International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

Energy Community:
Non-CO_2 GHG emissions, abatement potentials, and air pollution co-benefits in 2030 – GAINS model results

Lena Höglund-Isaksson, Pallav Purohit, Wilfried Winiwarter, Peter Rafaj, Laura Warnecke, Chris Heyes, Adriana Gomez-Sanabria, Jens Borken-Kleefeldt

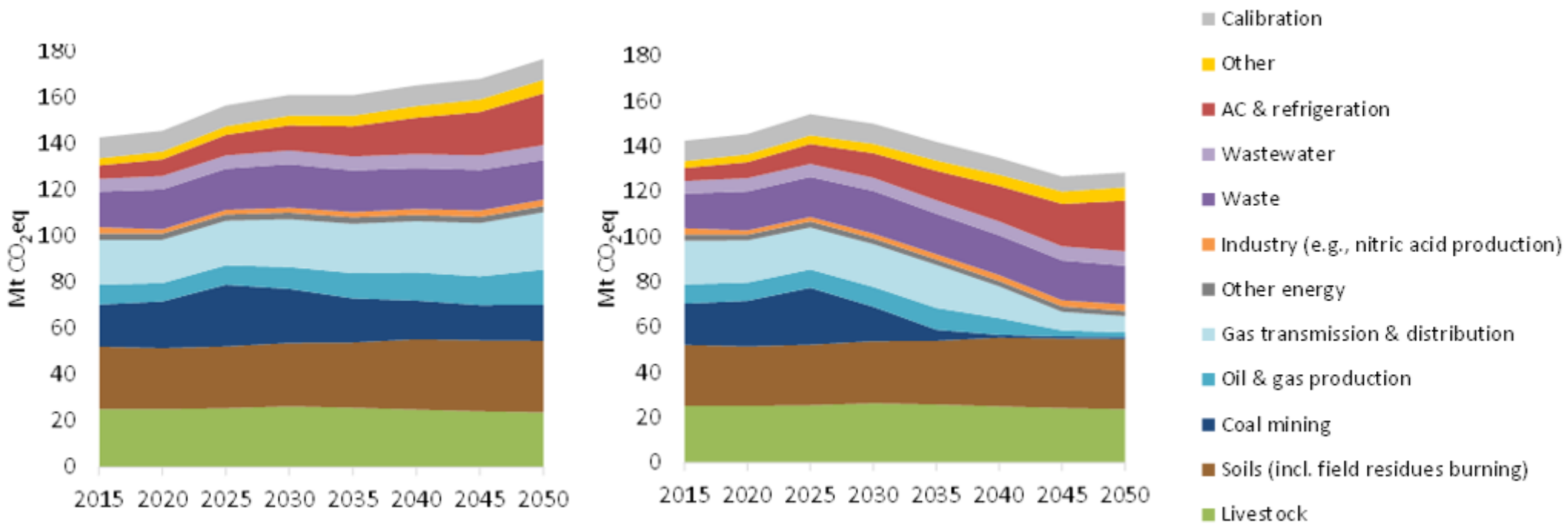
Energy Community

9th Energy and Climate Technical Working Group

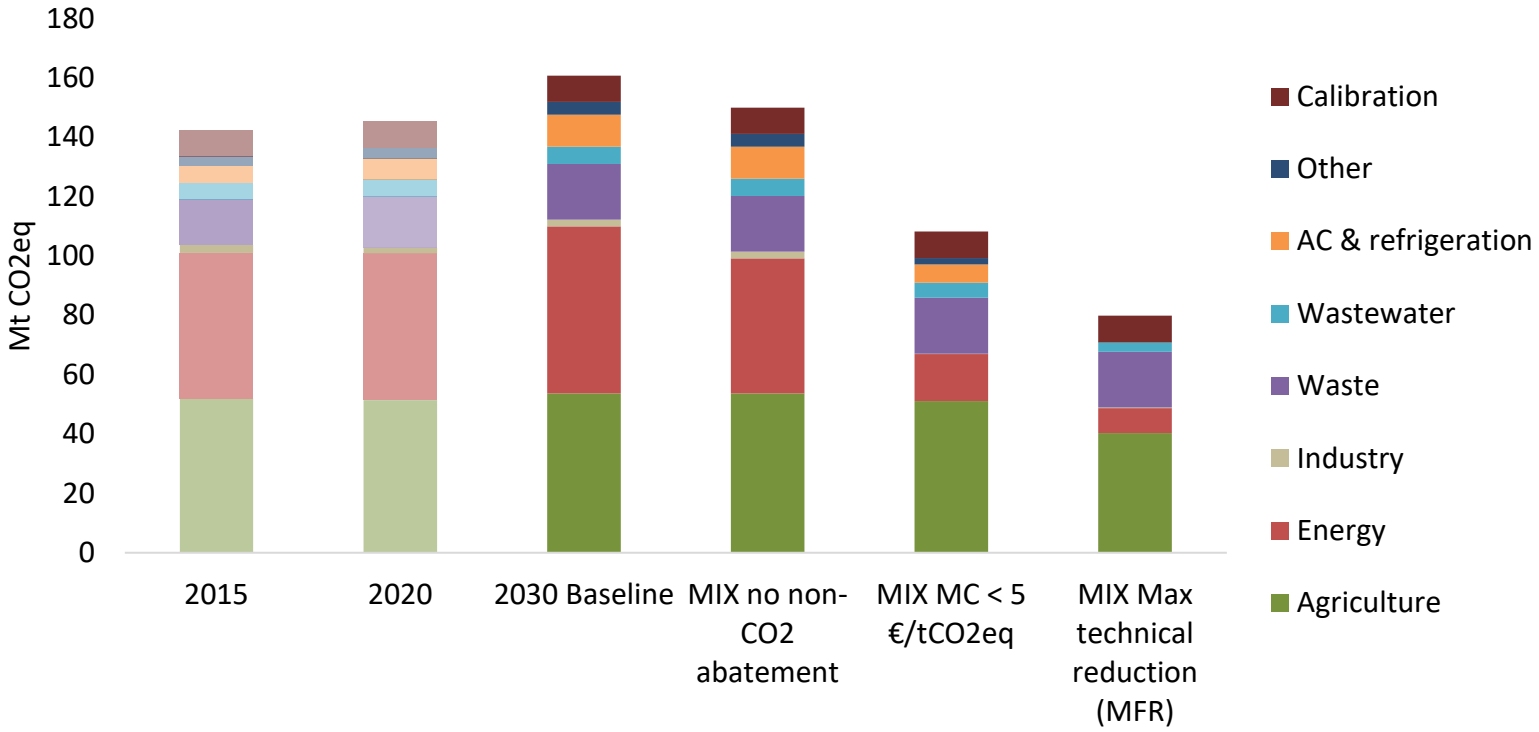
Vienna April 7, 2022

Energy Community:

Non-CO_2 GHGs Baseline (left) and MIX1 (right) scenarios before dedicated non-CO_2 abatement measures



Energy Community: Non-CO_2 GHGs Baseline, MIX1, and abatement potential in 2030



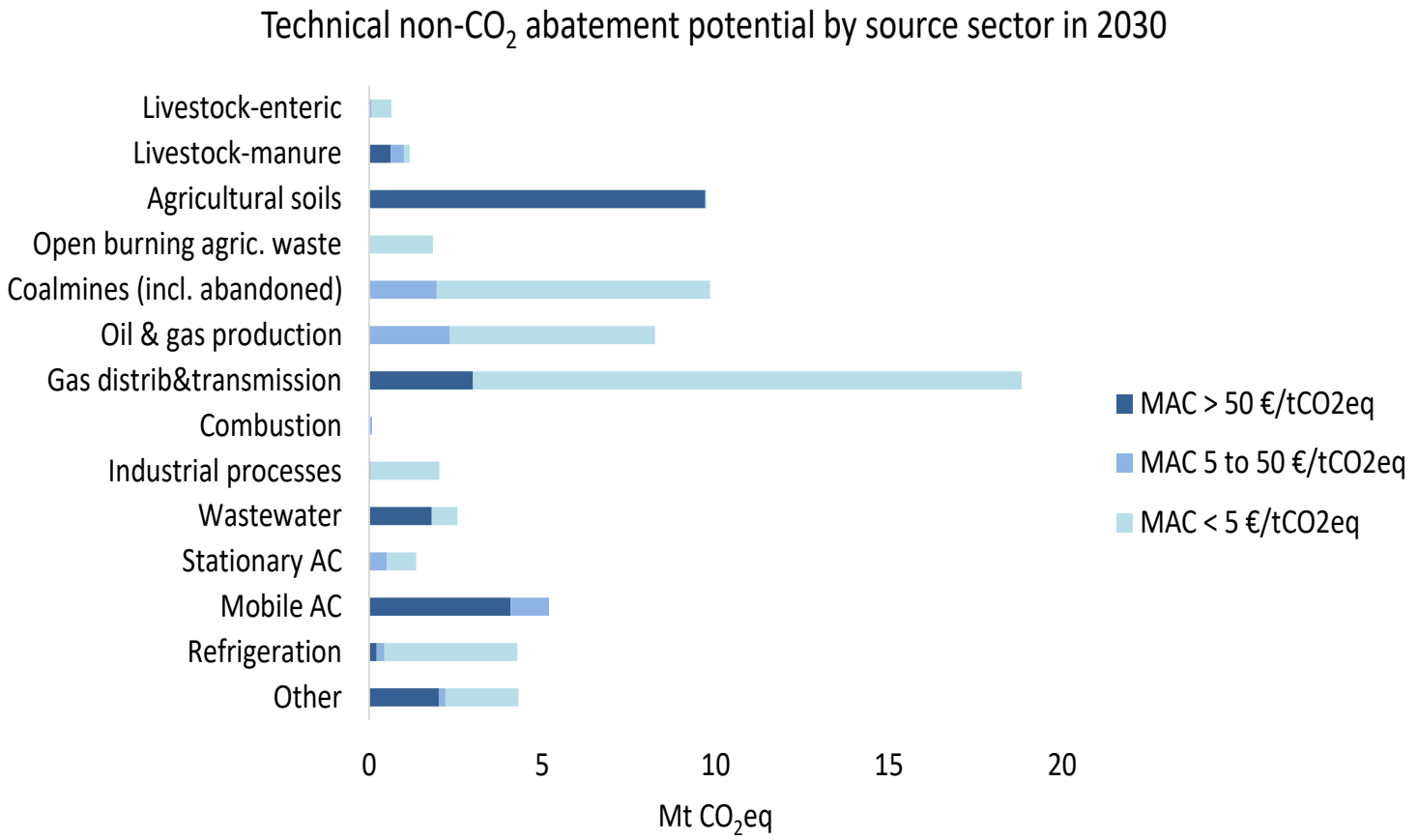
Baseline 2020 to 2030:	+11%
Baseline to MIX1 in 2030:	-7%
Baseline to MIX1 with non-CO_2 abatement < 5 €/tCO_2eq in 2030:	-33%
Baseline to MIX1 with max technical non-CO_2 abatement in 2030:	-50%

Energy Community: MIX1 non-CO_2 GHGs technical abatement potential in 2030

Source sector	Measures	% Max technical reduction of source sector emissions in EnC in 2030
Livestock-enteric	Feed additives and/or changed feed management practices	-3%
	Breeding through selection: enhance productivity, fertility and longevity to minimize kg CH4/kg milk	
Livestock-manure	Farm-scale anaerobic digestion with biogas recovery	-31%
Agricultural soils	Variable rate technology, Nitrification inhibitors, Precision farming, Abandon organic soils	-38%
Open burning agric. waste	Ban or enforcement of existing ban	-100%
Coalmines (incl. abandoned)	Pre-mining degasification, Ventilation air methane oxidation, Flooding abandoned mines	-65%
Oil & gas production	Recovery and utilization of associated gas and control of venting of unrecovered gas	-94%
	Leak-detection and control programs for equipment leaks	
Gas distrib&transmission	Leak detection and repair programs (Replacement of pipelines & networks)	-84% (-99%)
Combustion	Modification in fluidized bed combustion	-3%
Industrial processes	Best available technology in nitric acid production, New technologies in primary Al production	-94%
Waste	Diverting organic waste away from landfills through source separation and treatment	0%
Wastewater	2-stage treatment: anaerobic with biogas recovery followed by aerobic	-44%
Stationary AC	Alternative agents: hydrocarbons (e.g., butane, propane), water chillers, pressurized CO_2, HFOs etc.	-100%
Mobile AC	Alternative agents: HFO-1234yf or pressurized CO2	-100%
Refrigeration	Ammonia, isobutane, HFCs with GWP<150	-100%
Other	Control of SF6 in high- and mid- voltage switches	-99%
	Alternative agents in foam blowing, aerosols, heatpumps, anaesthetics	

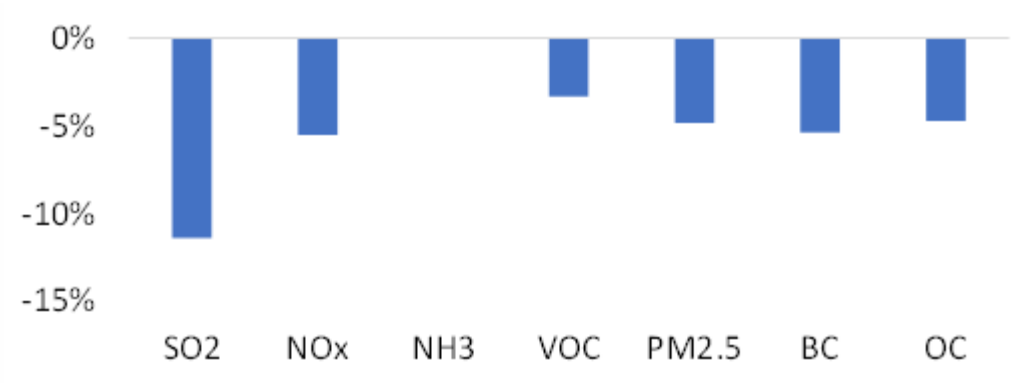
Note: No abatement potential from solid waste sector in 2030 due to on average 10-20 years time lags for decomposition between landfill of organic waste and release of methane emissions. Hence impacts on CH_4 emissions from waste sector measures in the period 2022-2030 only materialize from 2035 onward.

Energy Community: MIX1 non-CO_2 GHGs technical abatement potential in 2030



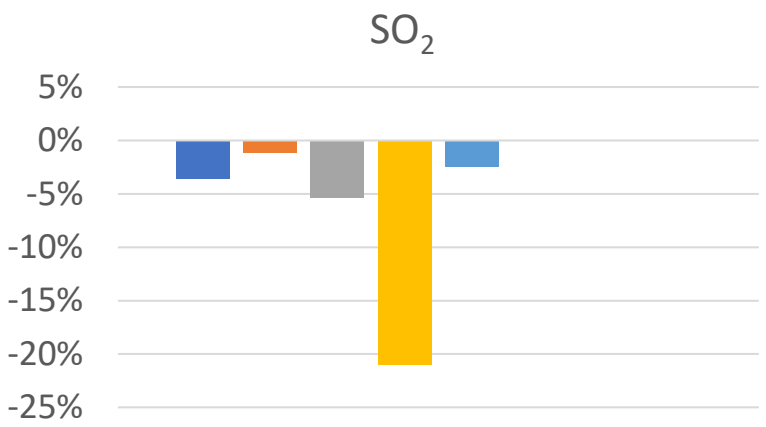
Note: No abatement potential from solid waste sector in 2030 due to on average 10-20 years time lags for decomposition between landfill of organic waste and release of methane emissions. Hence impacts on CH_4 emissions from waste sector measures in the period 2022-2030 only materialize from 2035 onward.

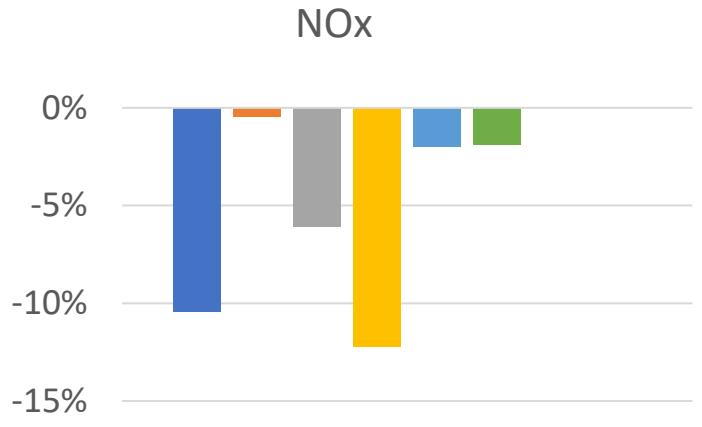
Energy Community: Differences in air pollution emissions between Baseline and MIX1 in 2030, totals

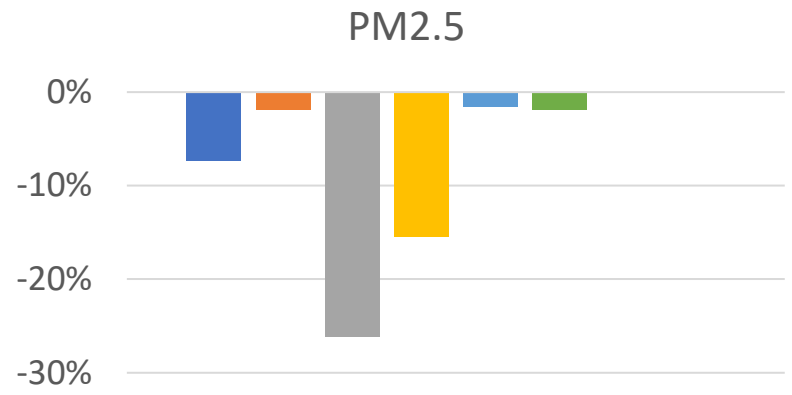


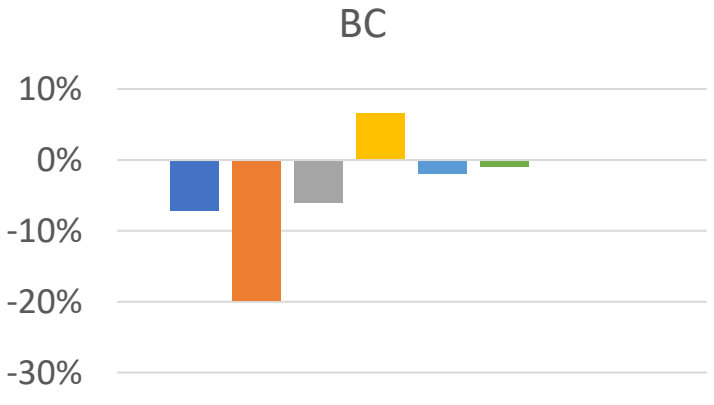
- Differences only refer to energy sector with no differences in agriculture, therefore differences in NH3 are tiny
- Less use of coal in power, residential and industry sectors
- Reduced oil & gas production, less flaring
- Limited effects on transport emissions: no changes in air quality control assumed, differences come from accelerated fuel switches away from fossil fuels

Energy Community: Differences in air pollution emissions between Baseline and MIX1 in 2030, by source sector









- Non-industrial combustion plants (stationary)
- Production processes (stationary)
- Extraction and distribution of fossil fuels
- Power plant and industry combustion
- Road transport
- Other mobile sources and machinery
- Waste treament and disposal
- Agriculture