to CLE)	51	40	-10	-20%
Total costs in the optimized scenario in 2030	1774	1805	32	2%

13 Hungary

The substantial revisions in the 2005 emission inventories for Hungary (especially for SO_2 from the power sector) results for 2030 in a lower baseline decline in SO_2 emission than estimated before (as many measures, which have been considered before as still available in 2030, have already been implemented in 2005). Thus, there is also less scope for additional reductions, so that the new emission reduction requirement for SO_2 is 15 percentage points lower than before. In contrast, changes introduced to the 2005 GAINS estimate for agricultural sources (changes to the structure, including share of urea in mineral fertilizer application) suggests a 10% percentage points larger baseline decline of NH_3, which increases the cost-effective emission reduction requirement for NH_3 by nine percentage points. Emission control costs (on top of CLE) decline by more than 30%.

13.1 Summary

Table 13.1: Summary table for Hungary. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	43	-26%	-46%	-79%	-88%	-88%	-57%	-73%	-75%	-22%	-15%	-13%
NO_x	165	-26%	-38%	-66%	-69%	-77%	-62%	-66%	-75%	-5%	-4%	-2%
PM2.5	27	13%	-13%	-37%	-63%	-73%	-38%	-64%	-70%	0%	+1%	-3%
NH_3	78	-16%	-10%	-13%	-34%	-38%	-23%	-43%	-50%	+10%	+9%	+12%
VOC	124	-16%	-30%	-44%	-59%	-69%	-44%	-58%	-71%	0%	-1%	+2%
PMeq	67	3%	-29%	-54%	-69%	-74%	-42%	-61%	-67%	-12%	-8%	-7%

13.2 Sectoral emission reductions

Table 13.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Hungary (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-10.2**	**-0.4**	**0.0**	**-10.6**
Domestic combustion		**-10.0**	**-1.7**	**-4.1**	**-15.8**
Industry		**-1.0**	**-0.4**	**-2.4**	**-3.8**
of which	Refineries	-0.6	-0.2	-0.8	-1.6
	Other industries	-0.4	-0.2	-1.7	-2.2
Road transport		**0.2**	**-0.9**	**0.0**	**-0.7**
of which	Light duty	0.2	-0.5	0.0	-0.4
	Heavy duty	0.0	-0.3	0.0	-0.3
Non-road mobile		**0.0**	**-0.1**	**0.0**	**-0.1**
Other sectors		**-0.1**	**0.0**	**-0.1**	**-0.2**
TOTAL		**-21.1**	**-3.4**	**-6.6**	**-31.2**

Table 13.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Hungary (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-15.1**	**-3.0**	**-1.2**	**-19.3**
Domestic combustion		**-3.9**	**0.0**	**0.0**	**-3.9**
Industry		**-0.1**	**-1.4**	**-4.2**	**-5.7**
of which	Refineries	0.4	-0.2	-0.5	-0.3
	Other industries	-0.6	-1.1	-3.7	-5.5
Road transport		**4.5**	**-64.1**	**0.0**	**-59.5**
of which	Light duty	5.1	-20.8	0.0	-15.7
	Heavy duty	-0.6	-43.3	0.0	-43.8
Non road mobile		**-2.2**	**-7.5**	**0.0**	**-9.7**
Other sectors		**-0.2**	**0.0**	**-0.2**	**-0.4**
TOTAL		**-17.1**	**-75.9**	**-5.7**	**-98.7**

Table 13.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Hungary (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.9**	**-0.1**	**-0.3**	**-1.2**
Domestic combustion		**-3.1**	**-2.6**	**-5.8**	**-11.4**
Industry		**0.2**	**-0.3**	**-1.4**	**-1.5**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.2	-0.3	-1.3	-1.4
Road transport		**1.9**	**-5.1**	**0.0**	**-3.2**
of which	Light duty	1.8	-3.5	0.0	-1.6
	Heavy duty	0.1	-1.6	0.0	-1.5
Non road mobile		**-0.2**	**-0.8**	**0.0**	**-1.0**
Other sectors		**-1.2**	**0.0**	**-1.2**	**-2.5**
TOTAL		**-3.4**	**-8.8**	**-8.6**	**-20.8**

Table 13.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Hungary (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-3.9**	**-1.0**	**-1.6**	**-6.5**
Poultry		**-0.3**	**-10.5**	**-4.2**	**-15.0**
Cattle		**-2.3**	**0.0**	**-5.0**	**-7.3**
of which	Dairy	-1.6	0.0	-3.3	-4.9
	Meat	-0.7	0.0	-1.7	-2.4
Other animals		**-0.6**	**0.0**	**-0.2**	**-0.8**
Mineral fertilizers		**2.6**	**0.0**	**-3.9**	**-1.3**
Other non -agricultural sources		**-1.7**	**-0.6**	**-0.7**	**-3.0**
TOTAL		**-6.2**	**-12.1**	**-15.5**	**-33.9**

Table 13.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Hungary (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.3**	**0.0**	**-2.5**	**-2.8**
Domestic combustion		**-0.4**	**-5.9**	**-13.8**	**-20.2**
Industry (combustion and processes, excluding solvent use)		**-0.6**	**-1.1**	**0.0**	**-1.7**
Road transport		**-10.1**	**-21.4**	**0.0**	**-31.5**
of which	Light duty	-10.0	-17.8	0.0	-27.7
	Heavy duty	-0.2	-3.6	0.0	-3.8
Non road mobile		**-0.2**	**-1.6**	**0.0**	**-1.8**
Refineries (processes)		**0.1**	**-0.2**	**0.0**	**-0.1**
Production, storage and distribution of oil products		**-1.5**	**-1.5**	**0.0**	**-3.0**
Solvent use		**-1.3**	**-10.0**	**-0.1**	**-11.4**
Other sectors		**-1.4**	**0.0**	**-1.5**	**-2.9**
of which	ban of agr. waste burning	-1.4	0.0	-1.1	-2.5
TOTAL		**-15.7**	**-41.8**	**-17.9**	**-75.3**

13.3 Differences to the 2013 Commission proposal

Table 13.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Hungary (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	128.5	42.9	-86	-67%	Adjustments to the 2014 submission of the national 2005 inventory (66% lower than 2012 submission) - more emission controls in the power sector implemented in 2005
Change 2005 to 2030 CLE	-101.7	-24.6	77	-76%	Less potential for further emission reductions in the power sector as measures were already taken in 2005
2030 Current legislation (CLE)	26.8	18.3	-9	-32%	
Additional reduction potential to MTFR	-11.9	-7.6	4	-37%	Lower potential in power sector, industrial combustion and processes (more stringent CLE)
2030 Maximum technical feasible reductions (MTFR)	14.9	10.8	-4	-28%	
Additional reduction in the optimized scenario	-11.0	-6.6	4	-40%	
2030 optimized scenario	15.9	11.7	-4	-26%	

Table 13.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Hungary (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	154.9	150.4	-4	-3%	Adjustments to the 2014 submission of the 2005 inventory (23% lower than 2012 submission): lower emissions from power plants (lower EFs), more from NRMM (higher EFs)
Change 2005 to 2030 CLE	-102.9	-93.0	10	-10%	Higher CLE emissions in industry and domestic sector (higher EFs) as well as from NRMM (higher abated emission factors)
2030 Current legislation (CLE)	51.9	57.4	6	11%	
Additional reduction potential to MTFR	-16.7	-20.0	-3	20%	More potential because of lower uptake of controls in the CLE scenario
2030 Maximum technical feasible reductions (MTFR)	35.2	37.5	2	6%	
Additional reduction in the optimized scenario	-4.4	-5.7	-1	28%	
2030 optimized scenario	47.5	51.8	4	9%	

Table 13.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Hungary (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	29.4	32.4	3	10%	Adjustments to the 2014 submission of the national 2005 inventory: higher emissions from domestic sector, lower from power sector, industry, road transport and from open burning of residential waste
Change 2005 to 2030 CLE	-11.0	-12.2	-1	11%	Higher emissions from domestic sector, lower from road transport (adjusted non-exhaust EF)
2030 Current legislation (CLE)	18.4	20.2	2	10%	
Additional reduction potential to MTFR	-10.5	-10.4	0	0%	
2030 Maximum technical feasible reductions (MTFR)	8.0	9.8	2	22%	
Additional reduction in the optimized scenario	-7.7	-8.6	-1	12%	
2030 optimized scenario	10.8	11.6	1	8%	

Table 13.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Hungary (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	77.6	78.9	+1.3	+2%	Updated statistical data for poultry and new emission factors for cattle (some compensating effects - relevant for projections)
Change 2005 to 2030 CLE	-10.1	-18.4	+8.3	+82%	Impact of the changes for the base year as the structure has changed, including the share of urea in mineral fertilizer application
2030 Current legislation (CLE)	67.5	60.5	-7.0	-10%	
Additional reduction potential to MTFR	-19.1	-21.0	+1.9	+10%	Impact of changes for the base year and CLE
2030 Maximum technical feasible reductions (MTFR)	48.4	39.5	-8.9	-18%	
Additional reduction in the optimized scenario	-16.3	-15.5	-0.8	-5%	
2030 optimized scenario	51.1	44.9	-6.2	-12%	

Table 13.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Hungary (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	144.4	130.2	-14.1	-10%	Updated emission factors for residential combustion and activities for industrial cleaning and decorative paints.
Change 2005 to 2030 CLE	-63.6	-57.4	-6.2	-10%	Updated control strategy for refineries and industrial cleaning and paint application
2030 Current legislation (CLE)	80.8	72.8	-8.0	-10%	
Additional reduction potential to MTFR	-36.0	-34.5	-1.6	-4%	see CLE
2030 Maximum technical feasible reductions (MTFR)	44.7	38.3	-6.4	-14%	
Additional reduction in the optimized scenario	-21.1	-17.9	-3.3	-15%	
2030 optimized scenario	59.6	54.9	-4.7	-8%	

Table 13.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Hungary (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	94.4	71.7	-22.7	-24%
Change 2005 to 2030 CLE	-50.7	-29.8	-20.9	-41%
2030 Current legislation (CLE)	43.7	41.9	-1.8	-4%
Additional reduction potential to MTFR	-19.2	-18.4	-0.7	-4%
2030 Maximum technical feasible reductions (MTFR)	24.6	23.5	-1.1	-4%
Additional reduction in the optimized scenario	-14.6	-14.1	-0.5	-3%
2030 optimized scenario	29.1	27.8	-1.3	-5%

Table 13.13: Emission control costs for Hungary (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1070	1072	+1.6	0%
Additional costs for MTFR	697	556	+140.2	-20%
2030 MTFR	1767	1628	-138.6	-8%
Additional costs in the optimized scenario (compared to CLE)	72	50	+21.5	-30%
Total costs in the optimized scenario in 2030	1142	1122	-19.9	-2%

14 Ireland

For Ireland, the re-optimized scenario does not significantly change the overall emission reduction requirement (ERR) in terms of PMeq. The new statistical information on solid fuel use in the domestic sector and on livestock imply larger baseline reductions of PM2.5 and NH_3, which also increase the potential for cost-effective ERRs accordingly. In turn, ERRs for NO_x and SO_2 are relaxed, and emission control costs of the additional measures decline by more than 60%.

14.1 Summary

Table 14.1: Summary table for Ireland. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	72	-68%	-65%	-80%	-83%	-85%	-80%	-82%	-87%	0%	-1%	+2%
NO_x	129	-43%	-49%	-71%	-75%	-82%	-70%	-71%	-79%	-1%	-4%	-2%
PM2.5	11	-27%	-18%	-33%	-35%	-49%	-37%	-39%	-48%	+5%	+4%	-1%
NH_3	110	-5%	-1%	-3%	-7%	-18%	-6%	-10%	-25%	+3%	+3%	+7%
VOC	57	-23%	-25%	-32%	-32%	-65%	-32%	-32%	-56%	0%	0%	-9%
PMeq	63	-48%	-38%	-45%	-48%	-56%	-45%	-48%	-58%	+1%	0%	+1%

14.2 Sectoral emission reductions

Table 14.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Ireland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-43.3**	**-0.4**	**0.0**	**-43.8**
Domestic combustion		**-3.0**	**-1.7**	**0.0**	**-4.7**
Industry		**-5.5**	**-1.4**	**-1.4**	**-8.3**
of which	Refineries	-0.6	0.0	0.0	-0.6
	Other industries	-4.9	-1.4	-1.4	-7.7
Road transport		**-0.1**	**-0.3**	**0.0**	**-0.4**
of which	Light duty	-0.1	-0.2	0.0	-0.3
	Heavy duty	0.0	-0.1	0.0	-0.1
Non-road mobile		**-0.5**	**-0.3**	**0.0**	**-0.8**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**-52.4**	**-4.1**	**-1.4**	**-57.9**

Table 14.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Ireland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-23.0**	**-0.6**	**0.0**	**-23.6**
Domestic combustion		**-0.7**	**0.0**	**0.0**	**-0.7**
Industry		**-3.0**	**-3.5**	**-2.3**	**-8.8**
of which	Refineries	-0.3	-0.2	0.0	-0.5
	Other industries	-2.7	-3.3	-2.3	-8.3
Road transport		**19.1**	**-71.4**	**0.0**	**-52.2**
of which	Light duty	3.7	-17.9	0.0	-14.2
	Heavy duty	15.4	-53.4	0.0	-38.0
Non road mobile		**-2.2**	**-9.2**	**0.0**	**-11.4**
Other sectors		**0.0**	**-0.1**	**0.0**	**-0.1**
TOTAL		**-9.9**	**-84.7**	**-2.3**	**-96.9**

Table 14.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Ireland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.8**	**0.0**	**-0.1**	**-0.9**
Domestic combustion		**-0.7**	**0.0**	**0.0**	**-0.7**
Industry		**0.0**	**0.0**	**0.0**	**0.0**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.1	0.0	0.0	0.0
Road transport		**1.6**	**-2.8**	**0.0**	**-1.2**
of which	Light duty	0.8	-1.5	0.0	-0.7
	Heavy duty	0.8	-1.3	0.0	-0.5
Non road mobile		**-0.2**	**-0.9**	**0.0**	**-1.1**
Other sectors		**0.2**	**-0.4**	**-0.1**	**-0.3**
TOTAL		**0.2**	**-4.2**	**-0.2**	**-4.2**

Table 14.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Ireland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**0.2**	**-0.6**	**-2.3**	**-2.7**
Poultry		**1.5**	**-1.7**	**-1.6**	**-1.9**
Cattle		**-5.0**	**-0.9**	**-0.8**	**-6.7**
of which	Dairy	5.1	-0.5	0.0	4.6
	Meat	-10.1	-0.5	-0.8	-11.4
Other animals		**-0.6**	**0.0**	**0.0**	**-0.6**
Mineral fertilizers		**2.3**	**0.0**	**0.0**	**2.3**
Other non -agricultural sources		**-1.1**	**-0.6**	**0.0**	**-1.7**
TOTAL		**-2.6**	**-3.9**	**-4.7**	**-11.2**

Table 14.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Ireland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.4**	**0.0**	**0.0**	**-0.4**
Domestic combustion		**1.7**	**-0.1**	**0.0**	**1.6**
Industry (combustion and processes, excluding solvent use)		**1.7**	**0.0**	**0.0**	**1.7**
Road transport		**-4.7**	**-7.8**	**0.0**	**-12.5**
of which	Light duty	-5.4	-5.0	0.0	-10.4
	Heavy duty	0.7	-2.8	0.0	-2.1
Non road mobile		**-0.2**	**-1.1**	**0.0**	**-1.4**
Refineries (processes)		**-0.2**	**-0.3**	**0.0**	**-0.5**
Production, storage and distribution of oil products		**-2.0**	**-0.6**	**0.0**	**-2.6**
Solvent use		**4.8**	**-8.7**	**0.0**	**-3.9**
Other sectors		**-0.5**	**-0.3**	**-0.1**	**-0.9**
of which	ban of agr. waste burning	0.0	0.0	-0.1	-0.1
TOTAL		**0.1**	**-18.9**	**-0.1**	**-18.9**

14.3 Differences to the 2013 Commission proposal

Table 14.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Ireland (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	71.0	70.7	-0.3	-0%	
Change 2005 to 2030 CLE	-56.6	-56.5	-0.1	-0%	
2030 Current legislation (CLE)	14.5	14.2	-0.2	-2%	
Additional reduction potential to MTFR	-3.9	-4.7	+0.9	+23%	Availability of S-free heating oil in domestic sector (assumed for all MS)
2030 Maximum technical feasible reductions (MTFR)	10.6	9.5	-1.1	-11%	
Additional reduction in the optimized scenario	-2.2	-1.4	-0.8	-36%	
2030 optimized scenario	12.3	12.8	+0.5	+4%	

Table 14.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Ireland (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	149.6	136.0	-13.6	-9%	Enhanced calibration to inventory: lower emissions from power plants and industry due to lower EFs
Change 2005 to 2030 CLE	-106.2	-94.6	-11.6	-11%	Lower CLE emissions from industry, higher from road transport and NRMM (higher abated emission factors)
2030 Current legislation (CLE)	43.5	41.4	-2.0	-5%	
Additional reduction potential to MTFR	-15.9	-13.2	-2.7	-17%	Less potential in industry due to higher CLE uptake
2030 Maximum technical feasible reductions (MTFR)	27.6	28.3	+0.7	+3%	
Additional reduction in the optimized scenario	-5.9	-2.3	-3.6	-61%	
2030 optimized scenario	37.6	39.1	+1.5	+4%	

Table 14.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Ireland (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	13.3	10.8	-2.5	-19%	Lower emissions from domestic sector (adjusted source structure) and road transport (newer vehicle fleet)
Change 2005 to 2030 CLE	-4.3	-4.0	-0.3	-8%	As in 2005
2030 Current legislation (CLE)	9.0	6.8	-2.2	-24%	
Additional reduction potential to MTFR	-2.2	-1.2	-1.1	-47%	Less potential from domestic sector due to different structure of combustion devices and revised applicabilities
2030 Maximum technical feasible reductions (MTFR)	6.7	5.6	-1.1	-17%	
Additional reduction in the optimized scenario	-0.3	-0.2	-0.1	-26%	
2030 optimized scenario	8.7	6.6	-2.1	-24%	

Table 14.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Ireland (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	104.2	110.7	+6.5	+6%	Harmonization of statistical data for livestock and shares of animals kept on solid and liquid systems
Change 2005 to 2030 CLE	-3.5	-6.5	+3.0	+87%	Different shares of liquid/solid systems and update of milk yield change
2030 Current legislation (CLE)	100.7	104.2	+3.5	+3%	
Additional reduction potential to MTFR	-14.9	-21.1	+6.3	+42%	See CLE; the changed structure and increased milk yield affects mitigation potentials
2030 Maximum technical feasible reductions (MTFR)	85.8	83.0	-2.8	-3%	
Additional reduction in the optimized scenario	-3.9	-4.7	+0.9	+23%	
2030 optimized scenario	96.8	99.4	+2.6	+3%	

Table 14.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Ireland (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	63.4	59.2	-4.2	-7%	Updated emission factors for solvent use
Change 2005 to 2030 CLE	-20.0	-18.8	-1.2	-6%	Updated CLE controls for the printing sector
2030 Current legislation (CLE)	43.3	40.4	-2.9	-7%	
Additional reduction potential to MTFR	-21.2	-14.2	-7.0	-33%	Harmonization of application limits for the industrial coating and cleaning sectors (drawing on the experience from the UK and NL)
2030 Maximum technical feasible reductions (MTFR)	22.2	26.3	+4.1	+19%	
Additional reduction in the optimized scenario	-0.1	-0.1	-0.0	-2%	
2030 optimized scenario	43.2	40.3	-2.9	-7%	

Table 14.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Ireland (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	65.3	63.0	-2.3	-4%
Change 2005 to 2030 CLE	-29.2	-28.6	-0.6	-2%
2030 Current legislation (CLE)	36.1	34.4	-1.8	-5%
Additional reduction potential to MTFR	-7.5	-7.7	+0.2	+2%
2030 Maximum technical feasible reductions (MTFR)	28.6	26.7	-1.9	-7%
Additional reduction in the optimized scenario	-2.1	-1.7	-0.4	-18%
2030 optimized scenario	34.0	32.6	-1.4	-4%

Table 14.13: Emission control costs for Ireland (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1192	1192	0	0%
Additional costs for MTFR	518	530	12	2%
2030 MTFR	1711	1723	12	1%
Additional costs in the optimized scenario (compared to CLE)	8	3	-5	-62%
Total costs in the optimized scenario in 2030	1200	1195	-5	0%

15 Italy

For Italy, the re-optimized overall emission reduction requirement (ERR) in terms of PMeq relative to 2005 is one percentage point larger than in the initial COM scenario. This is predominantly caused by new information for the residential and commercial sector (inclusion of non-commercial wood, changed structure, lower EF) and reallocation of diesel fuel between cars and HDT, which leads to a 16 percentage points larger baseline reduction of PM2.5 emissions in 2030. With less additional measures due to the higher uptake in the CLE baseline, the resulting re-optimized ERR is then nine percentage points higher than in the initial scenario, which allows relaxations of the ERRs of SO_2, NH_3 and VOC by four to five percentage points. Emission control costs (beyond CLE) decline by almost 30%.

15.1 Summary

Table 15.1: Summary table for Italy. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	405	-56%	-35%	-63%	-75%	-81%	-61%	-71%	-79%	-2%	-4%	-2%
NO_x	1214	-30%	-40%	-65%	-69%	-72%	-62%	-68%	-71%	-3%	-1%	-1%
PM2.5	142	-11%	-10%	-19%	-45%	-53%	-35%	-54%	-59%	+16%	+9%	+5%
NH_3	416	-3%	-5%	-8%	-26%	-29%	-8%	-22%	-29%	0%	-4%	0%
VOC	1204	-29%	-35%	-48%	-54%	-68%	-43%	-49%	-60%	-5%	-5%	-7%
PMeq	436	-29%	-22%	-38%	-54%	-60%	-42%	-55%	-61%	+4%	+1%	+1%

15.2 Sectoral emission reductions

Table 15.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Italy (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-99.5**	**-23.9**	**0.0**	**-123.3**
Domestic combustion		**-10.6**	**-3.5**	**0.0**	**-14.1**
Industry		**-43.3**	**-22.5**	**-39.0**	**-104.8**
of which	Refineries	-19.3	-14.9	-24.0	-58.2
	Other industries	-24.0	-7.7	-15.0	-46.6
Road transport		**-0.4**	**-1.5**	**0.0**	**-1.9**
of which	Light duty	-0.4	-1.1	0.0	-1.4
	Heavy duty	0.0	-0.4	0.0	-0.4
Non-road mobile		**9.0**	**-48.7**	**0.0**	**-39.7**
Other sectors		**-1.9**	**0.0**	**-2.0**	**-3.9**
TOTAL		**-146.6**	**-100.1**	**-41.0**	**-287.7**

Table 15.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Italy (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-16.8**	**-46.4**	**-30.8**	**-94.1**
Domestic combustion		**-9.1**	**-1.2**	**0.0**	**-10.3**
Industry		**-14.9**	**-33.1**	**-35.7**	**-83.7**
of which	Refineries	-5.9	-6.9	-1.6	-14.4
	Other industries	-9.0	-26.1	-34.2	-69.3
Road transport		**-43.0**	**-440.8**	**0.0**	**-483.8**
of which	Light duty	-34.4	-203.1	0.0	-237.5
	Heavy duty	-8.5	-237.8	0.0	-246.3
Non road mobile		**-28.7**	**-102.1**	**-1.9**	**-132.7**
Other sectors		**1.2**	**0.0**	**-1.5**	**-0.3**
TOTAL		**-111.3**	**-623.6**	**-69.9**	**-804.8**

Table 15.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Italy (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**3.8**	**-5.8**	**-4.3**	**-6.3**
Domestic combustion		**12.0**	**-14.8**	**-11.7**	**-14.5**
Industry		**0.2**	**-9.5**	**-3.9**	**-13.2**
of which	Refineries	-0.4	-0.4	-0.2	-1.0
	Other industries	0.6	-9.2	-3.7	-12.2
Road transport		**2.6**	**-31.2**	**0.0**	**-28.5**
of which	Light duty	2.6	-23.4	0.0	-20.8
	Heavy duty	0.0	-7.8	0.0	-7.8
Non road mobile		**-2.8**	**-5.3**	**-0.4**	**-8.4**
Other sectors		**1.0**	**0.0**	**-6.6**	**-5.7**
TOTAL		**16.9**	**-66.6**	**-27.0**	**-76.7**

Table 15.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Italy (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**3.1**	**-1.8**	**-13.1**	**-11.8**
Poultry		**2.9**	**-1.2**	**-9.7**	**-8.0**
Cattle		**-1.7**	**-7.9**	**-15.8**	**-25.4**
of which	Dairy	5.9	-7.9	-9.0	-11.1
	Meat	-7.6	0.0	-6.8	-14.3
Other animals		**16.3**	**-0.6**	**0.0**	**15.7**
Mineral fertilizers		**-25.4**	**0.0**	**-19.4**	**-44.8**
Other non -agricultural sources		**-16.2**	**-3.0**	**-2.8**	**-21.9**
TOTAL		**-21.0**	**-14.5**	**-60.7**	**-96.1**

Table 15.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Italy (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**14.6**	**-3.1**	**-17.3**	**-5.8**
Domestic combustion		**21.2**	**-18.0**	**-18.3**	**-15.2**
Industry (combustion and processes, excluding solvent use)		**0.1**	**-0.3**	**-0.5**	**-0.7**
Road transport		**-151.9**	**-139.3**	**0.0**	**-291.2**
of which	Light duty	-154.2	-120.3	0.0	-274.5
	Heavy duty	2.3	-19.0	0.0	-16.7
Non road mobile		**16.2**	**-100.7**	**-13.9**	**-98.4**
Refineries (processes)		**-5.2**	**-0.9**	**-2.7**	**-8.8**
Production, storage and distribution of oil products		**-7.3**	**-0.4**	**-2.2**	**-9.9**
Solvent use		**-6.3**	**-106.9**	**-15.6**	**-128.8**
Other sectors		**-7.3**	**0.0**	**-2.7**	**-10.0**
of which	ban of agr. waste burning	0.0	0.0	-0.7	-0.7
TOTAL		**-126.1**	**-369.6**	**-73.1**	**-568.8**

15.3 Differences to the 2013 Commission proposal

Table 15.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Italy (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	381.8	406.5	+24.7	+6%	Improved match with inventory for industrial combustion sources, refineries and other processes based on national inputs
Change 2005 to 2030 CLE	-239.7	-246.6	+6.9	+3%	More accurate interpretation of CLE based on input from Italy – higher EFs from industrial combustion and refineries
2030 Current legislation (CLE)	142.1	159.9	+17.8	+13%	
Additional reduction potential to MTFR	-69.3	-75.3	+5.9	+9%	Higher potential for industrial combustion, less potential to control process emissions
2030 Maximum technical feasible reductions (MTFR)	72.7	84.6	+11.9	+16%	
Additional reduction in the optimized scenario	-47.6	-41.0	-6.6	-14%	
2030 optimized scenario	94.5	118.9	+24.4	+26%	

Table 15.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Italy (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1305.8	1188.1	-117.7	-9%	Improved representation of inventory: lower emissions from the power sector (lower abated EFs), road transport (reallocation of diesel fuel between HDT and cars) and shipping (lower activities according to the national assessment). Lower emissions from agricultural waste burning based on national studies. Higher emissions from industry, domestic sector (inclusion of non-commercial wood) and NRMM (higher emission factors)
Change 2005 to 2030 CLE	-850.1	-734.9	-115.2	-14%	Mainly due to 2005 emissions changes but also higher CLE emissions from power and heating plants (different structure of gas use – more engines), industry and road transport; lower emissions from shipping (lower activities)
2030 Current legislation (CLE)	455.7	453.3	-2.4	-1%	
Additional reduction potential to MTFR	-95.6	-108.5	+13.0	+14%	Larger potential in the power sector (more gas engines, less boilers), less potential in industry and NRMM (slower turnover of fleet, higher EFs for Stages 4 and 5)
2030 Maximum technical feasible reductions (MTFR)	360.1	344.7	-15.4	-4%	
Additional reduction in the optimized scenario	-51.1	-69.9	+18.8	+37%	
2030 optimized scenario	404.6	383.4	-21.2	-5%	

Table 15.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Italy (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	146.7	141.4	-5.3	-4%	New national 2005 inventory (2014 submission estimate 17% lower than in 2012) - inclusion of non-commercial wood in 2005, lower emission factors for domestic wood combustion; higher emissions from industrial combustion (higher EFs) and NRMM, lower emissions from road transport (reallocation of diesel fuel between HDT and cars) and from agricultural waste burning (national assessment)
Change 2005 to 2030 CLE	-27.4	-49.7	+22.3	+81%	Lower CLE emissions from domestic sectors due to lower EFs and changed structure of combustion devices; lower emissions from road transport and agricultural waste burning
2030 Current legislation (CLE)	119.3	91.7	-27.6	-23%	
Additional reduction potential to MTFR	-50.6	-33.2	-17.4	-34%	Lower potential due to higher CLE uptake of measures in domestic sector; lower effects of ban on agricultural waste burning (lower CLE emissions)
2030 Maximum technical feasible reductions (MTFR)	68.7	58.5	-10.2	-15%	
Additional reduction in the optimized scenario	-39.1	-27.0	-12.2	-31%	
2030 optimized scenario	80.1	64.7	-15.4	-19%	

Table 15.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Italy (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	422.2	434.8	+12.6	+3%	Updated statistical data for cattle and rabbits.
Change 2005 to 2030 CLE	-32.8	-35.4	+2.6	+8%	Update for rabbits and non-agricultural sources
2030 Current legislation (CLE)	389.4	399.4	+10.0	+3%	
Additional reduction potential to MTFR	-90.1	-89.2	-0.9	-1%	see CLE
2030 Maximum technical feasible reductions (MTFR)	299.3	310.2	+10.9	+4%	
Additional reduction in the optimized scenario	-78.0	-60.7	-17.3	-22%	
2030 optimized scenario	311.4	338.7	+27.3	+9%	

Table 15.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Italy (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1237.0	1165.4	-71.6	-6%	Updated emission factors for transport, especially mopeds
Change 2005 to 2030 CLE	-591.3	-495.7	-95.5	-16%	See base year and updates for transport, i.e., renewal rates of vehicles
2030 Current legislation (CLE)	645.8	669.7	+23.9	+4%	
Additional reduction potential to MTFR	-245.3	-209.2	-36.1	-15%	Harmonization of application limits for industrial coating and cleaning sector
2030 Maximum technical feasible reductions (MTFR)	400.5	460.5	+60.0	+15%	
Additional reduction in the optimized scenario	-75.6	-73.1	-2.5	-3%	
2030 optimized scenario	570.2	596.6	+26.4	+5%	

Table 15.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Italy (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	441.0	437.0	-4.0	-1%
Change 2005 to 2030 CLE	-167.5	-183.8	+16.3	+10%
2030 Current legislation (CLE)	273.5	253.2	-20.3	-7%
Additional reduction potential to MTFR	-97.4	-82.1	-15.2	-16%
2030 Maximum technical feasible reductions (MTFR)	176.1	171.1	-5.0	-3%
Additional reduction in the optimized scenario	-72.5	-56.3	-16.2	-22%
2030 optimized scenario	201.0	196.9	-4.0	-2%

Table 15.13: Emission control costs for Italy (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	11146	11181	34	0%
Additional costs for MTFR	3967	3382	-585	-15%
2030 MTFR	15113	14562	-551	-4%
Additional costs in the optimized scenario (compared to CLE)	418	299	-119	-28%
Total costs in the optimized scenario in 2030	11565	11480	-85	-1%

16 Latvia

For Latvia, the re-optimized scenario has only limited impact on the overall (in terms of PMeq) emission reduction requirement (ERR) in relation to 2005. However, the updated information about the structure of agricultural activities, especially the shares of cattle kept on liquid/solid manure systems, implies a lower baseline increase of NH_3 emissions, which then translates into a larger ERR for NH_3. In a similar way, new data on solid fuel use in the domestic sector suggest a steeper baseline decline in PM2.5 emissions, and reduces the need for additional measures in the cost-effectiveness analysis. This contributes to the relaxation of ERRs for VOC, NO_x and SO_2. Emission control costs (beyond CLE) decline by 50%.

16.1 Summary

Table 16.1: Summary table for Latvia. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	7	-64%	-8%	-40%	-46%	-54%	-38%	-42%	-49%	-2%	-4%	-5%
NO_x	42	-15%	-32%	-44%	-44%	-58%	-40%	-41%	-54%	-4%	-4%	-4%
PM2.5	29	-5%	-16%	-34%	-45%	-80%	-40%	-46%	-78%	+6%	0%	-2%
NH_3	17	9%	-1%	19%	6%	-3%	15%	3%	-10%	+3%	+3%	+8%
VOC	56	-3%	-28%	-46%	-49%	-77%	-39%	-42%	-78%	-7%	-7%	+1%
PMeq	38	-22%	-19%	-31%	-40%	-69%	-36%	-41%	-70%	+5%	+1%	+1%

16.2 Sectoral emission reductions

Table 16.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Latvia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.2**	**-1.2**	**-0.1**	**-1.5**
Domestic combustion		**-0.8**	**0.0**	**0.0**	**-0.8**
Industry		**-0.1**	**-0.2**	**0.0**	**-0.4**
of which	Refineries	0.0	1.0	2.0	3.0
	Other industries	-0.1	-1.2	-2.0	-3.4
Road transport		**0.0**	**-0.1**	**0.0**	**-0.1**
of which	Light duty	0.0	-0.1	0.0	0.0
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**-0.1**	**0.0**	**0.0**	**-0.1**
Other sectors		**0.2**	**0.0**	**-0.1**	**0.0**
TOTAL		**-1.0**	**-1.5**	**-0.3**	**-2.8**

Table 16.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Latvia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.8**	**-0.4**	**0.0**	**-1.2**
Domestic combustion		**-0.7**	**0.0**	**0.0**	**-0.7**
Industry		**2.0**	**-0.4**	**0.0**	**1.6**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	2.0	-0.4	0.0	1.6
Road transport		**3.1**	**-15.9**	**0.0**	**-12.8**
of which	Light duty	1.6	-5.6	0.0	-4.0
	Heavy duty	1.5	-10.3	0.0	-8.8
Non road mobile		**-1.7**	**-1.7**	**0.0**	**-3.4**
Other sectors		**0.1**	**0.0**	**-0.3**	**-0.2**
TOTAL		**1.9**	**-18.4**	**-0.3**	**-16.8**

Table 16.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Latvia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.1**	**0.0**	**0.0**	**0.1**
Domestic combustion		**-8.2**	**-2.6**	**-0.2**	**-11.0**
Industry		**0.4**	**-0.6**	**-0.2**	**-0.3**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.4	-0.6	-0.2	-0.3
Road transport		**0.8**	**-1.5**	**0.0**	**-0.7**
of which	Light duty	0.8	-1.1	0.0	-0.4
	Heavy duty	0.1	-0.4	0.0	-0.3
Non road mobile		**-0.1**	**-0.2**	**0.0**	**-0.3**
Other sectors		**0.0**	**0.0**	**-1.2**	**-1.3**
TOTAL		**-7.0**	**-4.9**	**-1.6**	**-13.6**

Table 16.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Latvia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**0.5**	**-0.2**	**-0.4**	**-0.1**
Poultry		**0.7**	**-0.5**	**0.0**	**0.2**
Cattle		**1.4**	**0.0**	**-1.2**	**0.3**
of which	Dairy	0.9	0.0	-0.9	0.1
	Meat	0.5	0.0	-0.3	0.2
Other animals		**0.0**	**0.0**	**0.0**	**0.0**
Mineral fertilizers		**0.9**	**0.0**	**0.0**	**0.9**
Other non -agricultural sources		**-0.5**	**-0.1**	**-0.2**	**-0.8**
TOTAL		**3.0**	**-0.7**	**-1.8**	**0.5**

Table 16.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Latvia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.1**	**0.0**	**0.0**	**0.1**
Domestic combustion		**-6.8**	**-3.4**	**0.0**	**-10.2**
Industry (combustion and processes, excluding solvent use)		**-0.5**	**0.0**	**0.0**	**-0.5**
Road transport		**-2.9**	**-3.7**	**0.0**	**-6.5**
of which	Light duty	-2.8	-2.9	0.0	-5.7
	Heavy duty	0.0	-0.7	0.0	-0.8
Non road mobile		**0.1**	**-0.7**	**0.0**	**-0.6**
Refineries (processes)		**0.0**	**0.0**	**0.0**	**0.0**
Production, storage and distribution of oil products		**-0.5**	**-0.2**	**0.0**	**-0.7**
Solvent use		**7.5**	**-10.8**	**0.0**	**-3.3**
Other sectors		**0.0**	**0.0**	**-1.7**	**-1.7**
of which	ban of agr. waste burning	0.0	0.0	-1.5	-1.5
TOTAL		**-3.0**	**-18.7**	**-1.7**	**-23.4**

16.3 Differences to the 2013 Commission proposal

Table 16.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Latvia (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	5.2	6.7	+1.5	+28%	Enhanced representation of inventory for power sector and process emissions
Change 2005 to 2030 CLE	-2.1	-2.5	+0.4	+21%	Change in 2005 emissions and higher CLE emissions from processes
2030 Current legislation (CLE)	3.1	4.2	+1.0	+32%	
Additional reduction potential to MTFR	-0.7	-0.7	+0.0	+3%	No potential change (higher CLE emissions are from process sources with little control potential)
2030 Maximum technical feasible reductions (MTFR)	2.4	3.4	+1.0	+41%	
Additional reduction in the optimized scenario	-0.3	-0.3	-0.0	-10%	
2030 optimized scenario	2.8	3.9	+1.0	+37%	

Table 16.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Latvia (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	36.1	41.1	+5.0	+14%	Improved representation of inventory: lower emissions from power sector (lower EFs), higher from industry and processes as well as from domestic sector (revised emission factors for wood)
Change 2005 to 2030 CLE	-15.8	-16.5	+0.7	+4%	More reductions from road transport due to faster vehicle fleet turnover
2030 Current legislation (CLE)	20.3	24.6	+4.3	+21%	
Additional reduction potential to MTFR	-5.3	-5.8	+0.5	+10%	More potential due to lower uptake of measures in CLE for process and domestic sectors
2030 Maximum technical feasible reductions (MTFR)	15.0	18.8	+3.8	+25%	
Additional reduction in the optimized scenario	-0.3	-0.3	+0.0	+0%	
2030 optimized scenario	20.1	24.4	+4.3	+22%	

Table 16.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Latvia (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	18.6	29.7	+11.1	+60%	New national 2005 inventory (2014 submission estimate 7% higher than in 2012) - higher emissions from domestic sector (adjusted emission factors and modified structure of combustion devices)
Change 2005 to 2030 CLE	-6.4	-11.9	+5.5	+87%	As in 2005
2030 Current legislation (CLE)	12.2	17.8	+5.6	+46%	
Additional reduction potential to MTFR	-8.5	-11.2	+2.7	+32%	Higher potential to reduce emissions from domestic sector (due to lower uptake in CLE)
2030 Maximum technical feasible reductions (MTFR)	3.7	6.5	+2.9	+78%	
Additional reduction in the optimized scenario	-2.1	-1.6	-0.4	-21%	
2030 optimized scenario	10.1	16.1	+6.0	+59%	

Table 16.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Latvia (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	13.0	14.9	+1.9	+15%	Updated livestock statistics for poultry, sheep, horses, mineral fertilizer use, and liquid/solid shares for cattle
Change 2005 to 2030 CLE	2.4	2.3	+0.1	-6%	Impact of the base year changes, specifically from the updated solid/liquid shares for cattle
2030 Current legislation (CLE)	15.4	17.2	+1.8	+12%	
Additional reduction potential to MTFR	-2.7	-3.8	+1.1	+39%	see CLE
2030 Maximum technical feasible reductions (MTFR)	12.6	13.3	+0.7	+6%	
Additional reduction in the optimized scenario	-1.6	-1.8	+0.2	+9%	
2030 optimized scenario	13.7	15.4	+1.6	+12%	

Table 16.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Latvia (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	69.0	55.7	-13.3	-19%	New national 2005 inventory (2014 submission 32% lower than in 2012). Updated emission factors for residential combustion and solvent use (activity and emission factors)
Change 2005 to 2030 CLE	-32.1	-21.7	-10.4	-32%	Changes in emission factors (see 2005) and updated assumptions about the penetration of improved stoves; slower exchange of old stoves
2030 Current legislation (CLE)	36.9	34.0	-2.9	-8%	
Additional reduction potential to MTFR	-21.2	-21.8	+0.5	+2%	Impact of changes in emission factors and potential in residential combustion sector
2030 Maximum technical feasible reductions (MTFR)	15.7	12.2	-3.4	-22%	
Additional reduction in the optimized scenario	-1.6	-1.7	+0.0	+3%	
2030 optimized scenario	35.3	32.3	-3.0	-8%	

Table 16.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Latvia (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	25.7	37.8	+12.1	+47%
Change 2005 to 2030 CLE	-7.9	-13.5	+5.6	+72%
2030 Current legislation (CLE)	17.8	24.3	+6.5	+36%
Additional reduction potential to MTFR	-9.8	-12.8	+3.0	+30%
2030 Maximum technical feasible reductions (MTFR)	8.0	11.5	+3.5	+44%
Additional reduction in the optimized scenario	-2.5	-2.1	-0.4	-16%
2030 optimized scenario	15.3	22.2	+6.9	+45%

Table 16.13: Emission control costs for Latvia (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	360	319	-41	-11%
Additional costs for MTFR	613	473	-140	-23%
2030 MTFR	974	793	-181	-19%
Additional costs in the optimized scenario (compared to CLE)	2	1	-1	-49%
Total costs in the optimized scenario in 2030	362	320	-42	-11%

17 Lithuania

For Lithuania, the new statistical information suggests a steeper decline in baseline emissions by 2030 (in terms of PMeq), while the cost-effective emission reductions (ERR) of PMeq is one percentage point less stringent. In particular, the new data on the structure of agriculture in Lithuania leads to more baseline reductions of NH_3 and highlights a larger potential for additional low-cost measures from this sector. These additional measures contribute then to relaxations of the ERRs for SO_2, NO_x, PM2.5 and VOC. In particular for VOC, the relaxed ERR is also caused by new statistical data and updated data on emission controls and application limits. Emission control costs (beyond CLE) decline by 50%.

17.1 Summary

Table 17.1: Summary table for Lithuania. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	43	-16%	-55%	-41%	-72%	-77%	-47%	-65%	-77%	+6%	-7%	0%
NO_x	62	-8%	-48%	-54%	-55%	-65%	-49%	-51%	-63%	-5%	-5%	-3%
PM2.5	23	7%	-20%	-28%	-54%	-75%	-32%	-48%	-74%	+3%	-5%	-1%
NH_3	39	-3%	-10%	15%	7%	-26%	9%	-2%	-23%	+6%	+10%	-3%
VOC	68	-13%	-32%	-53%	-57%	-78%	-41%	-47%	-76%	-11%	-11%	-2%
PMeq	48	2%	-38%	-26%	-47%	-64%	-31%	-46%	-66%	+5%	-1%	+2%

17.2 Sectoral emission reductions

Table 17.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Lithuania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-9.1**	**-0.1**	**0.0**	**-9.2**
Domestic combustion		**-6.1**	**-0.3**	**-0.8**	**-7.1**
Industry		**2.9**	**-6.2**	**-6.7**	**-10.0**
of which	Refineries	-3.0	-5.8	-1.9	-10.6
	Other industries	5.9	-0.3	-4.8	0.7
Road transport		**0.1**	**-0.4**	**0.0**	**-0.3**
of which	Light duty	0.0	-0.2	0.0	-0.1
	Heavy duty	0.0	-0.2	0.0	-0.2
Non-road mobile		**0.0**	**-0.2**	**0.0**	**-0.2**
Other sectors		**0.0**	**0.0**	**-0.3**	**-0.3**
TOTAL		**-12.2**	**-7.1**	**-7.8**	**-27.0**

Table 17.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Lithuania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.3**	**-0.3**	**0.0**	**-0.6**
Domestic combustion		**-0.6**	**0.0**	**0.0**	**-0.6**
Industry		**0.0**	**-0.5**	**0.0**	**-0.5**
of which	Refineries	-0.8	-0.2	0.0	-1.0
	Other industries	0.7	-0.2	0.0	0.5
Road transport		**4.0**	**-24.1**	**0.0**	**-20.1**
of which	Light duty	-0.5	-8.4	0.0	-8.9
	Heavy duty	4.6	-15.8	0.0	-11.2
Non road mobile		**-0.9**	**-2.7**	**0.0**	**-3.6**
Other sectors		**0.6**	**0.0**	**-0.7**	**0.0**
TOTAL		**2.9**	**-27.6**	**-0.7**	**-25.4**

Table 17.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Lithuania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.0**	**-0.9**	**0.0**	**-0.9**
Domestic combustion		**-2.4**	**-2.3**	**-0.1**	**-4.9**
Industry		**0.1**	**-0.1**	**-0.5**	**-0.5**
of which	Refineries	-0.1	-0.1	0.0	-0.2
	Other industries	0.2	0.0	-0.5	-0.3
Road transport		**0.7**	**-1.5**	**0.0**	**-0.8**
of which	Light duty	0.5	-0.8	0.0	-0.3
	Heavy duty	0.2	-0.7	0.0	-0.5
Non road mobile		**-0.1**	**-0.3**	**0.0**	**-0.4**
Other sectors		**-0.1**	**0.0**	**-3.1**	**-3.2**
TOTAL		**-1.8**	**-5.0**	**-3.7**	**-10.6**

Table 17.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Luthuania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-1.1**	**-0.3**	**-0.8**	**-2.3**
Poultry		**0.2**	**-1.0**	**-0.2**	**-1.0**
Cattle		**1.0**	**0.0**	**-2.3**	**-1.4**
of which	Dairy	0.9	0.0	-1.8	-0.9
	Meat	0.1	0.0	-0.5	-0.5
Other animals		**0.0**	**0.0**	**0.0**	**0.0**
Mineral fertilizers		**4.6**	**0.0**	**0.0**	**4.6**
Other non -agricultural sources		**-0.2**	**0.0**	**-0.6**	**-0.9**
TOTAL		**4.5**	**-1.4**	**-4.0**	**-0.9**

Table 17.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Lithuania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.1**	**0.0**	**0.0**	**0.1**
Domestic combustion		**-2.9**	**-5.0**	**-0.1**	**-8.0**
Industry (combustion and processes, excluding solvent use)		**-0.7**	**-0.1**	**0.0**	**-0.8**
Road transport		**-4.0**	**-7.6**	**0.0**	**-11.6**
of which	Light duty	-4.1	-6.3	0.0	-10.4
	Heavy duty	0.1	-1.3	0.0	-1.2
Non road mobile		**-0.2**	**-0.6**	**0.0**	**-0.9**
Refineries (processes)		**-1.2**	**-2.4**	**0.0**	**-3.6**
Production, storage and distribution of oil products		**-0.8**	**-0.2**	**0.0**	**-1.0**
Solvent use		**1.1**	**-8.3**	**0.0**	**-7.2**
Other sectors		**0.0**	**0.0**	**-4.1**	**-4.1**
of which	ban of agr. waste burning	0.0	0.0	-3.9	-3.9
TOTAL		**-8.7**	**-24.3**	**-4.2**	**-37.1**

17.3 Differences to the 2013 Commission proposal

Table 17.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Lithuania (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	41.7	41.4	-0.2	-0%	
Change 2005 to 2030 CLE	-17.0	-19.3	+2.3	+14%	New information on the penetration of CLE controls in refineries, process sources and domestic sector provided by Lithuania
2030 Current legislation (CLE)	24.7	22.2	-2.5	-10%	
Additional reduction potential to MTFR	-15.1	-12.7	-2.4	-16%	Less potential for additional reductions from refineries (measures already taken in CLE); additional potential through availability of S-free heating oil in the domestic sector
2030 Maximum technical feasible reductions (MTFR)	9.6	9.4	-0.2	-2%	
Additional reduction in the optimized scenario	-13.2	-7.8	-5.4	-41%	
2030 optimized scenario	11.5	14.4	+2.9	+25%	

Table 17.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Lithuania (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	61.9	49.9	-12.0	-19%	Lower emissions EFs from power sector, and industrial processes (reported after consultations - not in inventory as yet) lower road transport emissions (younger fleet); higher emissions from domestic sector (revised EF for wood)
Change 2005 to 2030 CLE	-33.6	-24.7	-8.9	-26%	Reasons as for 2005
2030 Current legislation (CLE)	28.3	25.2	-3.1	-11%	
Additional reduction potential to MTFR	-6.8	-6.6	-0.2	-3%	Potential changed due to changes in CLE emissions
2030 Maximum technical feasible reductions (MTFR)	21.5	18.6	-2.9	-14%	
Additional reduction in the optimized scenario	-0.7	-0.7	-0.0	0%	
2030 optimized scenario	27.6	24.5	-3.1	-11%	

Table 17.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Lithuania (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	15.0	21.8	+6.8	+45%	New national 2005 inventory: higher GAINS emissions from domestic sector, power plants and industrial combustion (adjusted emission factors and structure of combustion devices)
Change 2005 to 2030 CLE	-4.3	-6.9	+2.6	+62%	More reductions in domestic sector (faster turnover of combustion devices)
2030 Current legislation (CLE)	10.8	14.9	+4.2	+39%	
Additional reduction potential to MTFR	-7.0	-9.3	+2.2	+32%	Higher potential in domestic sector due to different structure of combustion devices
2030 Maximum technical feasible reductions (MTFR)	3.7	5.7	+1.9	+52%	
Additional reduction in the optimized scenario	-3.8	-3.7	-0.1	-4%	
2030 optimized scenario	6.9	11.3	+4.3	+62%	

Table 17.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Lithuania (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	44.2	35.1	-9.1	-21%	Updated livestock statistics (horses and sheep), share of solid/liquid manure for cattle, emission factors for fertilizer production harmonized with the national inventory.
Change 2005 to 2030 CLE	6.4	3.1	+3.3	-51%	Updated shares of liquid/solid manure for cattle and share of urea in mineral N fertilizers
2030 Current legislation (CLE)	50.6	38.2	-12.4	-25%	
Additional reduction potential to MTFR	-18.0	-11.3	-6.8	-38%	Impact of changes in the base year and CLE
2030 Maximum technical feasible reductions (MTFR)	32.6	26.9	-5.6	-17%	
Additional reduction in the optimized scenario	-3.3	-4.0	+0.7	+21%	
2030 optimized scenario	47.3	34.2	-13.1	-28%	

Table 17.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Lithuania (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	84.5	79.7	-4.8	-6%	New national 2005 inventory (2014 submission estimate 24% lower than in 2012): harmonization of activities for solvent use sectors (coating application, printing, industrial cleaning), update of emission factors for food and drink industry and domestic sector; improved match with national inventory
Change 2005 to 2030 CLE	-44.6	-33.0	-11.6	-26%	Update of CLE controls for refineries, and changes in solvent use sectors listed above
2030 Current legislation (CLE)	39.9	46.7	+6.8	+17%	
Additional reduction potential to MTFR	-21.7	-27.9	+6.2	+29%	CLE changes and harmonization of application limits for industrial cleaning and coating operations
2030 Maximum technical feasible reductions (MTFR)	18.2	18.8	+0.6	+3%	
Additional reduction in the optimized scenario	-4.0	-4.2	+0.2	+5%	
2030 optimized scenario	36.0	42.5	+6.6	+18%	

Table 17.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Lithuania (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	40.9	45.0	+4.1	+10%
Change 2005 to 2030 CLE	-10.7	-14.0	+3.3	+30%
2030 Current legislation (CLE)	30.2	31.1	+0.9	+3%
Additional reduction potential to MTFR	-15.7	-15.9	+0.3	+2%
2030 Maximum technical feasible reductions (MTFR)	14.5	15.1	+0.6	+4%
Additional reduction in the optimized scenario	-8.5	-6.9	-1.6	-19%
2030 optimized scenario	21.7	24.2	+2.5	+11%

Table 17.13: Emission control costs for Lithuania (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	397	461	64	16%
Additional costs for MTFR	664	539	-125	-19%
2030 MTFR	1061	1001	-60	-6%
Additional costs in the optimized scenario (compared to CLE)	14	7	-7	-49%
Total costs in the optimized scenario in 2030	411	469	57	14%

18 Luxembourg

For Luxembourg, the updated data on the structure of emission sources results in a larger decline in baseline emissions of SO_2 and NOx than estimated before. As no additional measures are suggested in the re-optimized scenario for NOx, this decline translates directly into a larger emission reduction requirement (ERR). For SO_2, larger baseline reductions relax the need for additional measures, although the resulting ERR is larger than in the initial scenario. At the same time, ERRs for PM2.5 and VOC are relaxed by five and nine percentage points, respectively. Emission control costs (beyond CLE) decline by 50%.

18.1 Summary

Table 18.1: Summary table for Luxembourg. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	2	-18%	-34%	-21%	-44%	-56%	-42%	-45%	-75%	+21%	+1%	+19%
NO_x	62	-26%	-43%	-79%	-79%	-80%	-85%	-85%	-86%	+6%	+6%	+6%
PM2.5	4	-27%	-15%	-43%	-48%	-54%	-40%	-43%	-48%	-4%	-5%	-6%
NH_3	7	-3%	-7%	-11%	-24%	-27%	-9%	-24%	-28%	-2%	0%	+1%
VOC	13	-32%	-30%	-55%	-58%	-67%	-47%	-49%	-65%	-7%	-9%	-1%
PMeq	10	-33%	-27%	-51%	-56%	-60%	-55%	-59%	-64%	+5%	+3%	+4%

18.2 Sectoral emission reductions

Table 18.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Luxembourg (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.1**	**0.0**	**0.0**	**0.1**
Domestic combustion		**-0.3**	**-0.5**	**0.0**	**-0.8**
Industry		**0.1**	**-0.6**	**-0.1**	**-0.5**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.1	-0.6	-0.1	-0.5
Road transport		**0.0**	**0.0**	**0.0**	**0.0**
of which	Light duty	0.0	0.0	0.0	0.0
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**0.0**	**0.0**	**0.0**	**0.0**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**0.0**	**-1.0**	**-0.1**	**-1.2**

Table 18.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Luxembourg (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.4**	**-0.1**	**0.0**	**-0.5**
Domestic combustion		**-0.1**	**-0.3**	**0.0**	**-0.5**
Industry		**0.4**	**-1.9**	**0.0**	**-1.5**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.4	-1.9	0.0	-1.5
Road transport		**1.6**	**-46.2**	**0.0**	**-44.5**
of which	Light duty	-1.1	-6.4	0.0	-7.6
	Heavy duty	2.8	-39.7	0.0	-37.0
Non road mobile		**-0.5**	**-0.5**	**0.0**	**-1.0**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**1.1**	**-48.9**	**-0.1**	**-47.9**

Table 18.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Luxembourg (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.0**	**0.0**	**0.0**	**0.0**
Domestic combustion		**0.2**	**-0.1**	**-0.1**	**0.0**
Industry		**0.1**	**0.0**	**0.0**	**0.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.1	0.0	0.0	0.1
Road transport		**0.2**	**-1.5**	**0.0**	**-1.3**
of which	Light duty	0.1	-0.6	0.0	-0.4
	Heavy duty	0.1	-1.0	0.0	-0.9
Non road mobile		**0.0**	**0.0**	**0.0**	**-0.1**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**0.5**	**-1.7**	**-0.1**	**-1.3**

Table 18.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Luxembourg (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**0.05**	**0.00**	**-0.20**	**-0.15**
Poultry		**-0.01**	**0.00**	**-0.01**	**-0.02**
Cattle		**-0.16**	**0.00**	**-0.69**	**-0.85**
of which	Dairy	0.25	0.00	-0.46	-0.21
	Meat	-0.41	0.00	-0.23	-0.64
Other animals		**0.01**	**0.00**	**0.00**	**0.01**
Mineral fertilizers		**-0.08**	**0.00**	**-0.01**	**-0.09**
Other non -agricultural sources		**-0.30**	**-0.05**	**0.00**	**-0.36**
TOTAL		**-0.50**	**-0.05**	**-0.92**	**-1.47**

Table 18.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Luxembourg (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.0**	**0.0**	**0.0**	**0.0**
Domestic combustion		**0.3**	**-0.2**	**-0.3**	**-0.1**
Industry (combustion and processes, excluding solvent use)		**0.0**	**0.0**	**0.0**	**0.0**
Road transport		**-2.4**	**-3.2**	**0.0**	**-5.5**
of which	Light duty	-2.5	-1.3	0.0	-3.8
	Heavy duty	0.1	-1.8	0.0	-1.7
Non road mobile		**0.0**	**-0.1**	**0.0**	**-0.1**
Refineries (processes)		**0.0**	**0.0**	**0.0**	**0.0**
Production, storage and distribution of oil products		**-0.2**	**0.0**	**0.0**	**-0.2**
Solvent use		**-0.3**	**-0.5**	**0.0**	**-0.8**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
of which	ban of agr. waste burning	0.0	0.0	0.0	0.0
TOTAL		**-2.5**	**-4.0**	**-0.3**	**-6.7**

18.3 Differences to the 2013 Commission proposal

Table 18.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Luxembourg (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1.9	2.6	+0.7	+36%	Higher S content of heating oil in the domestic sector than originally assumed
Change 2005 to 2030 CLE	-0.4	-1.1	+0.7	+170%	The controls that were assumed to be in place in 2005 will be taken afterwards, before 2030
2030 Current legislation (CLE)	1.5	1.5	-0.0	-0%	
Additional reduction potential to MTFR	-0.7	-0.9	+0.2	+27%	Availability of S-free heating oil assumed for the domestic sector
2030 Maximum technical feasible reductions (MTFR)	0.8	0.7	-0.2	-22%	
Additional reduction in the optimized scenario	-0.4	-0.1	-0.3	-79%	
2030 optimized scenario	1.1	1.4	+0.3	+32%	

Table 18.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Luxembourg (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	47.4	56.3	+8.9	+19%	Higher road transport emissions - more diesel allocated to HDT
Change 2005 to 2030 CLE	-37.3	-47.9	+10.6	+28%	Larger reductions from road transport - HDT have higher reduction rate than cars
2030 Current legislation (CLE)	10.1	8.4	-1.7	-17%	
Additional reduction potential to MTFR	-0.8	-0.8	-0.0	-1%	Potential changed due to changes in CLE emissions
2030 Maximum technical feasible reductions (MTFR)	9.3	7.6	-1.7	-18%	
Additional reduction in the optimized scenario	-0.1	-0.1	-0.0	-44%	
2030 optimized scenario	10.0	8.3	-1.6	-16%	

Table 18.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Luxembourg (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	3.3	2.9	-0.3	-11%	More diesel allocated to HDT
Change 2005 to 2030 CLE	-1.4	-1.2	-0.3	-18%	Different diesel fuel allocation in road transport
2030 Current legislation (CLE)	1.9	1.8	-0.1	-5%	
Additional reduction potential to MTFR	-0.3	-0.2	-0.1	-27%	Less potential in domestic sector due to different structure of combustion devices
2030 Maximum technical feasible reductions (MTFR)	1.5	1.5	+0.0	+0%	
Additional reduction in the optimized scenario	-0.1	-0.1	-0.0	-29%	
2030 optimized scenario	1.7	1.7	-0.0	-3%	

Table 18.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Luxembourg (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	6.2	6.0	-0.2	-3%	New national 2005 inventory. Updated data for non-agricultural sources (transport, combustion).
Change 2005 to 2030 CLE	-0.7	-0.5	-0.1	-18%	Updates for non-agricultural sources (transport, combustion)
2030 Current legislation (CLE)	5.5	5.5	-0.0	-1%	
Additional reduction potential to MTFR	-1.0	-1.2	+0.1	+11%	see 2005 and CLE
2030 Maximum technical feasible reductions (MTFR)	4.5	4.3	-0.2	-4%	
Additional reduction in the optimized scenario	-0.9	-0.9	+0.1	+8%	
2030 optimized scenario	4.7	4.6	-0.1	-2%	

Table 18.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Luxembourg (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	12.6	13.7	1.1	9%	Updated activity statistics for solvent use sectors and emission factors for domestic solvent use
Change 2005 to 2030 CLE	-6.9	-6.5	0.4	-6%	Updated activity projections for printing and control strategy for liquid fuel distribution
2030 Current legislation (CLE)	5.7	7.2	1.5	26%	
Additional reduction potential to MTFR	-1.5	-2.5	-0.9	62%	Impacts of the changes for CLE and their consequences on applicabilities for industrial coating and cleaning sectors
2030 Maximum technical feasible reductions (MTFR)	4.2	4.8	0.6	14%	
Additional reduction in the optimized scenario	0.4	0.3	-0.2	-39%	
2030 optimized scenario	5.3	7.0	1.7	32%	

Table 18.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Luxembourg (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	8.4	8.8	+0.4	+5%
Change 2005 to 2030 CLE	-4.2	-4.9	+0.6	+15%
2030 Current legislation (CLE)	4.1	3.9	-0.2	-5%
Additional reduction potential to MTFR	-0.8	-0.8	-0.0	-1%
2030 Maximum technical feasible reductions (MTFR)	3.3	3.1	-0.2	-6%
Additional reduction in the optimized scenario	-0.5	-0.3	-0.1	-30%
2030 optimized scenario	3.7	3.6	-0.1	-2%

Table 18.13: Emission control costs for Luxembourg (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	204	214	9	5%
Additional costs for MTFR	45	46	1	3%
2030 MTFR	249	260	11	4%
Additional costs in the optimized scenario (compared to CLE)	2	1	-1	-50%
Total costs in the optimized scenario in 2030	207	215	8	4%

19 Malta

For Malta, the re-optimized scenario results in lower emission reduction requirements relative to 2005, and differences emerge mainly from new statistical data (including reallocation of diesel fuel between HDT and cars) that affect the baseline current legislation projection for 2030.

19.1 Summary

Table 19.1: Summary table for Malta. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	11	-32%	-77%	-97%	-98%	-99%	-95%	-95%	-98%	-2%	-3%	-1%
NO_x	9	-7%	-42%	-89%	-89%	-92%	-79%	-79%	-86%	-9%	-9%	-6%
PM2.5	1	-38%	-25%	-76%	-80%	-83%	-72%	-76%	-79%	-4%	-4%	-3%
NH_3	2	-4%	-4%	-8%	-24%	-35%	-8%	-24%	-37%	-0%	-0%	+2%
VOC	3	-5%	-23%	-30%	-31%	-64%	-26%	-27%	-59%	-4%	-4%	-5%
PMeq	6	-48%	-49%	-87%	-89%	-91%	-84%	-85%	-90%	-3%	-3%	-1%

19.2 Sectoral emission reductions

Table 19.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Malta (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-10.5**	**0.0**	**0.0**	**-10.5**
Domestic combustion		**0.0**	**0.0**	**0.0**	**0.0**
Industry		**-0.1**	**0.0**	**0.0**	**-0.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-0.1	0.0	0.0	-0.1
Road transport		**0.0**	**-0.1**	**0.0**	**-0.1**
of which	Light duty	0.0	0.0	0.0	0.0
	Heavy duty	0.0	-0.1	0.0	-0.1
Non-road mobile		**0.0**	**-0.1**	**0.0**	**-0.1**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**-10.6**	**-0.3**	**0.0**	**-10.8**

Table 19.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Malta (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-4.9**	**-0.2**	**0.0**	**-5.0**
Domestic combustion		**0.0**	**0.0**	**0.0**	**0.0**
Industry		**0.0**	**-0.1**	**0.0**	**-0.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.0	-0.1	0.0	-0.1
Road transport		**0.1**	**-2.4**	**0.0**	**-2.4**
of which	Light duty	0.2	-0.5	0.0	-0.3
	Heavy duty	-0.1	-1.9	0.0	-2.0
Non road mobile		**0.1**	**-0.2**	**0.0**	**-0.1**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**-4.7**	**-2.8**	**0.0**	**-7.6**

Table 19.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Malta (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.3**	**0.0**	**0.0**	**-0.3**
Domestic combustion		**0.0**	**0.0**	**0.0**	**0.0**
Industry		**0.0**	**-0.1**	**0.0**	**-0.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	0.0	-0.1	0.0	-0.1
Road transport		**0.0**	**-0.1**	**0.0**	**-0.1**
of which	Light duty	0.0	0.0	0.0	0.0
	Heavy duty	0.0	-0.1	0.0	-0.1
Non road mobile		**0.0**	**0.0**	**0.0**	**0.0**
Other sectors		**0.0**	**0.0**	**0.0**	**0.0**
TOTAL		**-0.3**	**-0.2**	**0.0**	**-0.5**

Table 19.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Malta (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-0.02**	**0.00**	**-0.12**	**-0.14**
Poultry		**-0.09**	**0.00**	**-0.07**	**-0.16**
Cattle		**0.03**	**0.00**	**-0.08**	**-0.06**
of which	Dairy	0.04	0.00	-0.07	-0.03
	Meat	-0.02	0.00	-0.01	-0.03
Other animals		**0.04**	**0.00**	**0.00**	**0.04**
Mineral fertilizers		**0.00**	**0.00**	**0.00**	**0.00**
Other non -agricultural sources		**-0.05**	**-0.03**	**-0.01**	**-0.09**
TOTAL		**-0.10**	**-0.03**	**-0.28**	**-0.41**

Table 19.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Malta (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.18**	**0.00**	**0.00**	**-0.19**
Domestic combustion		**0.00**	**0.00**	**0.00**	**0.00**
Industry (combustion and processes, excluding solvent use)		**0.00**	**0.00**	**0.00**	**0.00**
Road transport		**-0.25**	**-0.50**	**0.00**	**-0.75**
of which	Light duty	-0.24	-0.30	0.00	-0.54
	Heavy duty	-0.01	-0.20	0.00	-0.21
Non road mobile		**0.04**	**-0.01**	**0.00**	**0.03**
Refineries (processes)		**0.00**	**0.00**	**0.00**	**0.00**
Production, storage and distribution of oil products		**-0.11**	**-0.07**	**0.00**	**-0.17**
Solvent use		**0.30**	**-0.25**	**0.00**	**0.05**
Other sectors		**0.00**	**0.00**	**-0.04**	**-0.04**
of which	ban of agr. waste burning	0.00	0.00	-0.04	-0.04
TOTAL		**-0.20**	**-0.83**	**-0.04**	**-1.07**

19.3 Differences to the 2013 Commission proposal

Table 19.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Malta (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	11.08	11.37	0.29	+3%	Inclusion of emissions from national navigation (no data in PRIMES) and cement production
Change 2005 to 2030 CLE	-10.78	-10.81	0.03	+0%	As for 2005
2030 Current legislation (CLE)	0.30	0.56	0.26	+85%	
Additional reduction potential to MTFR	-0.20	-0.38	0.18	+92%	Additional potential from national navigation and cement production
2030 Maximum technical feasible reductions (MTFR)	0.10	0.18	0.07	+72%	
Additional reduction in the optimized scenario	-0.046	-0.003	-0.04	-93%	
2030 optimized scenario	0.26	0.56	0.30	+118%	

Table 19.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Malta (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	9.88	9.56	-0.32	-3%	Lower emissions from road transport (reallocation of diesel fuel between HDT and cars), higher emissions from industry (cement production), inclusion of national shipping (activities not in PRIMES)
Change 2005 to 2030 CLE	-8.74	-7.55	-1.19	-14%	Higher CLE emissions - cement and national shipping
2030 Current legislation (CLE)	1.14	2.00	0.87	+77%	
Additional reduction potential to MTFR	-0.30	-0.63	0.33	+109%	Higher reduction potential due to additional sources
2030 Maximum technical feasible reductions (MTFR)	0.83	1.37	0.54	+65%	
Additional reduction in the optimized scenario	-0.01	-0.01	0.00	0%	
2030 optimized scenario	1.13	2.00	0.87	+77%	

Table 19.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Malta (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	0.73	0.71	-0.02	-3%	Lower emissions from the power sector, higher from cement production; reallocation of diesel fuel between HDT and cars (emissions decrease). Naval activities included
Change 2005 to 2030 CLE	-0.56	-0.51	-0.04	-8%	Higher emissions from industry and naval activities, lower from road transport
2030 Current legislation (CLE)	0.18	0.20	0.02	+12%	
Additional reduction potential to MTFR	-0.05	-0.05	0.00	0%	
2030 Maximum technical feasible reductions (MTFR)	0.13	0.15	0.02	+17%	
Additional reduction in the optimized scenario	-0.03	-0.03	0.00	-9%	
2030 optimized scenario	0.14	0.17	0.02	+17%	

Table 19.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Malta (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1.71	1.71	0.00	0%	
Change 2005 to 2030 CLE	-0.13	-0.13	0.00	0%	
2030 Current legislation (CLE)	1.58	1.58	0.00	0%	
Additional reduction potential to MTFR	-0.46	-0.49	0.04	+8%	Changes for non-agricultural sources
2030 Maximum technical feasible reductions (MTFR)	1.12	1.08	-0.04	-3%	
Additional reduction in the optimized scenario	-0.27	-0.28	0.01	+3%	
2030 optimized scenario	1.31	1.30	-0.01	-1%	

Table 19.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Malta (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	3.98	3.92	-0.06	-2%	Reallocation of diesel fuel between HDT and cars
Change 2005 to 2030 CLE	-1.19	-1.02	-0.17	-14%	Reallocation of diesel fuel between HDT and cars
2030 Current legislation (CLE)	2.79	2.89	0.10	+4%	
Additional reduction potential to MTFR	-1.36	-1.29	-0.08	-6%	
2030 Maximum technical feasible reductions (MTFR)	1.43	1.61	0.18	+12%	
Additional reduction in the optimized scenario	-0.04	-0.04	0.00	-2%	
2030 optimized scenario	2.75	2.85	0.10	+4%	

Table 19.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Malta (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	5.06	5.11	0.04	+1%
Change 2005 to 2030 CLE	-4.39	-4.28	-0.11	-3%
2030 Current legislation (CLE)	0.67	0.83	0.16	+23%
Additional reduction potential to MTFR	-0.23	-0.31	0.08	+36%
2030 Maximum technical feasible reductions (MTFR)	0.44	0.52	0.07	+17%
Additional reduction in the optimized scenario	-0.10	-0.09	-0.01	-14%
2030 optimized scenario	0.57	0.74	0.17	+30%

Table 19.13: Emission control costs for Malta (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	103	104	2	2%
Additional costs for MTFR	17	16	-1	-8%
2030 MTFR	120	120	0	0%
Additional costs in the optimized scenario (compared to CLE)	0.14	0.08	-0.06	-40%
Total costs in the optimized scenario in 2030	103	104	2	2%

20 Netherlands

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for the Netherlands the overall emission reduction requirement (ERR) in terms of PMeq is three percentage points lower than in the initial COM scenario.

The new statistical data (e.g., on shipping, industry) suggest slightly steeper baseline declines for SO_2 and PM2.5 emissions, which keep the corresponding ERRs close to the original values. Relaxations occur in the ERRs for VOC (13 percentage points), NO_x (seven percentage points) and NH_3 (four percentage points). The strong relaxation for VOC is partially the result of the impact of several changes to the baseline (strong decrease in baseline emission reduction). Emission control costs (beyond CLE) decline by more than 50%.

20.1 Summary

Table 20.1: Summary table for Netherlands. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	64	-47%	-28%	-54%	-59%	-63%	-55%	-58%	-63%	+1%	-1%	0%
NO_x	365	-27%	-45%	-62%	-68%	-72%	-59%	-61%	-67%	-3%	-7%	-6%
PM2.5	19	-33%	-33%	-30%	-38%	-45%	-32%	-40%	-46%	+2%	+1%	+1%
NH_3	143	-16%	-13%	-24%	-25%	-25%	-19%	-21%	-22%	-6%	-4%	-4%
VOC	174	-16%	-8%	-31%	-34%	-50%	-19%	-22%	-37%	-12%	-13%	-12%
PMeq	92	-50%	-44%	-41%	-46%	-50%	-39%	-43%	-47%	-2%	-3%	-3%

20.2 Sectoral emission reductions

Table 20.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Netherlands (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-3.2**	**-1.2**	**0.0**	**-4.5**
Domestic combustion		**-0.6**	**0.0**	**0.0**	**-0.6**
Industry		**-15.4**	**-8.6**	**-1.9**	**-25.9**
of which	Refineries	-12.6	-7.5	-1.3	-21.4
	Other industries	-2.7	-1.1	-0.6	-4.4
Road transport		**0.1**	**-0.6**	**0.0**	**-0.5**
of which	Light duty	0.0	-0.3	0.0	-0.3
	Heavy duty	0.1	-0.3	0.0	-0.2
Non-road mobile		**-0.6**	**-2.4**	**0.0**	**-3.0**
Other sectors		**-2.8**	**0.0**	**0.0**	**-2.8**
TOTAL		**-22.5**	**-12.9**	**-1.9**	**-37.3**

Table 20.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Netherlands (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-7.7**	**-2.3**	**-0.5**	**-10.5**
Domestic combustion		**-5.9**	**-12.3**	**0.0**	**-18.2**
Industry		**-13.7**	**-7.2**	**-0.1**	**-21.0**
of which	Refineries	-5.9	-0.3	0.0	-6.2
	Other industries	-7.8	-6.9	-0.1	-14.8
Road transport		**14.6**	**-150.6**	**0.0**	**-136.0**
of which	Light duty	-2.0	-54.6	0.0	-56.5
	Heavy duty	16.5	-96.0	0.0	-79.5
Non road mobile		**-6.1**	**-22.2**	**-7.5**	**-35.9**
Other sectors		**0.5**	**0.0**	**0.0**	**0.4**
TOTAL		**-18.3**	**-194.6**	**-8.2**	**-221.2**

Table 20.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Netherlands (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**0.6**	**0.0**	**-0.5**	**0.1**
Domestic combustion		**2.5**	**-1.5**	**-0.2**	**0.8**
Industry		**-0.5**	**0.0**	**-0.3**	**-0.8**
of which	Refineries	-0.2	0.0	0.0	-0.2
	Other industries	-0.3	0.0	-0.3	-0.6
Road transport		**1.4**	**-7.9**	**0.0**	**-6.5**
of which	Light duty	0.9	-5.4	0.0	-4.5
	Heavy duty	0.5	-2.6	0.0	-2.1
Non road mobile		**-0.5**	**-2.0**	**-0.3**	**-2.8**
Other sectors		**0.2**	**0.0**	**-0.6**	**-0.4**
TOTAL		**3.7**	**-11.5**	**-1.8**	**-9.6**

Table 20.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for the Netherlands (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-2.2**	**-10.7**	**0.0**	**-12.8**
Poultry		**1.5**	**-4.9**	**-2.5**	**-6.0**
Cattle		**4.6**	**-6.9**	**-0.5**	**-2.8**
of which	Dairy	7.1	-5.0	0.0	2.1
	Meat	-2.5	-1.9	-0.5	-5.0
Other animals		**0.1**	**-0.2**	**0.0**	**-0.1**
Mineral fertilizers		**-1.5**	**-3.0**	**0.0**	**-4.5**
Other non -agricultural sources		**-2.0**	**-1.5**	**-0.1**	**-3.6**
TOTAL		**0.6**	**-27.3**	**-3.2**	**-29.9**

Table 20.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for the Netherlands (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.2**	**0.0**	**-0.1**	**0.1**
Domestic combustion		**7.0**	**-6.0**	**-0.9**	**0.0**
Industry (combustion and processes, excluding solvent use)		**5.1**	**-2.8**	**0.0**	**2.3**
Road transport		**-8.5**	**-16.6**	**0.0**	**-25.2**
of which	Light duty	-9.2	-11.9	0.0	-21.1
	Heavy duty	0.7	-4.7	0.0	-4.0
Non road mobile		**-2.4**	**-2.2**	**-2.4**	**-7.1**
Refineries (processes)		**-2.7**	**0.0**	**0.0**	**-2.7**
Production, storage and distribution of oil products		**-4.7**	**-0.1**	**0.0**	**-4.8**
Solvent use		**12.6**	**-11.3**	**-1.0**	**0.3**
Other sectors		**-0.1**	**0.0**	**-0.5**	**-0.6**
of which	ban of agr. waste burning	0.0	0.0	-0.2	-0.2
TOTAL		**6.5**	**-39.1**	**-5.0**	**-37.5**

20.3 Differences to the 2013 Commission proposal

Table 20.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Netherlands (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	69.9	64.5	-5.4	-8%	Improved representation of national inventory: lower emissions from industrial combustion and refineries, higher from other processes
Change 2005 to 2030 CLE	-37.6	-35.4	-2.2	-6%	Lower reduction due to lower 2005 emissions
2030 Current legislation (CLE)	32.3	29.1	-3.2	-10%	
Additional reduction potential to MTFR	-6.4	-5.2	-1.3	-20%	Lower potential due to lower CLE EFs from refineries and other processes
2030 Maximum technical feasible reductions (MTFR)	25.9	24.0	-1.9	-8%	
Additional reduction in the optimized scenario	-3.5	-1.9	-1.6	-46%	
2030 optimized scenario	28.8	27.2	-1.6	-6%	

Table 20.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Netherlands (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	379.7	361.7	-18.0	-5%	Improved representation of inventory (transport emissions based on fuel sold); lower emissions from power plants, small combustion and processes (lower EFs); lower emissions from road transport (newer fleet) higher from shipping (higher EFs)
Change 2005 to 2030 CLE	-236.3	-213.0	-23.3	-10%	Higher emissions from industrial combustion and national shipping (higher activity and EF for inland waterways), lower from industrial processes (lower EFs)
2030 Current legislation (CLE)	143.4	148.7	+5.3	+4%	
Additional reduction potential to MTFR	-38.7	-29.0	-9.7	-25%	Less potential for shipping (older fleet, less stringent Stage 4)
2030 Maximum technical feasible reductions (MTFR)	104.7	119.7	+15.0	+14%	
Additional reduction in the optimized scenario	-21.2	-8.2	-13.0	-61%	
2030 optimized scenario	122.2	140.5	+18.3	+15%	

Table 20.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Netherlands (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	24.2	24.0	-0.2	-1%	Lower emissions from road transport (newer fleet, updated EFs for non-exhaust emissions), higher emissions from shipping, higher from other non-road sources (updated EFs)
Change 2005 to 2030 CLE	-7.3	-7.7	+0.5	+7%	Reasons as for 2005
2030 Current legislation (CLE)	16.9	16.2	-0.7	-4%	
Additional reduction potential to MTFR	-3.7	-3.3	-0.4	-11%	Less potential in domestic sector (different distribution of combustion sources and updated applicabilities); less potential from shipping (different activities and uptake of Stage 4 for inland waterways)
2030 Maximum technical feasible reductions (MTFR)	13.2	12.9	-0.3	-2%	
Additional reduction in the optimized scenario	-2.1	-1.8	-0.2	-11%	
2030 optimized scenario	14.9	14.4	-0.5	-3%	

Table 20.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Netherlands (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	146.0	143.9	-2.1	-1%	Updated statistical data for non-agricultural sources (waste water treatment)
Change 2005 to 2030 CLE	-35.3	-26.7	-8.6	-24%	Update for non-agricultural sources and shares of broilers vs layers in poultry sector
2030 Current legislation (CLE)	110.7	117.2	+6.5	+6%	
Additional reduction potential to MTFR	-1.7	-4.3	+2.5	+147%	Updates in the CLE and harmonization of emission factors with application limits
2030 Maximum technical feasible reductions (MTFR)	108.9	112.9	+4.0	+4%	
Additional reduction in the optimized scenario	-0.9	-3.2	+2.3	+254%	
2030 optimized scenario	109.8	114.0	+4.2	+4%	

Table 20.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Netherlands (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	205.0	172.0	-33.0	-16%	Main differences from new statistical information on the transport sector, chemical industry, solvent use, and storage of oil and refining products; new estimates for transport are lower, for other categories changes go in both directions
Change 2005 to 2030 CLE	-64.4	-32.6	-31.8	-49%	Updated activity data for solvent use sectors, specifically chemical industries and storage of petroleum products and chemicals; several compensating effects
2030 Current legislation (CLE)	140.5	139.4	-1.1	-1%	
Additional reduction potential to MTFR	-37.1	-31.7	-5.3	-14%	Impact of changes in the CLE, i.e., different sectoral distribution
2030 Maximum technical feasible reductions (MTFR)	103.5	107.7	+4.2	+4%	
Additional reduction in the optimized scenario	-6.1	-5.0	-1.1	-18%	
2030 optimized scenario	134.5	134.4	-0.0	-0%	

Table 20.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the Netherlands (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	100.6	96.9	-3.7	-4%
Change 2005 to 2030 CLE	-41.7	-38.0	-3.7	-9%
2030 Current legislation (CLE)	58.9	58.9	-0.0	-0%
Additional reduction potential to MTFR	-8.9	-7.9	-1.0	-11%
2030 Maximum technical feasible reductions (MTFR)	50.0	51.0	+0.9	+2%
Additional reduction in the optimized scenario	-4.8	-3.6	-1.1	-24%
2030 optimized scenario	54.2	55.3	+1.1	+2%

Table 20.13: Emission control costs for the Netherlands (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	3407	3793	386	11%
Additional costs for MTFR	965	907	-58	-6%
2030 MTFR	4372	4700	328	8%
Additional costs in the optimized scenario (compared to CLE)	47	22	-26	-54%
Total costs in the optimized scenario in 2030	3454	3815	360	10%

21 Poland

For Poland, the new statistical data on solid fuel use in the residential sector reveals a larger potential for low cost measures for reducing PM2.5 than estimated before, so that the re-optimized scenario increases the PM2.5 cost-effective emission reduction by six percentage points. New statistics on the structure of agricultural activities in Poland lead to a four percentage points lower baseline decline in NH_3 emissions, and the re-optimized emission reduction requirement for NH_3 is lower by the same amount. The larger PM2.5 cuts relax the need for NOx reductions by four percentage points, and for SO_2 reductions by one percentage point. Emission control costs (beyond CLE) decline by 13%.

21.1 Summary

Table 21.1: Summary table for Poland. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	1217	-30%	-59%	-64%	-78%	-79%	-66%	-77%	-79%	+2%	-1%	0%
NO_x	851	-4%	-35%	-52%	-55%	-65%	-49%	-51%	-63%	-3%	-4%	-2%
PM2.5	141	-2%	-16%	-12%	-40%	-56%	-11%	-46%	-53%	0%	+6%	-3%
NH_3	272	-3%	-1%	-3%	-26%	-33%	1%	-22%	-37%	-4%	-4%	+3%
VOC	575	10%	-25%	-34%	-56%	-69%	-34%	-55%	-67%	-1%	0%	-2%
PMeq	618	-12%	-34%	-41%	-59%	-67%	-41%	-60%	-66%	0%	+1%	-1%

21.2 Sectoral emission reductions

Table 21.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Poland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-371.1**	**-371.3**	**-7.6**	**-750.1**
Domestic combustion		**-48.7**	**-9.0**	**-57.7**	**-115.4**
Industry		**36.1**	**-32.5**	**-70.4**	**-66.8**
of which	Refineries	-0.9	-4.6	-15.3	-20.9
	Other industries	37.0	-27.9	-55.0	-45.9
Road transport		**1.2**	**-1.8**	**0.0**	**-0.6**
of which	Light duty	0.6	-1.0	0.0	-0.3
	Heavy duty	0.6	-0.9	0.0	-0.2
Non-road mobile		**-0.2**	**-1.6**	**0.0**	**-1.8**
Other sectors		**1.8**	**0.0**	**-0.6**	**1.2**
TOTAL		**-381.0**	**-416.2**	**-136.3**	**-933.5**

Table 21.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Poland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-80.2**	**-129.0**	**-3.6**	**-212.7**
Domestic combustion		**1.2**	**0.0**	**0.0**	**1.2**
Industry		**76.0**	**-84.2**	**-8.0**	**-16.2**
of which	Refineries	1.7	-0.2	-0.2	1.3
	Other industries	74.3	-84.0	-7.8	-17.4
Road transport		**192.8**	**-311.8**	**0.0**	**-119.0**
of which	Light duty	48.7	-131.8	0.0	-83.1
	Heavy duty	144.1	-180.0	0.0	-35.9
Non road mobile		**13.8**	**-67.9**	**-0.1**	**-54.1**
Other sectors		**15.1**	**-7.6**	**-1.7**	**5.8**
TOTAL		**218.7**	**-600.5**	**-13.3**	**-395.0**

Table 21.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Poland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-5.8**	**-4.6**	**-1.5**	**-11.9**
Domestic combustion		**14.3**	**-23.6**	**-64.2**	**-73.5**
Industry		**4.9**	**-1.7**	**-5.0**	**-1.8**
of which	Refineries	0.0	0.0	-0.1	-0.1
	Other industries	4.9	-1.7	-4.9	-1.7
Road transport		**14.0**	**-17.0**	**0.0**	**-3.0**
of which	Light duty	7.8	-9.6	0.0	-1.8
	Heavy duty	6.2	-7.4	0.0	-1.2
Non road mobile		**1.0**	**-6.9**	**0.0**	**-5.9**
Other sectors		**0.9**	**-0.2**	**-4.5**	**-3.8**
TOTAL		**29.2**	**-54.0**	**-75.2**	**-100.1**

Table 21.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Poland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-3.8**	**-10.0**	**-25.7**	**-39.5**
Poultry		**22.5**	**-17.0**	**-2.6**	**2.9**
Cattle		**11.2**	**-0.2**	**-19.8**	**-8.8**
of which	Dairy	6.8	-0.2	-19.5	-12.8
	Meat	4.4	0.0	-0.4	4.0
Other animals		**-0.9**	**0.0**	**0.0**	**-0.9**
Mineral fertilizers		**0.9**	**0.0**	**-25.2**	**-24.3**
Other non -agricultural sources		**0.3**	**-0.1**	**-1.3**	**-1.1**
TOTAL		**30.3**	**-27.3**	**-74.6**	**-71.6**

Table 21.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Poland (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-2.8**	**0.0**	**-0.1**	**-2.9**
Domestic combustion		**70.0**	**-53.5**	**-122.3**	**-105.8**
Industry (combustion and processes, excluding solvent use)		**9.2**	**-7.9**	**0.0**	**1.3**
Road transport		**-0.4**	**-127.0**	**0.0**	**-127.4**
of which	Light duty	-12.0	-110.0	0.0	-122.0
	Heavy duty	11.6	-17.0	0.0	-5.4
Non road mobile		**4.6**	**-29.2**	**0.0**	**-24.5**
Refineries (processes)		**5.7**	**-11.7**	**-1.2**	**-7.1**
Production, storage and distribution of oil products		**-6.4**	**-4.7**	**0.0**	**-11.0**
Solvent use		**19.4**	**-68.9**	**-0.2**	**-49.8**
Other sectors		**0.7**	**0.0**	**-8.3**	**-7.7**
of which	ban of agr. waste burning	0.7	0.0	-5.4	-4.7
TOTAL		**100.1**	**-302.9**	**-132.1**	**-334.9**

21.3 Differences to the 2013 Commission proposal

Table 21.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Poland (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1255.5	1207.3	-48.2	-4%	Improved representation of national inventory (lower emission factors in the domestic sector and for industrial processes)
Change 2005 to 2030 CLE	-802.3	-797.2	-5.1	-1%	Changed emission factors in domestic sector and industrial processes
2030 Current legislation (CLE)	453.3	410.1	-43.1	-10%	
Additional reduction potential to MTFR	-192.0	-160.8	-31.2	-16%	Changed emission factors in domestic sector and industrial processes
2030 Maximum technical feasible reductions (MTFR)	261.2	249.3	-11.9	-5%	
Additional reduction in the optimized scenario	-177.0	-136.3	-40.7	-23%	
2030 optimized scenario	276.3	273.8	-2.5	-1%	

Table 21.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Poland (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	796.8	773.5	-23.2	-3%	Lower emissions from power sector, higher from industrial combustion (adjusted controls)
Change 2005 to 2030 CLE	-417.8	-381.8	-36.0	-9%	Higher CLE EFs from power sector and industrial combustion; higher emissions from NRMM (less efficient Stage 4)
2030 Current legislation (CLE)	378.9	391.8	+12.8	+3%	
Additional reduction potential to MTFR	-98.9	-102.9	+4.0	+4%	Consequence of changes in CLE emissions
2030 Maximum technical feasible reductions (MTFR)	280.1	288.9	+8.9	+3%	
Additional reduction in the optimized scenario	-21.3	-13.3	-8.1	-38%	
2030 optimized scenario	357.6	378.5	+20.9	+6%	

Table 21.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Poland (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	224.7	219.4	-5.3	-2%	Lower emissions from agricultural waste burning based on national studies; lower emission factors for non-exhaust emissions in road transport
Change 2005 to 2030 CLE	-26.5	-24.8	-1.7	-6%	As for 2005
2030 Current legislation (CLE)	198.2	194.6	-3.6	-2%	
Additional reduction potential to MTFR	-100.2	-92.1	-8.2	-8%	Less potential in domestic sector due to different structure of combustion devices and updated applicabilities; lower effect of ban on agricultural waste burning (lower CLE emissions)
2030 Maximum technical feasible reductions (MTFR)	97.9	102.5	+4.6	+5%	
Additional reduction in the optimized scenario	-62.8	-75.2	+12.5	+20%	
2030 optimized scenario	135.4	119.4	-16.1	-12%	

Table 21.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Poland (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	343.6	328.5	-15.0	-4%	Updated statistical data for mineral fertilizer use and livestock; modified shares of solid/liquid manure systems for cattle and pigs
Change 2005 to 2030 CLE	-11.1	3.0	-14.1	-127%	Modified shares of solid/liquid manure systems for cattle and pigs
2030 Current legislation (CLE)	332.4	331.5	-0.9	-0%	
Additional reduction potential to MTFR	-104.0	-124.3	+20.3	+20%	Changes to solid/liquid system shares, update of farm size structure and consequent harmonization of application limits and emission factors
2030 Maximum technical feasible reductions (MTFR)	228.5	207.2	-21.3	-9%	
Additional reduction in the optimized scenario	-77.8	-74.6	-3.2	-4%	
2030 optimized scenario	254.6	256.9	+2.3	+1%	

Table 21.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Poland (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	614.7	605.3	-9.3	-2%	Updated activity data for open burning of agricultural waste and emissions factors for large scale combustion
Change 2005 to 2030 CLE	-211.4	-202.8	-8.6	-4%	Impact of changes described for 2005
2030 Current legislation (CLE)	403.2	402.5	-0.7	-0%	
Additional reduction potential to MTFR	-210.8	-201.4	-9.4	-4%	Impact of the changes in the base year and the evolution of the structure of the residential combustion sector
2030 Maximum technical feasible reductions (MTFR)	192.4	201.1	+8.7	+5%	
Additional reduction in the optimized scenario	-130.2	-132.1	+1.9	+1%	
2030 optimized scenario	273.0	270.4	-2.6	-1%	

Table 21.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Poland (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	724.4	700.2	-24.2	-3%
Change 2005 to 2030 CLE	-297.7	-289.2	-8.4	-3%
2030 Current legislation (CLE)	426.8	411.0	-15.8	-4%
Additional reduction potential to MTFR	-186.2	-172.8	-13.3	-7%
2030 Maximum technical feasible reductions (MTFR)	240.6	238.2	-2.4	-1%
Additional reduction in the optimized scenario	-133.2	-132.4	-0.8	-1%
2030 optimized scenario	293.6	278.6	-15.0	-5%

Table 21.13: Emission control costs for Poland (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	9992	9388	-605	-6%
Additional costs for MTFR	6849	4909	-1939	-28%
2030 MTFR	16841	14297	-2544	-15%
Additional costs in the optimized scenario (compared to CLE)	638	557	-82	-13%
Total costs in the optimized scenario in 2030	10631	9944	-686	-6%

22 Portugal

For Portugal, different assumptions on emission controls in the power sector in 2005 (less controls) lead to a higher uptake of these controls after 2005 and as a result to a 16% higher baseline reduction of SO_2 emissions in 2030. Updated statistics for livestock and mineral fertilizers result in an eight percentage points larger decline of NH_3 baseline emissions. This partially relieves the need for additional measures, also for the other pollutants. For NO_x the emission reduction requirement (ERR) overall decreases with 10 percentage points, also as a result from updates to the 2005 estimate and consequential less baseline emission reductions. Emission control costs (beyond CLE) decline by 40%.

22.1 Summary

Table 22.1: Summary table for Portugal. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	177	-75%	-63%	-56%	-77%	-84%	-73%	-83%	-90%	+16%	+6%	+6%
NO_x	256	-37%	-36%	-65%	-71%	-79%	-59%	-61%	-75%	-6%	-10%	-4%
PM2.5	69	-19%	-23%	-35%	-70%	-74%	-39%	-68%	-71%	+4%	-1%	-3%
NH_3	50	-9%	-7%	3%	-16%	-29%	-5%	-19%	-35%	+8%	+3%	+6%
VOC	207	-19%	-18%	-40%	-46%	-60%	-40%	-44%	-56%	0%	-2%	-3%
PMeq	150	-43%	-43%	-41%	-66%	-72%	-51%	-69%	-76%	+11%	+3%	+3%

22.2 Sectoral emission reductions

Table 22.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Portugal (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-97.8**	**-1.2**	**0.0**	**-99.1**
Domestic combustion		**-4.0**	**0.0**	**0.0**	**-4.0**
Industry		**-13.7**	**-10.8**	**-18.0**	**-42.5**
of which	Refineries	-7.8	-9.1	-13.3	-30.3
	Other industries	-5.9	-1.7	-4.6	-12.3
Road transport		**0.1**	**-0.6**	**0.0**	**-0.5**
of which	Light duty	0.1	-0.5	0.0	-0.4
	Heavy duty	0.0	-0.2	0.0	-0.1
Non-road mobile		**-0.1**	**-1.2**	**0.0**	**-1.3**
Other sectors		**-0.3**	**0.0**	**-0.3**	**-0.7**
TOTAL		**-115.9**	**-13.9**	**-18.3**	**-148.1**

Table 22.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Portugal (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-40.8**	**-5.0**	**0.0**	**-45.8**
Domestic combustion		**-6.5**	**0.0**	**0.0**	**-6.5**
Industry		**11.0**	**-10.8**	**-1.6**	**-1.3**
of which	Refineries	-1.1	-0.6	0.0	-1.6
	Other industries	12.1	-10.2	-1.6	0.3
Road transport		**1.3**	**-81.1**	**0.0**	**-79.8**
of which	Light duty	0.2	-42.4	0.0	-42.1
	Heavy duty	1.1	-38.7	0.0	-37.6
Non road mobile		**-2.6**	**-11.2**	**-0.1**	**-13.9**
Other sectors		**0.5**	**-0.9**	**-2.1**	**-2.6**
TOTAL		**-37.0**	**-109.0**	**-3.8**	**-149.8**

Table 22.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Portugal (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.7**	**-0.1**	**-0.4**	**-1.1**
Domestic combustion		**-14.4**	**-1.0**	**-2.0**	**-17.3**
Industry		**4.4**	**-6.0**	**-12.0**	**-13.6**
of which	Refineries	-0.1	0.0	0.0	-0.1
	Other industries	4.5	-6.0	-12.0	-13.5
Road transport		**0.8**	**-4.9**	**0.0**	**-4.1**
of which	Light duty	0.7	-3.7	0.0	-3.0
	Heavy duty	0.1	-1.2	0.0	-1.1
Non road mobile		**-0.2**	**-1.0**	**0.0**	**-1.2**
Other sectors		**0.3**	**-0.1**	**-3.1**	**-3.0**
TOTAL		**-9.8**	**-13.1**	**-17.5**	**-40.3**

Table 22.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Portugal (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-0.2**	**-0.3**	**-2.0**	**-2.5**
Poultry		**3.2**	**-2.2**	**-0.6**	**0.4**
Cattle		**1.1**	**-0.8**	**-3.4**	**-3.1**
of which	Dairy	0.3	-0.8	-2.5	-3.0
	Meat	0.8	0.0	-0.9	-0.1
Other animals		**-0.5**	**0.0**	**0.0**	**-0.5**
Mineral fertilizers		**-1.4**	**0.0**	**0.0**	**-1.4**
Other non -agricultural sources		**-1.0**	**-0.9**	**-1.1**	**-3.0**
TOTAL		**1.1**	**-4.1**	**-7.1**	**-10.1**

Table 22.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Portugal (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-1.1**	**0.0**	**0.0**	**-1.1**
Domestic combustion		**-20.6**	**-2.6**	**-5.9**	**-29.1**
Industry (combustion and processes, excluding solvent use)		**4.5**	**-3.5**	**-0.2**	**0.8**
Road transport		**-23.4**	**-13.8**	**0.0**	**-37.2**
of which	Light duty	-23.7	-11.1	0.0	-34.8
	Heavy duty	0.2	-2.6	0.0	-2.4
Non road mobile		**-1.1**	**-3.8**	**0.0**	**-5.0**
Refineries (processes)		**-2.6**	**-3.9**	**0.0**	**-6.5**
Production, storage and distribution of oil products		**-3.5**	**-1.4**	**0.0**	**-4.9**
Solvent use		**6.9**	**-19.5**	**0.0**	**-12.6**
Other sectors		**0.1**	**0.0**	**-3.7**	**-3.6**
of which	ban of agr. waste burning	0.1	0.0	-2.3	-2.2
TOTAL		**-40.9**	**-48.4**	**-9.8**	**-99.2**

22.3 Differences to the 2013 Commission proposal

Table 22.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Portugal (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	111.3	178.5	+67.2	+60%	New national 2005 inventory (2014 submission estimate 49% higher than in 2012) - major difference in power sector (less controls in 2005)
Change 2005 to 2030 CLE	-62.5	-129.7	+67.2	+107 %	Measures that were originally assumed for 2005 were implemented after 2005
2030 Current legislation (CLE)	48.8	48.8	+0.0	+0%	
Additional reduction potential to MTFR	-31.4	-31.3	-0.2	-1%	
2030 Maximum technical feasible reductions (MTFR)	17.3	17.5	+0.2	+1%	
Additional reduction in the optimized scenario	-23.1	-18.3	-4.8	-21%	
2030 optimized scenario	25.6	30.4	+4.8	+19%	

Table 22.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Portugal (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	268.0	245.6	-22.4	-8%	Improved representation of national inventory: lower emissions from power sector (lower EFs) and road transport (reallocation of diesel fuel between HDT and cars), higher emissions from mineral products industry (higher activities) and burning of agricultural waste (based on national sources)
Change 2005 to 2030 CLE	-175.5	-146.0	-29.5	-17%	Higher CLE emissions from mineral products industry, road sector, NRMM (higher EFs) and agricultural waste
2030 Current legislation (CLE)	92.5	99.6	+7.1	+8%	
Additional reduction potential to MTFR	-35.1	-37.2	+2.1	+6%	Higher potential to reduce emissions from mineral products industry and agricultural waste burning
2030 Maximum technical feasible reductions (MTFR)	57.3	62.3	+5.0	+9%	
Additional reduction in the optimized scenario	-16.1	-3.8	-12.3	-76%	
2030 optimized scenario	76.4	95.7	+19.4	+25%	

Table 22.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Portugal (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	62.7	59.2	-3.5	-6%	New national 2005 inventory (2014 submission estimate 14% lower than in 2012) – lower emissions from agricultural waste burning based on national studies; lower emissions from road transport (emission factors for non-exhaust emissions, reallocation of diesel fuel between HDT and cars), lower emissions from the power sector and small combustion (based on EFs provided by PT after bilaterals)
Change 2005 to 2030 CLE	-21.9	-22.9	+0.9	+4%	Lower CLE emissions from agricultural waste burning, road transport and domestic sector (different structure of combustion devices); higher emissions from industrial combustion
2030 Current legislation (CLE)	40.7	36.4	-4.4	-11%	
Additional reduction potential to MTFR	-24.5	-19.3	-5.2	-21%	Less potential in domestic sector due to different structure of combustion devices and applicabilities of measures; less effects of ban on agricultural waste burning
2030 Maximum technical feasible reductions (MTFR)	16.3	17.1	+0.8	+5%	
Additional reduction in the optimized scenario	-21.6	-17.5	-4.2	-19%	
2030 optimized scenario	19.1	18.9	-0.2	-1%	

Table 22.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Portugal (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	70.9	54.1	-16.8	-24%	Updated activity statistics for livestock and mineral fertilizers, including the shares of solid/liquid systems; revised livestock emission factors
Change 2005 to 2030 CLE	2.0	-3.0	+4.9	-250%	Impact of the changes for the base year, specifically shares of solid/liquid manure systems, emission factors and projections for fur animals
2030 Current legislation (CLE)	72.8	51.1	-21.7	-30%	
Additional reduction potential to MTFR	-22.5	-15.9	-6.6	-29%	Impact of changes in the solid/liquid systems structure for cattle
2030 Maximum technical feasible reductions (MTFR)	50.3	35.3	-15.1	-30%	
Additional reduction in the optimized scenario	-13.0	-7.1	-5.9	-45%	
2030 optimized scenario	59.8	44.0	-15.8	-26%	

Table 22.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Portugal (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	227.2	223.5	-3.7	-2%	Changes made in transport and residential sectors; see NO_x and PM2.5 comments.
Change 2005 to 2030 CLE	-90.2	-89.4	-0.9	-1%	As for 2005
2030 Current legislation (CLE)	137.0	134.1	-2.9	-2%	
Additional reduction potential to MTFR	-45.2	-36.6	-8.7	-19%	Consequence of the structural changes in residential combustion
2030 Maximum technical feasible reductions (MTFR)	91.7	97.5	+5.8	+6%	
Additional reduction in the optimized scenario	-14.4	-9.8	-4.6	-32%	
2030 optimized scenario	122.6	124.3	+1.7	+1%	

Table 22.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Portugal (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	129.6	141.4	+11.8	+9%
Change 2005 to 2030 CLE	-52.8	-72.7	+19.9	+38%
2030 Current legislation (CLE)	76.8	68.7	-8.1	-11%
Additional reduction potential to MTFR	-41.0	-34.5	-6.5	-16%
2030 Maximum technical feasible reductions (MTFR)	35.9	34.2	-1.7	-5%
Additional reduction in the optimized scenario	-32.3	-24.7	-7.6	-24%
2030 optimized scenario	44.6	44.0	-0.5	-1%

Table 22.13: Emission control costs for Portugal (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1495	1573	+78	+5%
Additional costs for MTFR	922	620	+302	-33%
2030 MTFR	2418	2193	-224	-9%
Additional costs in the optimized scenario (compared to CLE)	67	40	+27	-41%
Total costs in the optimized scenario in 2030	1562	1613	+50	+3%

23 Romania

The new statistical information on the structure of emission sources, especially for the use of solid fuels in the residential sector in Romania, leads to a 14 percentage points larger baseline decline of PM2.5 in 2030. Also, the baseline cut of VOC is higher than estimated before. As a consequence, the re-optimized scenario sees less need to reduce these emissions further, although the resulting emission reduction requirements (ERR) in relation to 2005 are still larger than in the initial COM scenario. Also, new data on the structure of agriculture in Romania suggests a larger potential for low-cost measures, which turns up in the cost-effective solution. Emission control costs (beyond CLE) decline by 11%.

23.1 Summary

Table 23.1: Summary table for Romania. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	643	-60%	-77%	-86%	-93%	-94%	-84%	-92%	-93%	-2%	-1%	0%
NO_x	309	-27%	-45%	-59%	-67%	-74%	-55%	-62%	-71%	-4%	-5%	-3%
PM2.5	106	7%	-28%	-25%	-65%	-80%	-39%	-69%	-76%	+14%	+5%	-4%
NH_3	199	-20%	-13%	-12%	-24%	-31%	-13%	-28%	-34%	0%	+4%	+3%
VOC	425	-16%	-40%	-48%	-64%	-79%	-54%	-67%	-80%	+6%	+4%	+1%
PMeq	360	-15%	-54%	-60%	-77%	-83%	-59%	-76%	-80%	-1%	-1%	-3%

23.2 Sectoral emission reductions

Table 23.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Romania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-233.6**	**-249.5**	**-0.4**	**-483.6**
Domestic combustion		**-5.0**	**-0.2**	**-0.5**	**-5.7**
Industry		**-30.7**	**-12.4**	**-46.0**	**-89.1**
of which	Refineries	-7.2	-7.8	-11.1	-26.1
	Other industries	-23.5	-4.5	-35.0	-63.0
Road transport		**0.9**	**-2.0**	**0.0**	**-1.2**
of which	Light duty	0.7	-1.2	0.0	-0.4
	Heavy duty	0.1	-0.9	0.0	-0.7
Non-road mobile		**0.7**	**-2.6**	**0.0**	**-1.9**
Other sectors		**-7.3**	**0.0**	**-2.4**	**-9.7**
TOTAL		**-274.9**	**-266.8**	**-49.4**	**-591.1**

Table 23.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Romania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-48.0**	**-27.7**	**-1.3**	**-77.0**
Domestic combustion		**-2.2**	**0.0**	**0.0**	**-2.2**
Industry		**-1.0**	**-5.2**	**-15.6**	**-21.8**
of which	Refineries	-2.4	-0.9	-1.4	-4.7
	Other industries	1.4	-4.3	-14.2	-17.1
Road transport		**22.3**	**-99.1**	**0.0**	**-76.8**
of which	Light duty	10.1	-37.8	0.0	-27.7
	Heavy duty	12.2	-61.3	0.0	-49.1
Non road mobile		**12.0**	**-17.4**	**-2.0**	**-7.3**
Other sectors		**-3.3**	**0.0**	**-2.4**	**-5.8**
TOTAL		**-20.3**	**-149.4**	**-21.2**	**-190.9**

Table 23.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Romania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-1.0**	**-0.1**	**-0.5**	**-1.6**
Domestic combustion		**-8.3**	**-36.7**	**-11.1**	**-56.2**
Industry		**1.4**	**-2.7**	**-10.7**	**-12.0**
of which	Refineries	-0.1	0.0	-0.1	-0.2
	Other industries	1.5	-2.7	-10.6	-11.8
Road transport		**4.3**	**-7.0**	**0.0**	**-2.7**
of which	Light duty	3.7	-4.1	0.0	-0.3
	Heavy duty	0.5	-2.9	0.0	-2.4
Non road mobile		**1.1**	**-2.0**	**-0.2**	**-1.1**
Other sectors		**-5.6**	**-0.1**	**-21.2**	**-26.9**
TOTAL		**-8.2**	**-48.6**	**-43.7**	**-100.5**

Table 23.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Romania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-17.8**	**-1.0**	**-3.0**	**-21.8**
Poultry		**-0.8**	**-7.9**	**-0.2**	**-8.9**
Cattle		**-10.9**	**0.0**	**-0.2**	**-11.1**
of which	Dairy	-8.5	0.0	-0.2	-8.7
	Meat	-2.4	0.0	0.0	-2.4
Other animals		**-0.1**	**0.0**	**-0.4**	**-0.5**
Mineral fertilizers		**21.3**	**0.0**	**-20.5**	**0.8**
Other non -agricultural sources		**-6.5**	**0.2**	**-4.2**	**-10.5**
TOTAL		**-14.8**	**-8.7**	**-28.5**	**-52.1**

Table 23.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Romania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-0.8**	**0.0**	**0.0**	**-0.9**
Domestic combustion		**-1.6**	**-61.6**	**-22.6**	**-85.8**
Industry (combustion and processes, excluding solvent use)		**0.0**	**-3.2**	**0.0**	**-3.3**
Road transport		**-22.3**	**-45.7**	**0.0**	**-68.1**
of which	Light duty	-23.8	-38.5	0.0	-62.3
	Heavy duty	1.4	-7.2	0.0	-5.7
Non road mobile		**2.4**	**-6.1**	**-0.1**	**-3.8**
Refineries (processes)		**-1.0**	**-6.6**	**0.0**	**-7.6**
Production, storage and distribution of oil products		**-11.7**	**-3.3**	**0.0**	**-15.0**
Solvent use		**12.1**	**-59.6**	**-0.1**	**-47.7**
Other sectors		**-5.6**	**0.0**	**-27.5**	**-33.1**
of which	ban of agr. waste burning	-5.6	0.0	-25.4	-31.0
TOTAL		**-28.5**	**-186.2**	**-50.3**	**-265.0**

23.3 Differences to the 2013 Commission proposal

Table 23.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Romania (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	705.7	641.9	-63.8	-9%	Improved representation of national inventory (lower emissions from the power and domestic sectors, higher from industrial combustion); changes occur through different implementation of control measures
Change 2005 to 2030 CLE	-606.6	-541.7	-64.8	-11%	Change is mainly caused by the change in 2005 GAINS estimate
2030 Current legislation (CLE)	99.1	100.1	+1.0	+1%	
Additional reduction potential to MTFR	-53.8	-56.4	+2.6	+5%	More potential in domestic sector. WPE 2014 assumes availability of low S heating oil
2030 Maximum technical feasible reductions (MTFR)	45.3	43.8	-1.5	-3%	
Additional reduction in the optimized scenario	-48.0	-49.4	+1.3	+3%	
2030 optimized scenario	51.1	50.8	-0.3	-1%	

Table 23.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Romania (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	310.5	309.0	-1.5	-0%	Improved representation of national inventory - lower emissions from power plants (lower EFs) , higher from industry and domestic sector (higher EFs)
Change 2005 to 2030 CLE	-183.3	-169.7	-13.6	-7%	Higher CLE emissions from industrial combustion, domestic sector and NRMM (higher emission factors)
2030 Current legislation (CLE)	127.3	139.3	+12.1	+9%	
Additional reduction potential to MTFR	-46.7	-49.9	+3.3	+7%	More potential from industry due to less stringent CLE measures), less potential from NRMM and shipping (reduction efficiencies for Stages 4 and 5)
2030 Maximum technical feasible reductions (MTFR)	80.6	89.4	+8.8	+11%	
Additional reduction in the optimized scenario	-25.1	-21.2	-3.9	-15%	
2030 optimized scenario	102.1	118.1	+16.0	+16%	

Table 23.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Romania (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	112.5	145.3	+32.8	+29%	Higher emissions from domestic sector due to different emission factors and a different structure of combustion devices
Change 2005 to 2030 CLE	-28.6	-56.8	+28.2	+99%	As for 2005
2030 Current legislation (CLE)	84.0	88.5	+4.6	+5%	
Additional reduction potential to MTFR	-61.4	-53.7	-7.7	-13%	Less potential in domestic sector due to different structure of combustion devices and applicabilities
2030 Maximum technical feasible reductions (MTFR)	22.5	34.8	+12.3	+55%	
Additional reduction in the optimized scenario	-44.0	-43.7	-0.3	-1%	
2030 optimized scenario	39.9	44.8	+4.9	+12%	

Table 23.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Romania (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	161.4	185.8	+24.4	+15%	Updated livestock emission factors, shares of solid/liquid systems, and share of urea in total mineral fertilizer use.
Change 2005 to 2030 CLE	-20.1	-23.6	+3.4	+17%	Impact of changes for the base year
2030 Current legislation (CLE)	141.3	162.3	+21.0	+15%	
Additional reduction potential to MTFR	-29.7	-40.2	+10.5	+35%	Impact of changes for the base year
2030 Maximum technical feasible reductions (MTFR)	111.6	122.1	+10.5	+9%	
Additional reduction in the optimized scenario	-18.3	-28.5	+10.2	+56%	
2030 optimized scenario	123.0	133.7	+10.8	+9%	

Table 23.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Romania (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	459.8	394.0	-65.8	-14%	Updated structure and emission factors for residential combustion and solvent use.
Change 2005 to 2030 CLE	-221.8	-214.7	-7.1	-3%	Impact of changes for the base year
2030 Current legislation (CLE)	238.0	179.3	-58.8	-25%	
Additional reduction potential to MTFR	-142.2	-99.7	-42.6	-30%	Impact of the changes for the base year, especially in the residential combustion sector
2030 Maximum technical feasible reductions (MTFR)	95.8	79.6	-16.2	-17%	
Additional reduction in the optimized scenario	-71.0	-50.3	-20.7	-29%	
2030 optimized scenario	167.0	128.9	-38.1	-23%	

Table 23.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Romania (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	379.1	396.9	+17.8	+5%
Change 2005 to 2030 CLE	-227.5	-236.1	+8.6	+4%
2030 Current legislation (CLE)	151.6	160.8	+9.2	+6%
Additional reduction potential to MTFR	-87.6	-82.6	-5.1	-6%
2030 Maximum technical feasible reductions (MTFR)	63.9	78.3	+14.3	+22%
Additional reduction in the optimized scenario	-64.2	-65.9	+1.6	+3%
2030 optimized scenario	87.3	95.0	+7.6	+9%

Table 23.13: Emission control costs for Romania (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	2605	2566	-40	-2%
Additional costs for MTFR	3010	2033	-977	-32%
2030 MTFR	5615	4599	-1016	-18%
Additional costs in the optimized scenario (compared to CLE)	180	160	-20	-11%
Total costs in the optimized scenario in 2030	2785	2726	-60	-2%

24 Slovakia

For Slovakia, the new statistical information on the structure of industrial and NH_3 emission sources suggests larger baseline emission reductions of SO_2 and NH_3 than estimated before. As a consequence, in the re-optimized scenario the need for additional measures for these pollutants declines, although the resulting emission reduction requirements (in relation to 2005 are nominally higher than in the initial COM scenario. For NOx and VOC, the new information implies lower baseline emission reductions; while there is a larger potential for low-cost measures for NOx that is taken up in the re-optimized scenario, additional reductions for VOC are lower than in the initial scenario. Emission control costs (beyond CLE) decline by 33%.

24.1 Summary

Table 24.1: Summary table for Slovakia. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	89	-34%	-57%	-50%	-79%	-80%	-73%	-82%	-85%	+23%	+3%	+5%
NO_x	102	-20%	-43%	-51%	-59%	-67%	-44%	-48%	-63%	-6%	-10%	-4%
PM2.5	37	-21%	-36%	-38%	-64%	-78%	-36%	-63%	-73%	-1%	0%	-5%
NH_3	29	-12%	-15%	-16%	-37%	-42%	-22%	-43%	-48%	+6%	+5%	+7%
VOC	73	-16%	-18%	-31%	-40%	-65%	-22%	-32%	-57%	-9%	-8%	-8%
PMeq	76	-34%	-56%	-42%	-67%	-75%	-49%	-67%	-74%	+7%	0%	0%

24.2 Sectoral emission reductions

Table 24.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Slovakia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-23.4**	**-21.6**	**0.0**	**-45.0**
Domestic combustion		**-4.5**	**-0.3**	**0.0**	**-4.8**
Industry		**-5.9**	**-9.8**	**-7.8**	**-23.5**
of which	Refineries	-3.7	-2.7	-1.6	-8.0
	Other industries	-2.2	-7.1	-6.2	-15.5
Road transport		**0.2**	**-0.4**	**0.0**	**-0.2**
of which	Light duty	0.1	-0.2	0.0	-0.1
	Heavy duty	0.1	-0.2	0.0	-0.1
Non-road mobile		**0.0**	**0.0**	**0.0**	**0.0**
Other sectors		**0.0**	**0.0**	**-0.1**	**-0.1**
TOTAL		**-33.7**	**-32.1**	**-7.9**	**-73.7**

Table 24.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Slovakia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-6.2**	**-2.4**	**-0.7**	**-9.3**
Domestic combustion		**-0.7**	**0.0**	**0.0**	**-0.7**
Industry		**2.9**	**-10.8**	**-2.7**	**-10.5**
of which	Refineries	-3.1	-0.7	-0.1	-4.0
	Other industries	6.0	-10.0	-2.5	-6.5
Road transport		**20.2**	**-43.0**	**0.0**	**-22.8**
of which	Light duty	5.6	-9.5	0.0	-3.9
	Heavy duty	14.6	-33.4	0.0	-18.9
Non road mobile		**0.1**	**-1.4**	**-0.1**	**-1.5**
Other sectors		**0.7**	**0.0**	**-0.2**	**0.6**
TOTAL		**17.0**	**-57.6**	**-3.6**	**-44.2**

Table 24.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Slovakia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-2.8**	**-5.4**	**-0.2**	**-8.4**
Domestic combustion		**-0.5**	**-2.9**	**-6.9**	**-10.2**
Industry		**0.6**	**-0.6**	**-1.3**	**-1.2**
of which	Refineries	0.0	0.0	0.0	-0.1
	Other industries	0.7	-0.6	-1.3	-1.2
Road transport		**1.6**	**-2.5**	**0.0**	**-1.0**
of which	Light duty	1.0	-1.2	0.0	-0.2
	Heavy duty	0.6	-1.4	0.0	-0.7
Non road mobile		**0.0**	**-0.2**	**0.0**	**-0.2**
Other sectors		**0.0**	**0.0**	**-0.9**	**-0.9**
TOTAL		**-1.1**	**-11.6**	**-9.3**	**-21.9**

Table 24.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Slovakia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-3.7**	**-0.2**	**-0.8**	**-4.7**
Poultry		**-0.3**	**-2.3**	**-0.1**	**-2.6**
Cattle		**-0.4**	**0.0**	**-2.4**	**-2.9**
of which	Dairy	0.4	0.0	-1.9	-1.5
	Meat	-0.8	0.0	-0.6	-1.4
Other animals		**-0.1**	**0.0**	**0.0**	**-0.1**
Mineral fertilizers		**1.1**	**0.0**	**-2.5**	**-1.4**
Other non -agricultural sources		**-0.1**	**-0.4**	**-0.2**	**-0.7**
TOTAL		**-3.5**	**-2.8**	**-6.1**	**-12.4**

Table 24.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Slovakia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.1**	**0.0**	**0.0**	**0.0**
Domestic combustion		**0.8**	**-2.6**	**-6.1**	**-7.9**
Industry (combustion and processes, excluding solvent use)		**0.3**	**-0.3**	**0.0**	**-0.1**
Road transport		**-0.1**	**-9.6**	**0.0**	**-9.8**
of which	Light duty	-1.4	-6.4	0.0	-7.8
	Heavy duty	1.3	-3.2	0.0	-2.0
Non road mobile		**0.1**	**-0.8**	**0.0**	**-0.7**
Refineries (processes)		**-1.0**	**-2.0**	**0.0**	**-3.0**
Production, storage and distribution of oil products		**0.0**	**-1.0**	**0.0**	**-1.0**
Solvent use		**8.4**	**-7.5**	**-0.1**	**0.8**
Other sectors		**0.0**	**0.0**	**-1.1**	**-1.1**
of which	ban of agr. waste burning	0.0	0.0	-0.6	-0.6
TOTAL		**8.4**	**-23.8**	**-7.3**	**-22.6**

24.3 Differences to the 2013 Commission proposal

Table 24.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovakia (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	91.5	89.9	-1.6	-2%	Improved representation of national inventory: higher emissions from the power sector and refineries, lower from industrial combustion, domestic sector, processes and road sources due to adjustment of EFs and the uptake of control measures
Change 2005 to 2030 CLE	-45.8	-65.8	+20.0	+44%	Lower CLE emissions due to the change in EFs for solid fuels use in iron and steel industry as well as cement and sulphuric acid production
2030 Current legislation (CLE)	45.7	24.1	-21.6	-47%	
Additional reduction potential to MTFR	-27.2	-10.4	-16.8	-62%	Less potential for further measures due to larger uptake in CLE
2030 Maximum technical feasible reductions (MTFR)	18.5	13.7	-4.8	-26%	
Additional reduction in the optimized scenario	-26.2	-7.9	-18.3	-70%	
2030 optimized scenario	19.5	16.2	-3.3	-17%	

Table 24.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovakia (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	94.7	91.3	-3.4	-4%	Improved representation of national inventory - lower EFs from power plants, higher from industry and domestic sector (higher EFs); lower emissions from road transport (reallocation of diesel fuel between HDT and cars)
Change 2005 to 2030 CLE	-48.1	-40.5	-7.6	-16%	Less reduction due to updated EFs and technology uptake in 2005
2030 Current legislation (CLE)	46.6	50.8	+4.2	+9%	
Additional reduction potential to MTFR	-15.5	-16.7	+1.2	+8%	Higher potential due to higher CLE EFs in domestic sector
2030 Maximum technical feasible reductions (MTFR)	31.1	34.1	+2.9	+9%	
Additional reduction in the optimized scenario	-7.4	-3.6	-3.7	-51%	
2030 optimized scenario	39.2	47.2	+7.9	+20%	

Table 24.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovakia (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	32.1	34.7	+2.6	+8%	Higher emissions from domestic sector due to updated emission factors and modified structure of combustion devices. Lower emissions from power plants, industry and road sector.
Change 2005 to 2030 CLE	-12.1	-12.6	+0.6	+5%	Higher emissions from domestic sector, lower from industry and road transport (updated non-exhaust EFs)
2030 Current legislation (CLE)	20.0	22.0	+2.0	+10%	
Additional reduction potential to MTFR	-12.8	-12.5	-0.4	-3%	Less potential in domestic sector due to different structure of combustion devices and updated applicabilities
2030 Maximum technical feasible reductions (MTFR)	7.2	9.5	+2.3	+33%	
Additional reduction in the optimized scenario	-8.3	-9.3	+1.0	+11%	
2030 optimized scenario	11.7	12.7	+1.0	+9%	

Table 24.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovakia (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	28.3	28.8	+0.5	+2%	Impact of changes for non-agricultural sources, mainly in transport
Change 2005 to 2030 CLE	-4.5	-6.3	+1.8	+40%	Updated data on farm size distribution with consequences on the CLE control strategy, primarily for poultry
2030 Current legislation (CLE)	23.8	22.5	-1.3	-5%	
Additional reduction potential to MTFR	-7.3	-7.6	+0.3	+4%	See CLE
2030 Maximum technical feasible reductions (MTFR)	16.6	15.0	-1.6	-10%	
Additional reduction in the optimized scenario	-6.1	-6.1	0.0	0%	
2030 optimized scenario	17.7	16.5	-1.3	-7%	

Table 24.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovakia (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	77.1	70.9	-6.1	-8%	Updated structure and emission factors for the residential combustion sector, updated transport emissions, lower emission factors for power plants
Change 2005 to 2030 CLE	-23.8	-15.4	-8.4	-35%	Impact of the changes in the base year and updated control strategy for industrial coating
2030 Current legislation (CLE)	53.3	55.6	+2.3	+4%	
Additional reduction potential to MTFR	-26.0	-25.0	-1.0	-4%	Consequence of the changed structure of the residential combustion sector and industrial coating
2030 Maximum technical feasible reductions (MTFR)	27.3	30.6	+3.3	+12%	
Additional reduction in the optimized scenario	-7.1	-7.3	+0.2	+3%	
2030 optimized scenario	46.2	48.3	+2.1	+4%	

Table 24.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovakia (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	71.9	73.8	+1.9	+3%
Change 2005 to 2030 CLE	-30.0	-36.3	+6.3	+21%
2030 Current legislation (CLE)	41.9	37.5	-4.4	-11%
Additional reduction potential to MTFR	-23.6	-18.4	-5.2	-22%
2030 Maximum technical feasible reductions (MTFR)	18.2	19.1	+0.8	+5%
Additional reduction in the optimized scenario	-17.9	-13.1	-4.8	-27%
2030 optimized scenario	24.0	24.3	+0.4	+1%

Table 24.13: Emission control costs for Slovakia (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	826	813	-13	-2%
Additional costs for MTFR	852	674	-177	-21%
2030 MTFR	1678	1487	-191	-11%
Additional costs in the optimized scenario (compared to CLE)	78	52	-27	-34%
Total costs in the optimized scenario in 2030	904	864	-40	-4%

25 Slovenia

For Slovenia, most significant changes are related to the new information on the structure of solid fuel combustion sources and applied emissions factors in the residential sector. As a consequence, by 2030 in the baseline case PM2.5 emissions would decline 17 percentage points less than estimated before, while a larger potential for low cost measures exists that is taken up in the re-optimized scenario. The seven percentage points larger decline in PM2.5 emissions suggests then relaxations of the NOx reductions and of VOC. Emission control costs (beyond CLE) decline by six percent.

25.1 Summary

Table 25.1: Summary table for Slovenia. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	41	-75%	-63%	-85%	-89%	-89%	-86%	-88%	-90%	+1%	-1%	+1%
NO_x	48	-6%	-41%	-69%	-71%	-75%	-64%	-65%	-70%	-4%	-6%	-6%
PM2.5	16	+9%	-25%	-40%	-70%	-76%	-23%	-76%	-77%	-17%	+7%	+1%
NH_3	19	-8%	-1%	-12%	-24%	-28%	-10%	-26%	-32%	-3%	+2%	+5%
VOC	48	-17%	-32%	-33%	-63%	-75%	-31%	-59%	-68%	-2%	-4%	-7%
PMeq	35	-15%	-44%	-58%	-72%	-75%	-48%	-74%	-76%	11%	+2%	+1%

25.2 Sectoral emission reductions

Table 25.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Slovenia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-27.6**	**-1.5**	**0.0**	**-29.1**
Domestic combustion		**-0.5**	**-0.4**	**0.0**	**-0.9**
Industry		**-1.0**	**-1.4**	**-0.7**	**-3.0**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-1.0	-1.4	-0.7	-3.0
Road transport		**-0.1**	**-0.4**	**0.0**	**-0.4**
of which	Light duty	-0.1	-0.3	0.0	-0.4
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**0.0**	**-0.1**	**0.0**	**-0.1**
Other sectors		**-1.0**	**0.0**	**0.0**	**-1.1**
TOTAL		**-30.1**	**-3.8**	**-0.7**	**-34.6**

Table 25.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Slovenia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-10.6**	**-0.6**	**-0.1**	**-11.3**
Domestic combustion		**-0.2**	**0.0**	**0.0**	**-0.2**
Industry		**-0.6**	**-1.1**	**-0.4**	**-2.1**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-0.6	-1.1	-0.4	-2.1
Road transport		**12.4**	**-27.7**	**0.0**	**-15.3**
of which	Light duty	5.2	-10.2	0.0	-5.0
	Heavy duty	7.2	-17.5	0.0	-10.4
Non road mobile		**-0.2**	**-3.4**	**0.0**	**-3.5**
Other sectors		**-0.1**	**0.0**	**-0.1**	**-0.1**
TOTAL		**0.8**	**-32.8**	**-0.6**	**-32.6**

Table 25.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Slovenia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-0.6**	**0.0**	**-0.1**	**-0.7**
Domestic combustion		**0.3**	**-0.3**	**-7.3**	**-7.3**
Industry		**-0.7**	**-0.7**	**-0.1**	**-1.5**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	-0.7	-0.7	-0.1	-1.5
Road transport		**1.3**	**-1.9**	**0.0**	**-0.6**
of which	Light duty	1.0	-1.3	0.0	-0.3
	Heavy duty	0.3	-0.6	0.0	-0.3
Non road mobile		**0.0**	**-0.3**	**0.0**	**-0.4**
Other sectors		**-0.3**	**0.0**	**-0.3**	**-0.6**
TOTAL		**-0.2**	**-3.2**	**-7.8**	**-11.2**

Table 25.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Slovania (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-0.8**	**-0.1**	**-0.9**	**-1.7**
Poultry		**0.4**	**0.0**	**-0.7**	**-0.2**
Cattle		**0.2**	**-0.6**	**-1.3**	**-1.7**
of which	Dairy	-0.3	0.0	-1.1	-1.4
	Meat	0.5	-0.6	-0.2	-0.3
Other animals		**0.1**	**0.0**	**0.0**	**0.1**
Mineral fertilizers		**-0.4**	**0.0**	**-0.3**	**-0.7**
Other non -agricultural sources		**-0.4**	**-0.2**	**-0.1**	**-0.7**
TOTAL		**-0.8**	**-1.0**	**-3.2**	**-5.0**

Table 25.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Slovenia (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.0**	**0.0**	**0.0**	**0.0**
Domestic combustion		**0.1**	**-0.4**	**-11.8**	**-12.1**
Industry (combustion and processes, excluding solvent use)		**-0.2**	**-1.5**	**0.0**	**-1.8**
Road transport		**-2.3**	**-5.3**	**0.0**	**-7.6**
of which	Light duty	-2.7	-4.0	0.0	-6.7
	Heavy duty	0.4	-1.3	0.0	-0.8
Non road mobile		**-0.5**	**-0.9**	**0.0**	**-1.4**
Refineries (processes)		**0.0**	**0.0**	**0.0**	**0.0**
Production, storage and distribution of oil products		**-0.9**	**-0.5**	**0.0**	**-1.4**
Solvent use		**1.4**	**-2.3**	**-0.4**	**-1.3**
Other sectors		**-0.5**	**0.0**	**-0.4**	**-0.8**
of which	ban of agr. waste burning	-0.5	0.0	-0.2	-0.6
TOTAL		**-2.9**	**-10.9**	**-12.6**	**-26.3**

25.3 Differences to the 2013 Commission proposal

Table 25.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovenia (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	39.6	39.4	-0.2	-1%	Updated estimates for power sector and small combustion
Change 2005 to 2030 CLE	-33.9	-33.9	+0.1	+0%	As for 2005
2030 Current legislation (CLE)	5.8	5.5	-0.3	-5%	
Additional reduction potential to MTFR	-1.4	-1.6	+0.2	+17%	S-free light heating oil assumed available for the domestic sector
2030 Maximum technical feasible reductions (MTFR)	4.4	3.8	-0.6	-13%	
Additional reduction in the optimized scenario	-1.3	-0.7	-0.6	-44%	
2030 optimized scenario	4.5	4.8	+0.2	+5%	

Table 25.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovenia (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	49.8	49.7	-0.1	-0%	Higher emissions in the domestic sector (wood EF adjusted), lower from NRMM (different fleet structure)
Change 2005 to 2030 CLE	-34.3	-32.0	-2.3	-7%	Less reduction due to higher emissions from the domestic sector, road transport (car fleet) and NRMM (slower turnover of tractors, higher EFs)
2030 Current legislation (CLE)	15.6	17.8	+2.2	+14%	
Additional reduction potential to MTFR	-3.2	-2.7	-0.5	-16%	Less potential for NRMM due to less stringent Stage 4 and 5)
2030 Maximum technical feasible reductions (MTFR)	12.3	15.0	+2.7	+22%	
Additional reduction in the optimized scenario	-1.3	-0.6	-0.7	-55%	
2030 optimized scenario	14.3	17.2	+2.9	+20%	

Table 25.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovenia (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	9.3	14.7	+5.4	+58%	Higher emissions from domestic sector (updated EFs and structure of combustion devices); lower emissions from power plants, higher from road sector
Change 2005 to 2030 CLE	-3.7	-3.4	-0.3	-9%	Higher CLE emissions from domestic sector (structure of combustion devices, EFs and stock turnover); emissions from road transport lower (lower non-exhaust EFs)
2030 Current legislation (CLE)	5.6	11.3	+5.7	+102%	
Additional reduction potential to MTFR	-3.4	-8.0	+4.6	+134%	Higher potential in domestic sector (reasons as for CLE)
2030 Maximum technical feasible reductions (MTFR)	2.2	3.3	+1.1	+52%	
Additional reduction in the optimized scenario	-2.8	-7.8	+5.0	+182%	
2030 optimized scenario	2.8	3.5	+0.7	+24%	

Table 25.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovenia (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	19.0	18.8	-0.2	-1%	Updated livestock statistics and shares of solid/liquid manure systems
Change 2005 to 2030 CLE	-2.3	-1.8	-0.5	-23%	Consequence of the updated share of solid/liquid manure systems
2030 Current legislation (CLE)	16.7	17.0	+0.3	+2%	
Additional reduction potential to MTFR	-2.9	-4.3	+1.3	+46%	As for CLE and updated application limits for low nitrogen feed and improved urea application
2030 Maximum technical feasible reductions (MTFR)	13.8	12.7	-1.0	-8%	
Additional reduction in the optimized scenario	-2.3	-3.2	+0.8	+36%	
2030 optimized scenario	14.3	13.8	-0.5	-4%	

Table 25.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovenia (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	41.2	44.7	+3.5	+9%	New national 2005 inventory (2014 submission estimate 18% higher than in 2012). Emissions from coal mining added; harmonization of emission factors for large scale combustion and domestic solvent use
Change 2005 to 2030 CLE	-13.4	-13.8	+0.4	+3%	Updated structure of residential combustion sector
2030 Current legislation (CLE)	27.8	30.9	+3.2	+11%	
Additional reduction potential to MTFR	-17.6	-16.6	-1.0	-6%	Updated structure of residential combustion sector
2030 Maximum technical feasible reductions (MTFR)	10.2	14.3	+4.2	+41%	
Additional reduction in the optimized scenario	-12.7	-12.6	-0.1	-1%	
2030 optimized scenario	15.1	18.4	+3.3	+22%	

Table 25.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Slovenia (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	28.5	33.8	+5.3	+19%
Change 2005 to 2030 CLE	-16.7	-16.1	-0.6	-3%
2030 Current legislation (CLE)	11.8	17.7	+5.9	+49%
Additional reduction potential to MTFR	-4.8	-9.6	+4.9	+102%
2030 Maximum technical feasible reductions (MTFR)	7.1	8.1	+1.0	+14%
Additional reduction in the optimized scenario	-3.8	-8.8	+5.0	+132%
2030 optimized scenario	8.1	8.9	+0.9	+11%

Table 25.13: Emission control costs for Slovenia (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	467	451	+15	-3%
Additional costs for MTFR	147	130	-17	-12%
2030 MTFR	614	581	+32	-5%
Additional costs in the optimized scenario (compared to CLE)	34	32	-2	-7%
Total costs in the optimized scenario in 2030	501	484	+17	-3%

26 Spain

As a consequence of the new data on the structure of emission sources on 2005 and the penetration of baseline emission controls, baseline declines of NOx and VOC emissions in 2030 are seven percentage points lower than estimated before. Generally lower marginal emission control costs in the re-optimized scenario relax the need for additional measures, so that the resulting emission reduction requirements for NOx, VOC and NH_3 are eight to nine percentage points lower than in the initial COM scenario. Emission control costs (beyond CLE) decline by 45%.

26.1 Summary

Table 26.1: Summary table for Spain. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	1252	-69%	-67%	-83%	-89%	-90%	-83%	-87%	-90%	0%	-1%	0%
NO_x	1311	-36%	-42%	-71%	-75%	-80%	-65%	-66%	-74%	-7%	-9%	-6%
PM2.5	90	-22%	-15%	-20%	-61%	-68%	-19%	-62%	-68%	-1%	+1%	0%
NH_3	376	0%	-2%	-5%	-29%	-43%	-6%	-21%	-42%	+1%	-8%	-1%
VOC	802	-28%	-22%	-36%	-48%	-62%	-29%	-39%	-54%	-7%	-9%	-8%
PMeq	632	-43%	-35%	-60%	-75%	-79%	-58%	-72%	-78%	-2%	-3%	-2%

26.2 Sectoral emission reductions

Table 26.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Spain (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-716.2**	**-129.9**	**-3.0**	**-849.2**
Domestic combustion		**-17.1**	**-3.8**	**-1.8**	**-22.6**
Industry		**-36.6**	**-83.0**	**-46.0**	**-165.6**
of which	Refineries	-46.7	-34.0	-12.8	-93.5
	Other industries	10.1	-49.0	-33.2	-72.1
Road transport		**0.3**	**-2.4**	**0.0**	**-2.1**
of which	Light duty	0.3	-1.5	0.0	-1.2
	Heavy duty	0.1	-0.9	0.0	-0.8
Non-road mobile		**-11.4**	**-20.6**	**0.0**	**-32.0**
Other sectors		**2.1**	**-10.9**	**-8.5**	**-17.4**
TOTAL		**-778.9**	**-250.7**	**-59.3**	**-1088.9**

Table 26.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Spain (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-116.4**	**-94.8**	**-0.7**	**-211.9**
Domestic combustion		**-6.4**	**0.0**	**0.0**	**-6.4**
Industry		**-17.3**	**-63.8**	**-2.9**	**-84.0**
of which	Refineries	-2.8	-8.0	0.0	-10.8
	Other industries	-14.5	-55.8	-2.9	-73.2
Road transport		**37.0**	**-465.7**	**0.0**	**-428.8**
of which	Light duty	21.0	-169.0	0.0	-148.0
	Heavy duty	16.0	-296.7	0.0	-280.7
Non road mobile		**-79.3**	**-84.3**	**0.0**	**-163.7**
Other sectors		**7.8**	**0.0**	**-11.1**	**-3.3**
TOTAL		**-174.6**	**-708.8**	**-14.7**	**-898.1**

Table 26.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Spain (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-5.6**	**-3.8**	**-0.4**	**-9.8**
Domestic combustion		**-2.2**	**-7.5**	**-5.7**	**-15.4**
Industry		**1.3**	**-0.3**	**-5.3**	**-4.3**
of which	Refineries	-0.3	0.0	-0.2	-0.6
	Other industries	1.7	-0.3	-5.1	-3.7
Road transport		**5.6**	**-25.3**	**0.0**	**-19.7**
of which	Light duty	4.8	-17.4	0.0	-12.6
	Heavy duty	0.8	-7.9	0.0	-7.1
Non road mobile		**-5.9**	**-8.4**	**0.0**	**-14.3**
Other sectors		**25.4**	**-0.2**	**-51.6**	**-26.5**
TOTAL		**18.6**	**-45.6**	**-63.1**	**-90.0**

Table 26.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for Spain (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**19.8**	**-20.6**	**-32.5**	**-33.3**
Poultry		**0.9**	**-6.1**	**-8.7**	**-13.8**
Cattle		**-4.4**	**-6.8**	**-3.8**	**-15.0**
of which	Dairy	-0.7	-4.6	-3.8	-9.0
	Meat	-3.7	-2.3	0.0	-6.0
Other animals		**-1.1**	**0.0**	**-0.7**	**-1.7**
Mineral fertilizers		**-5.6**	**-8.3**	**0.0**	**-13.9**
Other non -agricultural sources		**8.6**	**0.7**	**-10.5**	**-1.2**
TOTAL		**18.3**	**-41.2**	**-56.1**	**-79.0**

Table 26.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Spain (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-1.7**	**-2.5**	**-0.3**	**-4.5**
Domestic combustion		**-2.6**	**-21.9**	**-12.6**	**-37.1**
Industry (combustion and processes, excluding solvent use)		**10.7**	**-5.9**	**0.0**	**4.8**
Road transport		**-38.7**	**-61.9**	**0.0**	**-100.6**
of which	Light duty	-39.7	-46.7	0.0	-86.4
	Heavy duty	1.0	-15.2	0.0	-14.2
Non road mobile		**-8.4**	**-21.5**	**0.0**	**-29.9**
Refineries (processes)		**-1.6**	**-6.8**	**0.0**	**-8.4**
Production, storage and distribution of oil products		**-11.5**	**-3.3**	**0.0**	**-14.8**
Solvent use		**82.1**	**-193.0**	**-1.3**	**-112.2**
Other sectors		**34.3**	**-1.8**	**-68.7**	**-36.2**
of which	ban of agr. waste burning	31.8	0.0	-67.7	-35.9
TOTAL		**62.5**	**-318.5**	**-82.9**	**-338.8**

26.3 Differences to the 2013 Commission proposal

Table 26.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Spain (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1327.9	1245.3	-82.6	-6%	Improved representation of national inventory: use of recent estimate of emissions within the EMEP region, correction of EFs and controls in power sector and mineral products industry
Change 2005 to 2030 CLE	-1096.0	-1029.6	-66.4	-6%	Correction of controls in the power sector and mineral products industry
2030 Current legislation (CLE)	231.9	215.7	-16.2	-7%	
Additional reduction potential to MTFR	-101.7	-89.4	-12.3	-12%	Less potential due to lower CLE emissions
2030 Maximum technical feasible reductions (MTFR)	130.2	126.3	-3.9	-3%	
Additional reduction in the optimized scenario	-80.3	-59.3	-21.0	-26%	
2030 optimized scenario	151.6	156.4	+4.8	+3%	

Table 26.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Spain (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1513.4	1365.8	-147.6	-10%	Improved representation of national inventory within the EMEP domain: lower emissions from power sector, industry (lower EFs), road sources (less old gasoline cars) and NRMM (adjusted age structure and EFs); higher activity data and emissions from national shipping as in recent national assessment
Change 2005 to 2030 CLE	-1079.7	-883.4	-196.3	-18%	Higher emissions from shipping (activity update) and NRMM (less stringent Stage 4); other differences caused by the update of 2005 emissions
2030 Current legislation (CLE)	433.7	482.5	+48.8	+11%	
Additional reduction potential to MTFR	-134.0	-133.1	-0.9	-1%	Less potential from NRMM (less stringent Stage 5); potential for other sectors from adjusted CLE is approximately the same
2030 Maximum technical feasible reductions (MTFR)	299.7	349.4	+49.7	+17%	
Additional reduction in the optimized scenario	-53.9	-14.7	-39.2	-73%	
2030 optimized scenario	379.8	467.7	+88.0	+23%	

Table 26.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Spain (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	156.1	144.4	-11.8	-8%	Improved representation of national inventory within the EMEP domain: more stringent controls in power plants and industry; lower emissions from road transport and NRMM, higher emissions from shipping due to higher activity
Change 2005 to 2030 CLE	-31.4	-27.0	-4.5	-14%	Lower CLE emissions from industry, road transport (non-exhaust EFs) and agricultural livestock; higher emissions from shipping
2030 Current legislation (CLE)	124.7	117.4	-7.3	-6%	
Additional reduction potential to MTFR	-74.9	-70.8	-4.1	-5%	Less potential in domestic sector due to different structure of combustion devices
2030 Maximum technical feasible reductions (MTFR)	49.8	46.6	-3.2	-6%	
Additional reduction in the optimized scenario	-63.9	-63.1	-0.9	-1%	
2030 optimized scenario	60.8	54.3	-6.4	-11%	

Table 26.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Spain (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	365.9	377.0	+11.1	+3%	Updated statistical data on mineral fertilizer use and emission factors for livestock and fertilizers.
Change 2005 to 2030 CLE	-16.8	-22.8	+6.1	+36%	Impact of the updated share of urea and emission factors
2030 Current legislation (CLE)	349.2	354.2	+5.0	+1%	
Additional reduction potential to MTFR	-139.7	-135.4	-4.3	-3%	Impact of the updated share of urea and emission factors
2030 Maximum technical feasible reductions (MTFR)	209.5	218.8	+9.3	+4%	
Additional reduction in the optimized scenario	-90.8	-56.1	-34.7	-38%	
2030 optimized scenario	258.4	298.1	+39.7	+15%	

Table 26.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Spain (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	934.0	870.7	-63.3	-7%	Updated structures for the transport and residential combustion sector (see NOx and PM2.5)
Change 2005 to 2030 CLE	-338.5	-256.0	-82.5	-24%	Impact of the structural changes introduced from the base year
2030 Current legislation (CLE)	595.5	614.7	+19.2	+3%	
Additional reduction potential to MTFR	-237.2	-209.9	-27.3	-12%	Impact of the structural changes introduced for residential sector
2030 Maximum technical feasible reductions (MTFR)	358.3	404.8	+46.5	+13%	
Additional reduction in the optimized scenario	-111.8	-82.9	-28.9	-26%	
2030 optimized scenario	483.7	531.8	+48.1	+10%	

Table 26.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Spain (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	732.7	688.0	-44.7	-6%
Change 2005 to 2030 CLE	-436.7	-399.7	-37.0	-8%
2030 Current legislation (CLE)	296.0	288.3	-7.7	-3%
Additional reduction potential to MTFR	-143.4	-134.5	-8.9	-6%
2030 Maximum technical feasible reductions (MTFR)	152.6	153.8	+1.2	+1%
Additional reduction in the optimized scenario	-110.1	-93.4	-16.8	-15%
2030 optimized scenario	185.9	194.9	+9.0	+5%

Table 26.13: Emission control costs for Spain (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	8624	8683	59	1%
Additional costs for MTFR	5130	4483	-647	-13%
2030 MTFR	13754	13166	-588	-4%
Additional costs in the optimized scenario (compared to CLE)	231	128	-102	-44%
Total costs in the optimized scenario in 2030	8855	8812	-43	0%

27 Sweden

In line with the general decrease in the marginal costs of the measures in the re-optimized scenario (due to slightly larger reductions from current legislation and a larger potential for low-cost measures in some Member States), for Sweden the overall emission reduction requirement (ERR) in terms of PMeq is three percentage points lower than in the initial COM scenario. New statistical data on the structure of emission sources lead to slightly larger baseline reductions of NOx and VOC, and less decline for SO_2 and PM2.5 (although differences are small). As only little additional efforts are required for Sweden in the re-optimized scenario, for all pollutants except for PM2.5, these baseline changes propagate directly into modified emission reduction requirements (relative to 2005). Due to lower marginal costs, the emission reduction requirement for PM2.5 is relaxed and declines by six percentage points compared to the initial COM scenario. Emission control costs (beyond CLE) decline by 75%.

27.1 Summary

Table 27.1: Summary table for Sweden. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	36	-23%	-22%	-16%	-16%	-19%	-14%	-14%	-18%	-2%	-2%	-1%
NO_x	175	-25%	-36%	-65%	-65%	-70%	-66%	-66%	-70%	+1%	+1%	0%
PM2.5	30	-10%	-19%	-19%	-23%	-56%	-16%	-17%	-48%	-3%	-6%	-7%
NH_3	56	-8%	-15%	-9%	-17%	-27%	-10%	-17%	-33%	0%	0%	+7%
VOC	198	-6%	-25%	-37%	-38%	-53%	-39%	-39%	-54%	+2%	+2%	0%
PMeq	65	-19%	-29%	-27%	-30%	-48%	-25%	-27%	-45%	-2%	-3%	-3%

27.2 Sectoral emission reductions

Table 27.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for Sweden (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-1.5**	**0.0**	**0.0**	**-1.5**
Domestic combustion		**-0.8**	**0.0**	**0.0**	**-0.8**
Industry		**0.7**	**-0.5**	**0.0**	**0.3**
of which	Refineries	-0.3	0.0	0.0	-0.3
	Other industries	1.0	-0.5	0.0	0.6
Road transport		**0.0**	**0.0**	**0.0**	**0.0**
of which	Light duty	0.0	0.0	0.0	0.0
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**-0.4**	**-1.7**	**0.0**	**-2.1**
Other sectors		**-1.0**	**0.0**	**0.0**	**-1.0**
TOTAL		**-2.9**	**-2.2**	**0.0**	**-5.1**

Table 27.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for Sweden (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**1.6**	**0.0**	**0.0**	**1.6**
Domestic combustion		**-1.5**	**-0.2**	**0.0**	**-1.7**
Industry		**3.8**	**-10.8**	**0.0**	**-7.0**
of which	Refineries	0.0	-0.2	0.0	-0.2
	Other industries	3.7	-10.6	0.0	-6.8
Road transport		**-8.4**	**-89.2**	**0.0**	**-97.6**
of which	Light duty	-1.9	-30.4	0.0	-32.3
	Heavy duty	-6.5	-58.8	0.0	-65.3
Non road mobile		**-19.3**	**-8.8**	**0.0**	**-28.1**
Other sectors		**0.6**	**0.0**	**0.0**	**0.6**
TOTAL		**-23.3**	**-109.0**	**0.0**	**-132.3**

Table 27.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for Sweden (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**1.6**	**-0.3**	**0.0**	**1.2**
Domestic combustion		**-1.1**	**-0.8**	**0.0**	**-1.9**
Industry		**1.2**	**-1.8**	**-0.2**	**-0.8**
of which	Refineries	0.0	0.0	0.0	0.0
	Other industries	1.2	-1.8	-0.2	-0.8
Road transport		**3.5**	**-5.1**	**0.0**	**-1.6**
of which	Light duty	3.6	-3.5	0.0	0.1
	Heavy duty	-0.1	-1.5	0.0	-1.7
Non road mobile		**-1.6**	**-1.1**	**0.0**	**-2.7**
Other sectors		**0.3**	**-0.1**	**-0.1**	**0.2**
TOTAL		**4.0**	**-9.2**	**-0.3**	**-5.5**

Table 27.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for

Sweden (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-1.8**	**-0.1**	**-0.8**	**-2.7**
Poultry		**0.5**	**-0.8**	**-0.3**	**-0.5**
Cattle		**1.0**	**-0.6**	**-3.2**	**-2.8**
of which	Dairy	2.3	-0.5	-2.7	-0.9
	Meat	-1.4	-0.2	-0.4	-2.0
Other animals		**0.0**	**0.0**	**0.0**	**0.0**
Mineral fertilizers		**0.1**	**0.0**	**0.0**	**0.1**
Other non -agricultural sources		**-2.1**	**-1.3**	**0.0**	**-3.4**
TOTAL		**-2.3**	**-2.8**	**-4.2**	**-9.4**

Table 27.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for Spain (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**0.8**	**0.0**	**0.0**	**0.8**
Domestic combustion		**-3.0**	**-2.8**	**0.0**	**-5.9**
Industry (combustion and processes, excluding solvent use)		**4.6**	**-1.0**	**0.0**	**3.6**
Road transport		**-26.2**	**-19.5**	**0.0**	**-45.7**
of which	Light duty	-25.9	-16.4	0.0	-42.3
	Heavy duty	-0.3	-3.0	0.0	-3.3
Non road mobile		**-6.3**	**-17.1**	**0.0**	**-23.4**
Refineries (processes)		**-1.1**	**-1.1**	**0.0**	**-2.2**
Production, storage and distribution of oil products		**-2.0**	**0.0**	**0.0**	**-2.0**
Solvent use		**4.1**	**-9.7**	**-0.2**	**-5.8**
Other sectors		**0.0**	**0.0**	**-0.1**	**-0.1**
of which	ban of agr. waste burning	0.0	0.0	-0.1	-0.1
TOTAL		**-29.1**	**-51.3**	**-0.2**	**-80.6**

27.3 Differences to the 2013 Commission proposal

Table 27.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Sweden (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	38.0	36.4	-1.6	-4%	Change of EFs for coal and oil use in iron and steel industry
Change 2005 to 2030 CLE	-5.9	-5.1	-0.8	-14%	Change of EFs for coal and oil use in iron and steel industry
2030 Current legislation (CLE)	32.0	31.3	-0.8	-2%	
Additional reduction potential to MTFR	-1.2	-1.4	+0.1	+11%	S-free light heating oil assumed available for the domestic sector
2030 Maximum technical feasible reductions (MTFR)	30.8	29.9	-0.9	-3%	

Additional reduction in the optimized scenario	0.0	0.0	-0.0	0%	
2030 optimized scenario	32.0	31.3	-0.8	-2%	

Table 27.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Sweden (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	215.7	200.2	-15.5	-7%	Improved representation of national emission estimates as provided by national experts. Lower emissions from power sector, road sources, shipping and NRMM (adjusted emission factors based on national data); still quite high difference for road transport due to lower activity levels used in the inventory compared with EUROSTAT and PRIMES
Change 2005 to 2030 CLE	-140.2	-132.3	-7.9	-6%	Lower CLE emissions from power sector and shipping (more controls), higher from industry and NRMM (higher EF for Stage 4)
2030 Current legislation (CLE)	75.5	67.9	-7.6	-10%	
Additional reduction potential to MTFR	-11.5	-7.6	-3.9	-34%	Lower potential due to higher uptake of control measures in CLE for power plants
2030 Maximum technical feasible reductions (MTFR)	64.0	60.3	-3.7	-6%	
Additional reduction in the optimized scenario	0.0	0.0	+0.0	+0%	
2030 optimized scenario	75.5	67.9	-7.6	-10%	

Table 27.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Sweden (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	31.2	32.0	+0.7	+2%	Higher non-exhaust emissions from road sources (higher emission factors for road abrasion - studded tyres); emissions from industry and NRMM lower.
Change 2005 to 2030 CLE	-6.0	-5.2	-0.8	-13%	Higher CLE emissions from road sector, lower from industry
2030 Current legislation (CLE)	25.2	26.8	+1.5	+6%	
Additional reduction potential to MTFR	-11.4	-10.1	-1.2	-11%	Less potential in domestic sector due to different structure of combustion devices and applicabilities; less potential in industry (measures already taken in CLE), higher potential for NRMM (Stage 5)
2030 Maximum technical feasible reductions (MTFR)	13.9	16.6	+2.7	+20%	
Additional reduction in the optimized scenario	-1.2	-0.3	-0.9	-77%	
2030 optimized scenario	24.1	26.5	+2.4	+10%	

Table 27.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013

Commission proposal, for Sweden (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	53.5	54.0	+0.5	+1%	Changes in non-agricultural sectors.
Change 2005 to 2030 CLE	-4.9	-5.2	+0.3	+6%	
2030 Current legislation (CLE)	48.7	48.9	+0.2	+0%	
Additional reduction potential to MTFR	-9.4	-12.8	+3.4	+36%	Updated farm size structure and the resulting impacts on application limits and emission factors
2030 Maximum technical feasible reductions (MTFR)	39.3	36.1	-3.2	-8%	
Additional reduction in the optimized scenario	-4.2	-4.2	-0.0	-0%	
2030 optimized scenario	44.4	44.6	+0.2	+0%	

Table 27.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Sweden (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	209.6	205.4	-4.1	-2%	Updates for transport (see NO_x) and emission factors for power plants
Change 2005 to 2030 CLE	-78.0	-80.3	+2.3	+3%	Impact of changes for the base year
2030 Current legislation (CLE)	131.6	125.1	-6.5	-5%	
Additional reduction potential to MTFR	-34.0	-30.5	-3.5	-10%	Impact of the changes for base year
2030 Maximum technical feasible reductions (MTFR)	97.6	94.6	-2.9	-3%	
Additional reduction in the optimized scenario	-0.7	-0.2	-0.4	-64%	
2030 optimized scenario	130.9	124.9	-6.0	-5%	

Table 27.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for Sweden (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	69.3	68.6	-0.7	-1%
Change 2005 to 2030 CLE	-18.8	-17.3	-1.5	-8%
2030 Current legislation (CLE)	50.5	51.2	+0.8	+2%
Additional reduction potential to MTFR	-14.6	-13.8	-0.8	-5%
2030 Maximum technical feasible reductions (MTFR)	35.9	37.4	+1.6	+4%
Additional reduction in the optimized scenario	-2.0	-1.1	-0.9	-45%
2030 optimized scenario	48.5	50.1	+1.6	+3%

Table 27.13: Emission control costs for Sweden (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	1484	1535	52	3%
Additional costs for MTFR	635	521	-114	-18%
2030 MTFR	2118	2057	-62	-3%
Additional costs in the optimized scenario (compared to CLE)	4	1	-3	-71%
Total costs in the optimized scenario in 2030	1488	1537	49	3%

28 UK

As a result of the bilateral consultations, updates and corrections have been introduced for emissions from blast furnaces, national shipping and non-road mobile sources in agriculture and construction, and petcoke as household fuel. These changes have profound implications on the current legislation projection of SO_2. As a net effect, baseline SO_2 reduction in 2030 is now five percentage points larger than estimated before. Similarly, new data, inter alia on solid fuel use in the domestic sector, imply significant larger baseline reductions of PM2.5. These changes have direct impact on the emission reduction requirements (ERRs) of the re-optimized scenario. For SO_2, baseline changes propagate directly to ERRs, while for PM2.5 the need for additional reductions declines. However, in relation to 2005, the resulting ERR for PM2.5 is still higher than in the initial COM scenario, although more is already achieved through the baseline case. For NH_3, new information on the structure of agricultural activities in the UK, especially on the share of solid/liquid manure systems, increases the additional reduction potential and leads to a higher cost-effective emission reduction by four percentage points. In contrast, the ERR for VOC declines by 10 percentage points, allowed by the deeper cut for PM2.5, but also induced by a strong decrease in additional reduction potential for VOC. Emission control costs (beyond CLE) decline by more than 40%.

28.1 Summary

Table 28.1: Summary table for UK. Emissions relative to latest reported inventories for 2005 (submission 2014). 2012: reported in 2014; 2020: Gothenburg Protocol commitment; 2030 numbers computed by GAINS (relative to GAINS 2005 estimate)

EU28	2005	2012	2020	2030 Commission 2013			2030 WPE 2014			Difference WPE-COM		
	[kt]		GP	CLE	67%GC	MTFR	CLE	67%GC	MTFR	CLE	67%GC	MTFR
SO_2	709	-40%	-59%	-75%	-84%	-85%	-80%	-89%	-91%	+5%	+5%	+6%
NO_x	1592	-33%	-55%	-70%	-73%	-79%	-72%	-74%	-80%	+2%	+1%	+2%
PM2.5	93	-17%	-30%	-6%	-47%	-56%	-28%	-53%	-57%	+22%	+7%	+2%
NH_3	302	-8%	-5%	-7%	-21%	-22%	-8%	-24%	-27%	+1%	+4%	+4%
VOC	1160	-28%	-37%	-37%	-49%	-62%	-37%	-39%	-52%	-1%	-10%	-10%
PMeq	480	-30%	-49%	-53%	-67%	-71%	-58%	-70%	-74%	+5%	+3%	+2%

28.2 Sectoral emission reductions

Table 28.2: SO_2 emission reductions of the optimized scenario by category, relative to 2005, for the UK (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-416.2**	**-6.8**	**-4.7**	**-427.8**
Domestic combustion		**-9.7**	**0.0**	**-20.8**	**-30.5**
Industry		**-70.4**	**-17.1**	**-42.0**	**-129.5**
of which	Refineries	-39.1	-4.0	-16.2	-59.3
	Other industries	-31.3	-13.0	-25.8	-70.1
Road transport		**-1.3**	**-0.9**	**0.0**	**-2.2**
of which	Light duty	-1.3	-0.9	0.0	-2.2
	Heavy duty	0.0	0.0	0.0	0.0
Non-road mobile		**-16.4**	**-15.0**	**0.0**	**-31.4**
Other sectors		**-21.2**	**0.0**	**-0.2**	**-21.4**
TOTAL		**-535.2**	**-39.8**	**-67.8**	**-642.8**

Table 28.3: NO_x emission reductions of the optimized scenario by category, relative to 2005, for the UK (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**-374.5**	**-22.3**	**-3.3**	**-400.1**
Domestic combustion		**-16.2**	**-11.0**	**0.0**	**-27.3**
Industry		**-55.7**	**-29.5**	**-28.0**	**-113.1**
of which	Refineries	-37.0	-6.0	-9.8	-52.7
	Other industries	-18.7	-23.5	-18.2	-60.4
Road transport		**1.6**	**-462.5**	**0.0**	**-460.9**
of which	Light duty	-12.6	-158.0	0.0	-170.6
	Heavy duty	14.2	-304.5	0.0	-290.3
Non road mobile		**-8.4**	**-107.8**	**-4.5**	**-120.7**
Other sectors		**-2.7**	**0.0**	**-0.8**	**-3.5**
TOTAL		**-455.9**	**-633.1**	**-36.5**	**-1125.5**

Table 28.4: PM2.5 emission reductions of the optimized scenario by category, relative to 2005, for the UK (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power and heating plants		**11.9**	**-10.3**	**-8.0**	**-6.4**
Domestic combustion		**5.6**	**-3.3**	**-3.8**	**-1.4**
Industry		**2.2**	**-0.5**	**-8.4**	**-6.7**
of which	Refineries	-0.8	0.0	-0.2	-1.0
	Other industries	3.0	-0.5	-8.2	-5.7
Road transport		**5.2**	**-20.5**	**0.0**	**-15.2**
of which	Light duty	4.0	-13.3	0.0	-9.3
	Heavy duty	1.2	-7.2	0.0	-5.9
Non road mobile		**-1.6**	**-11.6**	**-0.1**	**-13.3**
Other sectors		**-0.3**	**-2.6**	**-3.7**	**-6.6**
TOTAL		**23.2**	**-48.7**	**-24.0**	**-49.6**

Table 28.5: NH_3 emission reductions of the optimized scenario by category, relative to 2005, for the

UK (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Pigs		**-1.6**	**-3.8**	**-3.7**	**-9.1**
Poultry		**3.4**	**-17.1**	**-0.6**	**-14.3**
Cattle		**10.9**	**0.0**	**-34.3**	**-23.4**
of which	Dairy	7.7	0.0	-29.0	-21.3
	Meat	3.2	0.0	-5.3	-2.1
Other animals		**-2.3**	**0.0**	**0.0**	**-2.3**
Mineral fertilizers		**-2.2**	**0.0**	**-12.3**	**-14.6**
Other non -agricultural sources		**-6.8**	**-4.6**	**-0.5**	**-11.9**
TOTAL		**1.4**	**-25.5**	**-51.5**	**-75.6**

Table 28.6: VOC emission reductions of the optimized scenario by category, relative to 2005, for the UK (kilotons)

		Activity changes 2005-2030	CLE control measures 2005-2030	Additional control measures 2030	Total reduction
Power plants		**-7.1**	**0.0**	**0.0**	**-7.1**
Domestic combustion		**13.4**	**-9.9**	**-8.0**	**-4.6**
Industry (combustion and processes, excluding solvent use)		**32.2**	**-28.4**	**-0.2**	**3.6**
Road transport		**-72.7**	**-55.5**	**0.0**	**-128.2**
of which	Light duty	-74.1	-41.9	0.0	-116.0
	Heavy duty	1.4	-13.6	0.0	-12.2
Non road mobile		**4.9**	**-32.4**	**-2.2**	**-29.7**
Refineries (processes)		**-9.4**	**0.0**	**-2.7**	**-12.1**
Production, storage and distribution of oil products		**-110.2**	**-7.8**	**-1.5**	**-119.5**
Solvent use		**28.6**	**-91.3**	**-4.5**	**-67.2**
Other sectors		**-44.3**	**0.0**	**-2.7**	**-47.0**
of which	ban of agr. waste burning	0.0	0.0	-1.3	-1.3
TOTAL		**-164.6**	**-225.2**	**-21.9**	**-411.7**

28.3 Differences to the 2013 Commission proposal

Table 28.7: Differences in SO_2 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the UK (kilotons)

SO_2	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	849.5	721.4	-128.1	-15%	Emission factors for coke use in blast furnaces changed to values consistent with PRIMES/EUROSTAT fuel reporting. Updated activities for national shipping and non-road mobile sources in agriculture and construction. Inclusion of petcoke as household fuel. Improved calibration for other sectors
Change 2005 to 2030 CLE	-635.6	-575.0	-60.6	-10%	Change of EF for coke in iron and steel industry. Inclusion of petcoke as household fuel. Updated

					activities for national shipping
2030 Current legislation (CLE)	214.0	146.5	-67.5	-32%	
Additional reduction potential to MTFR	-90.4	-83.2	-7.2	-8%	Consequence of changes in CLE, first of all lower EF for metallurgical coke
2030 Maximum technical feasible reductions (MTFR)	123.6	63.3	-60.3	-49%	
Additional reduction in the optimized scenario	-76.0	-67.8	-8.2	-11%	
2030 optimized scenario	138.0	78.7	-59.3	-43%	

Table 28.8: Differences in NO_x emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the UK (kilotons)

NO_x	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1479.8	1515.7	+36.0	+2%	Improved representation of national inventory based on new inputs from UK. Higher emissions from power sector (adjusted controls) and NRMM (higher activity); Lower emissions from industrial combustion, domestic sector (adjusted controls) and shipping (lower activities)
Change 2005 to 2030 CLE	-1038.5	-1089.0	+50.5	+5%	Lower activity for shipping, higher activity and EFs for NRMM
2030 Current legislation (CLE)	441.2	426.7	-14.5	-3%	
Additional reduction potential to MTFR	-125.4	-130.5	+5.1	+4%	Higher potential for shipping and NRMM
2030 Maximum technical feasible reductions (MTFR)	315.8	296.3	-19.6	-6%	
Additional reduction in the optimized scenario	-43.9	-36.5	-7.3	-17%	
2030 optimized scenario	397.4	390.2	-7.2	-2%	

Table 28.9: Differences in PM2.5 emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the UK (kilotons)

PM2.5	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	87.0	92.8	+5.8	+7%	Improved representation of new national 2005 inventory (2014 submission estimate 12% higher than in 2012) – adjusted vehicle fleet and emission factors for road transport, higher activities for non-road sector, higher emissions from industry
Change 2005 to 2030 CLE	-5.0	-25.6	+20.6	+416%	Lower emissions from domestic sector due to newer structure of combustion devices; lower emissions from road transport, higher from non-road sector (higher activities and less efficient Stage 4)
2030 Current legislation (CLE)	82.0	67.2	-14.8	-18%	
Additional reduction potential to MTFR	-43.7	-27.7	-16.0	-37%	Less potential in domestic sector (newer combustion devices), more potential for NRMM (Stage 5)
2030 Maximum technical feasible reductions (MTFR)	38.4	39.5	+1.2	+3%	
Additional reduction in the optimized scenario	-35.7	-24.0	-11.6	-33%	
2030 optimized scenario	46.4	43.2	-3.2	-7%	

Table 28.10: Differences in NH_3.emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the UK (kilotons)

NH_3	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	308.4	310.2	+1.8	+1%	Updated activity data for dairy cows and non-agricultural NH_3 sources.
Change 2005 to 2030 CLE	-21.5	-24.1	+2.6	+12%	Impact of the changes for the base year
2030 Current legislation (CLE)	287.0	286.1	-0.8	-0%	
Additional reduction potential to MTFR	-47.6	-59.2	+11.6	+24%	Impact of the changes in the baseline including change in the shares of solid/liquid manure systems for cattle
2030 Maximum technical feasible reductions (MTFR)	239.4	227.0	-12.5	-5%	
Additional reduction in the optimized scenario	-42.4	-51.5	+9.1	+22%	
2030 optimized scenario	244.6	234.6	-10.0	-4%	

Table 28.11: Differences in VOC emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the UK (kilotons)

VOC	COM 2013	WPE 2014	Difference		Main reasons for differences
2005 (GAINS estimate)	1092.8	1062.8	-30.0	-3%	New national 2005 inventory (2014 submission estimate 6% higher than in 2012). Modified structure of residential combustion sector (see PM), updates for solvent sector (several activities), adjustments in transport (see NOx)
Change 2005 to 2030 CLE	-408.8	-389.8	-19.0	-5%	
2030 Current legislation (CLE)	684.0	673.0	-11.1	-2%	
Additional reduction potential to MTFR	-274.1	-164.1	-110.0	-40%	Updated structure (newer devices) of residential sector and transport, composition of the solvent use sector, including higher domestic solvent emissions which have limited mitigation potential
2030 Maximum technical feasible reductions (MTFR)	409.9	508.9	+99.0	+24%	
Additional reduction in the optimized scenario	-121.9	-21.9	-100.0	-82%	
2030 optimized scenario	562.2	651.1	+88.9	+16%	

Table 28.12: Differences in PMeq emissions of the GAINS estimates of the 2005 emission inventories, CLE 2030, MTFR 2030 and the optimized scenario, between the new WPE14 and the original 2013 Commission proposal, for the UK (kilotons)

PMeq	COM 2013	WPE 2014	Difference	
2005 (GAINS estimate)	509.0	479.1	-29.9	-6%
Change 2005 to 2030 CLE	-271.8	-278.1	+6.3	+2%
2030 Current legislation (CLE)	237.2	201.0	-36.2	-15%
Additional reduction potential to MTFR	-90.7	-74.2	-16.5	-18%
2030 Maximum technical feasible reductions (MTFR)	146.5	126.9	-19.7	-13%
Additional reduction in the optimized scenario	-70.6	-56.9	-13.7	-19%
2030 optimized scenario	166.6	144.2	-22.5	-13%

Table 28.13: Emission control costs for the UK (million €/yr)

Emission control costs	COM 2013	WPE 2014	Difference	
2030 Current legislation (CLE)	8327	8289	-39	0%
Additional costs for MTFR	4199	3084	-1116	-27%
2030 MTFR	12527	11372	-1155	-9%
Additional costs in the optimized scenario (compared to CLE)	303	173	-130	-43%
Total costs in the optimized scenario in 2030	8630	8462	-169	-2%