GAINS DATA SHEET ON GHG MITIGATION POTENTIALS

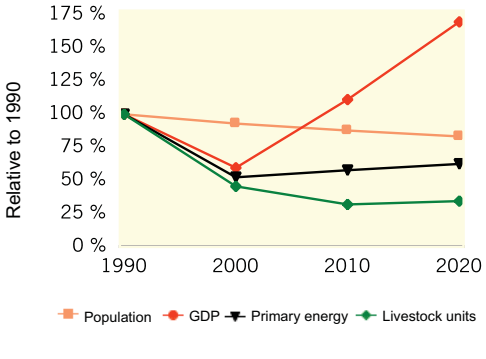
INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
Greenhouse Gas - Air Pollution Interactions and Synergies
VERSION 2.1, October 2009

Activity projection: BL ANNEX I 2008 upd

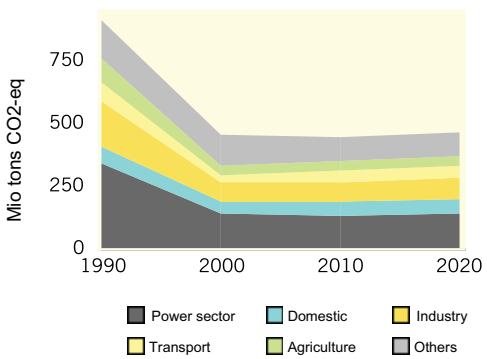
Ukraine

MACRO-ECONOMIC DRIVERS AND BASELINE GHG EMISSIONS

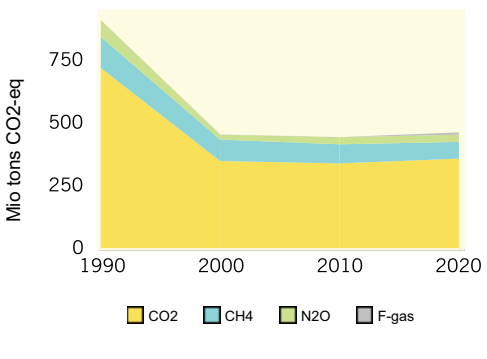
MACRO-ECONOMIC ASSUMPTIONS



GHG EMISSIONS BY SECTOR

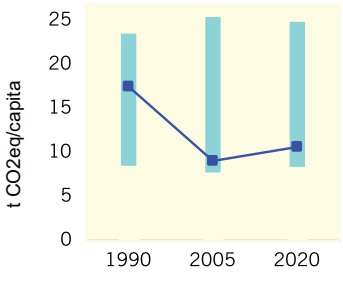


TOTAL GHG EMISSIONS BY GAS

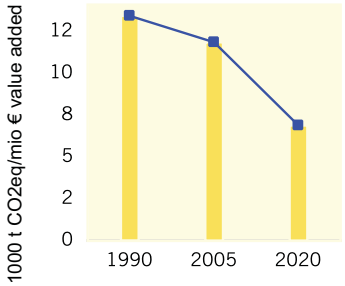


GHG INTENSITIES (bars indicate ranges for Annex I)

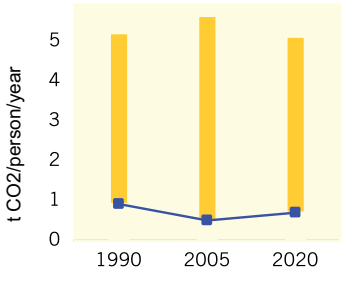
TOTAL GHG EMISSIONS/CAPITA



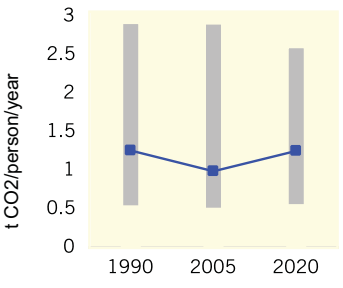
GHG INTENSITY OF INDUSTRIAL GDP



CO2/CAPITA FROM ROAD TRANSPORT

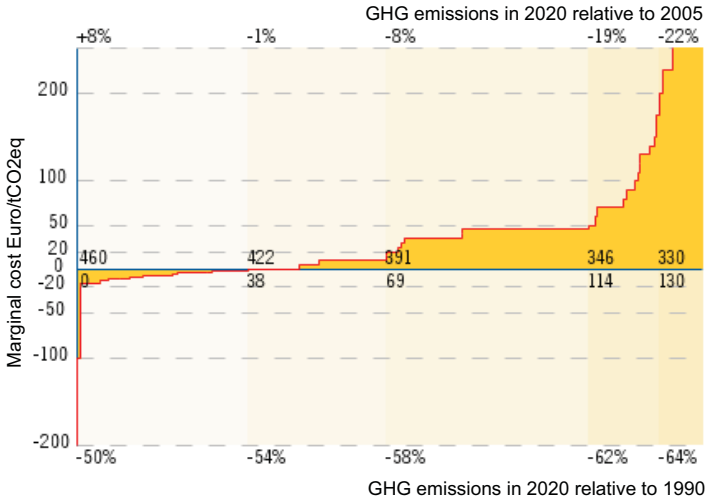


CO2/CAPITA FROM HOUSEHOLDS

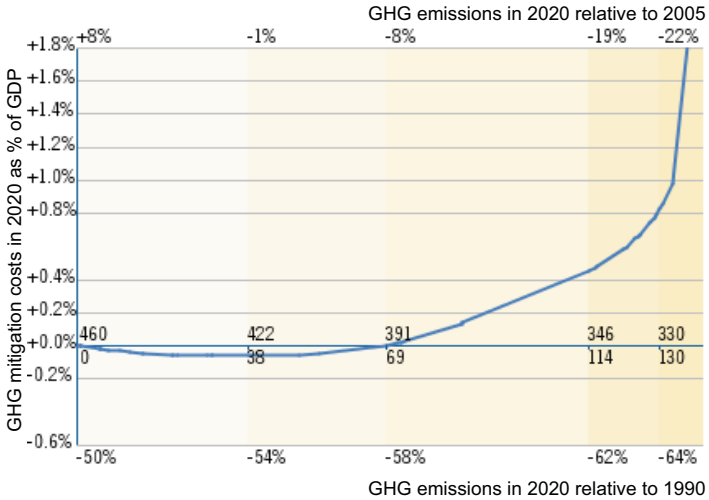


MITIGATION POTENTIALS AND COSTS IN 2020 (excl. transaction costs, incl. LULUCF)

MARGINAL COST CURVE



TOTAL COSTS OF GHG MITIGATION



GAINS

List of mitigation measures

The following pages list the cost-effective mitigation measures for Annex I Parties for increasing marginal costs. The list was obtained by comparing GAINS model results at consecutive marginal cost values. Thus, this table provides a list of incremental steps of measures. The GAINS model identifies cost-effective mitigation measures using an optimization method. It takes into account the fact that the combination of mitigation measures may not be as effective as the sum of the measures taken individually. For example, from a systems perspective reducing electricity consumption is a less effective mitigation measure *per se* if it is accompanied with a decarbonisation of the supply fuel mix.

The column *More* describes the measures that would be taken *in addition* to those taken at the previous marginal cost. Likewise measures under the heading *Less* are being reduced relative to the previous marginal cost.

At each marginal cost the list also shows:

1. The remaining GHG emissions (in Mt CO2eq)
2. The amount of GHG emissions reduced relative to the baseline (in MtCO2eq)
3. The resulting percentage change relative to the 1990 emissions reported to the UNFCCC.

Ukraine

Party	Marginal Cost Euro/CO2eq	More of	Less of	Remaining Emissions (MtCO2eq)	Cumulative Reductions rel. to baseline (MtCO2eq)	Change rel. to 1990
Ukraine	**-20**	DOM - Efficiency measures stage 1 - commercial heating and cooling - new buildings DOM - standard efficiency - residential heating and cooling - existing apartments TRA - Diesel cars with advanced internal combustion engines TRA - Gasoline cars with advanced internal combustion engines TRA - Highest efficiency diesel buses TRA - Highest efficiency heavy duty gasoline trucks TRA - Improved efficiency diesel buses	DOM -standard efficiency - commercial heating and cooling - new buildings DOM - Efficiency measures stage 1 - residential heating and cooling - existing apartments TRA - Diesel cars with standard efficiency TRA - Gasoline cars with standard efficiency TRA - Heavy duty gasoline trucks with standard efficiency TRA -Diesel buses with standard efficiency	**459.7**	**-0.7**	**-50%**
Ukraine	**-15**	DOM - Efficiency measures stage 1 - residential lighting	New gas fired power plants DOM - standard efficiency - residential lighting	**455.3**	**-5.1**	**-51%**
Ukraine	**-12**	TRA - Light duty gasoline trucks with advanced internal combustion engine	TRA - Light duty gasoline trucks with standard efficiency	**455.2**	**-5.2**	**-51%**
Ukraine	**-11**	DOM - Efficiency measures stage 1 - residential heating and cooling - existing apartments	New gas fired power plants DOM - standard efficiency - residential heating and cooling - existing apartments	**453.5**	**-6.9**	**-51%**
Ukraine	**-10**	DOM - Efficiency measures stage 2 - residential heating and cooling - new apartments	New gas fired power plants DOM - standard efficiency - residential heating and cooling - new apartments	**450.7**	**-9.6**	**-51%**
Ukraine	**-9**	DOM - Efficiency measures stage 1 - residential heating and cooling - existing houses DOM - Efficiency measures stage 2 - residential lighting	New gas fired power plants DOM - standard efficiency - residential heating and cooling - existing houses DOM - standard efficiency - residential lighting	**448.4**	**-11.9**	**-51%**

Party	Marginal Cost Euro/CO2eq	More of	Less of	Remaining Emissions (MtCO2eq)	Cumulative Reductions rel. to baseline (MtCO2eq)	Change rel. to 1990
Ukraine	**-8**	DOM - Efficiency measures stage 2 - residential heating and cooling - new houses	New gas fired power plants DOM - standard efficiency - residential heating and cooling - new houses	**445.7**	**-14.6**	**-52%**
Ukraine	**-7**	TRA - Improved efficiency heavy duty gasoline trucks	TRA - Heavy duty gasoline trucks with standard efficiency	**445.7**	**-14.6**	**-52%**
Ukraine	**-6**	DOM - Efficiency measures stage 2 - residential heating and cooling - existing apartments	New gas fired power plants New oil-fired power plants DOM - standard efficiency - residential heating and cooling - existing apartments	**439.0**	**-21.4**	**-52%**
Ukraine	**-5**	TRA - Light duty diesel trucks with advanced internal combustion engine	TRA - Light duty diesel trucks with standard efficiency	**438.9**	**-21.4**	**-52%**
Ukraine	**-4**	DOM - Efficiency measures stage 2 - residential heating and cooling - new apartments	New oil-fired power plants DOM - Efficiency measures stage 1 - residential heating and cooling - new apartments	**438.1**	**-22.2**	**-53%**
Ukraine	**-3**	DOM - Efficiency measures stage 2 - residential heating and cooling - existing houses DOM - Efficiency measures stage 1 - residential cooking with electricity CH4: Enteric fermentation -mix of feed changes	New oil-fired power plants DOM - standard efficiency - residential heating and cooling - existing houses DOM - standard efficiency - residential cooking with electricity	**431.3**	**-29.1**	**-53%**
Ukraine	**-2**	DOM - Efficiency measures stage 1 - residential thermal water heating	DOM - standard efficiency - residential thermal water heating	**430.3**	**-30.1**	**-53%**
Ukraine	**0**	DOM - Efficiency measures stage 2 - residential heating and cooling - new houses DOM - Efficiency measures stage 1 - residential electric water heating CH4: Gas transmission - reduced gas losses at compressor stations CH4: Enteric fermentation -mix of feed changes	New oil-fired power plants DOM - Efficiency measures stage 1 - residential heating and cooling - new apartments DOM - Efficiency measures stage 1 - residential heating and cooling - new houses DOM - standard efficiency - residential electric water heating	**422.2**	**-38.2**	**-54%**
Ukraine	**5**	IND - Efficiency improvements - best current practice - Energy Conversions Industry HFC: Aerosols -alternative propellant HFC: Transp. refrigeration -alternative refrigerant CH4: Ban on open burning of agricultural or residential waste N2O: catalytic reduction in nitric or adipic acid production CH4: Oil and gas production -increased flaring of associated gas HFC: Commerc. refrigeration -good practice: end-of-life recollection SF6: High and mid voltage switches -good practice HFC: Ind. refrigeration -good practice: end-of-life recollection HFC: Mobile air cond. -good practice: end-of-life recollection HFC: Stationary air cond. -good practice: end-of-life recollection CH4: Food industry waste - landfill with gas recovery and utilization CH4: MSW food - landfill with gas recovery and utilization N2O: optimizing wastewater treatment to abate N2O emissions N2O: product use in anaesthetic reduced by combination therapy TRA - Improved efficiency heavy duty diesel trucks	New conventional coal-fired power plants New gas fired power plants DOM - standard efficiency - residential heating and cooling - existing apartments N2O: Deep injection of manure into soils as fertilizer TRA - Heavy duty diesel trucks with standard efficiency	**410.7**	**-49.7**	**-56%**

Party	Marginal Cost Euro/CO2eq	More of	Less of	Remaining Emissions (MtCO2eq)	Cumulative Reductions rel. to baseline (MtCO2eq)	Change rel. to 1990
Ukraine	**10**	Wind Energy	New conventional coal-fired power plants	**406.5**	**-53.9**	**-56%**
		IND - Efficiency improvements - best current practice - Energy Conversions Industry	New gas fired power plants			
		IND - Efficiency improvements - best current practice - Paper and Pulp Industry				
		CH4: Rice cultivation -alternative low methane rice hybrids				
		N2O: improving agricultural nitrogen use by simple measures				
		PFC: Prim. aluminium prod. -VSS retrofitting				
Ukraine	**15**	DOM - Efficiency measures stage 1 - commercial heating and cooling - existing buildings	New conventional coal-fired power plants	**391.2**	**-69.1**	**-58%**
		IND - Efficiency improvements - best current practice - Iron and Steel Industry	New gas fired power plants			
		IND - Efficiency improvements - best current practice - Non-Metalic Minerals Industry	DOM - standard efficiency - commercial heating and cooling - existing buildings			
		IND - Efficiency improvements - best current practice - Paper and Pulp Industry				
		CH4: Oil refinery -flaring				
Ukraine	**20**	Biofuels		**391.2**	**-69.2**	**-58%**
		CH4: Coal mine gas recovery with flaring				
		HFC: Transp. refrigeration -good practice: end-of-life recollection				
Ukraine	**25**	New conventional coal-fired power plants	New gas fired power plants	**388.6**	**-71.7**	**-58%**
		DOM - Efficiency measures stage 2 - commercial heating and cooling - new buildings	DOM -standard efficiency - commercial heating and cooling - new buildings			
		DOM - Efficiency measures stage 2 - residential cooking with electricity	DOM - standard efficiency - residential cooking with electricity			
		IND - Efficiency improvements - best current practice - Non-ferrous Metals Industry	CH4: Rice cultivation -alternative low methane rice hybrids			
		HFC: Transp. refrigeration -good practice: leak control	CH4: Food industry waste - landfill with gas recovery and utilization			
		CH4: Rice cultivation -aeration of continuously flooded rice fields				
		CH4: Food industry waste - anaerobic digestion with gas recovery and utilization				
Ukraine	**30**	Combined Heat and Power plants used in Industry	New conventional coal-fired power plants	**388.2**	**-72.2**	**-58%**
		New gas fired power plants	HFC: Mobile air cond. -good practice: end-of-life recollection			
		IND - Efficiency improvements - best current practice - Other Industries				
		HFC: Mobile air cond. -alternative refrigerant: pressurized CO2				
		HFC: Mobile air cond. -good practice: leak control				
Ukraine	**35**	IND - Efficiency improvements - best current practice - Other Industries	New conventional coal-fired power plants	**387.4**	**-73.0**	**-58%**
		CH4: Manure management -farm scale anaerobic digester	TRA - Light duty gasoline trucks with standard efficiency			
		HFC: Ind. refrigeration -process modifications incl. alt. refrigerants				
		TRA - Light duty hybrid gasoline trucks				

Party	Marginal Cost Euro/CO2eq	More of	Less of	Remaining Emissions (MtCO2eq)	Cumulative Reductions rel. to baseline (MtCO2eq)	Change rel. to 1990
Ukraine	**40**	Biofuels	Existing Power Plants using fossil fuels	**374.5**	**-85.8**	**-59%**
		New gas fired power plants	DOM - standard efficiency - residential heating and cooling - existing houses			
		CH4: Coal mine gas recovery with flaring	N2O: improving agricultural nitrogen use by simple measures			
		N2O: adjusting fertilizer addition to the periods of agricultural demand				
		HFC: Commerc. refrigeration -good practice: leak control				
		HFC: Ind. refrigeration -good practice: leak control				
Ukraine	**45**	Combined Heat and Power plants used in Industry		**374.3**	**-86.1**	**-59%**
		New conventional coal-fired power plants				
		New gas fired power plants				
		IND - Efficiency improvements - best current practice - Non-ferrous Metals Industry				
Ukraine	**50**	Combined Heat and Power plants used in Industry	New conventional coal-fired power plants	**346.3**	**-114.0**	**-62%**
		New gas fired power plants				
		CH4: Gas distribution networks -doubling of leak control frequency				
Ukraine	**60**	DOM - Efficiency measures stage 1 - commercial lighting	New gas fired power plants	**344.7**	**-115.7**	**-63%**
		DOM - Efficiency measures stage 2 - commercial lighting	New oil-fired power plants			
		CH4: Rice cultivation -combination alt. hybrids	DOM - standard efficiency - commercial lighting			
		PFC: Prim. aluminium prod. -conversion VSS to PFPB	CH4: Rice cultivation -aeration of continuously flooded rice fields			
			PFC: Prim. aluminium prod. -VSS retrofitting			
Ukraine	**70**	New gas fired power plants	Existing Power Plants using fossil fuels	**344.5**	**-115.9**	**-63%**
		IND - Efficiency improvements - best current practice - Chemical Industry				
		IND - Efficiency improvements - best current practice - Non-ferrous Metals Industry				
Ukraine	**80**	New gas fired power plants	Existing Power Plants using fossil fuels	**338.5**	**-121.9**	**-63%**
		DOM - Efficiency measures stage 1 - commercial - large appliances	DOM - standard efficiency - commercial - large appliances			
		DOM - Efficiency measures stage 1 - residential cooking - thermal fuels	DOM - standard efficiency - residential cooking - thermal fuels			
		IND - Efficiency improvements - best current practice - Chemical Industry	N2O: adjusting fertilizer addition to the periods of agricultural demand			
		N2O: application of agrochemicals such as nitrification inhibitors	HFC: Commerc. refrigeration -good practice: leak control			
		HFC: Commerc. refrigeration -process modifications incl. alt. refrigerants	TRA - Gasoline cars with standard efficiency			
		TRA - Gasoline hybrid cars				
Ukraine	**90**	IND - Efficiency improvements - best current practice - Chemical Industry	New gas fired power plants	**337.8**	**-122.6**	**-63%**
		HFC: Stationary air cond. -good practice: leak control	TRA - Light duty gasoline trucks with standard efficiency			
		TRA - Advanced hybrid gasoline light duty trucks				
Ukraine	**100**	DOM - Efficiency measures stage 1 - commercial heating and cooling - existing buildings	Existing Power Plants using fossil fuels	**335.7**	**-124.7**	**-64%**
			New gas fired power plants			
			DOM - standard efficiency - commercial heating and cooling - existing buildings			
Ukraine	**110**	HFC: Mobile air cond. -alternative refrigerant: pressurized CO2	HFC: Mobile air cond. -good practice: leak control	**335.1**	**-125.3**	**-64%**
		SF6: Magnesium prod. -alternative protection gas: SO2				
Ukraine	**120**	CH4: Food industry wastewater -aerobic treatment	TRA - Diesel cars with standard efficiency	**334.8**	**-125.6**	**-64%**
		TRA - Diesel hybrid cars				

Party	Marginal Cost Euro/CO2eq	More of	Less of	Remaining Emissions (MtCO2eq)	Cumulative Reductions rel. to baseline (MtCO2eq)	Change rel. to 1990
Ukraine	**130**	Combined Heat and Power plants used in Industry DOM - Efficiency measures stage 2 - residential electric water heating	New gas fired power plants DOM - standard efficiency - residential electric water heating	**334.8**	**-125.6**	**-64%**
Ukraine	**140**	Combined Heat and Power plants used in Industry New gas fired power plants CH4: Gas distribution networks -replacement grey cast iron networks	CH4: Gas distribution networks -doubling of leak control frequency	**332.5**	**-127.9**	**-64%**
Ukraine	**150**	DOM - Efficiency measures stage 2 - residential electric water heating N2O: abandon agricultural use of organic soils (histosols)	New gas fired power plants DOM - Efficiency measures stage 1 - residential electric water heating	**331.6**	**-128.7**	**-64%**
Ukraine	**175**	DOM - Efficiency measures stage 2 - commercial heating and cooling - new buildings	New gas fired power plants DOM - Efficiency measures stage 1 - commercial heating and cooling - new buildings	**331.1**	**-129.3**	**-64%**
Ukraine	**200**	DOM - Efficiency measures stage 1 - commercial thermal water heating DOM - Efficiency measures stage 2 - residential thermal water heating CH4: Organic chemical industry wastewater -aerobic treatment TRA - Gasoline hybrid cars with advanced internal combustion engine TRA - Light duty hybrid diesel trucks	DOM - standard efficiency - commercial thermal water heating DOM - standard efficiency - residential thermal water heating TRA - Gasoline cars with standard efficiency TRA - Light duty diesel trucks with standard efficiency	**330.3**	**-130.1**	**-64%**
Ukraine	**225**	New gas fired power plants	Existing Power Plants using fossil fuels CH4: Gas distribution networks -replacement grey cast iron networks	**329.7**	**-130.6**	**-64%**