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What might CH_4 control policies look like

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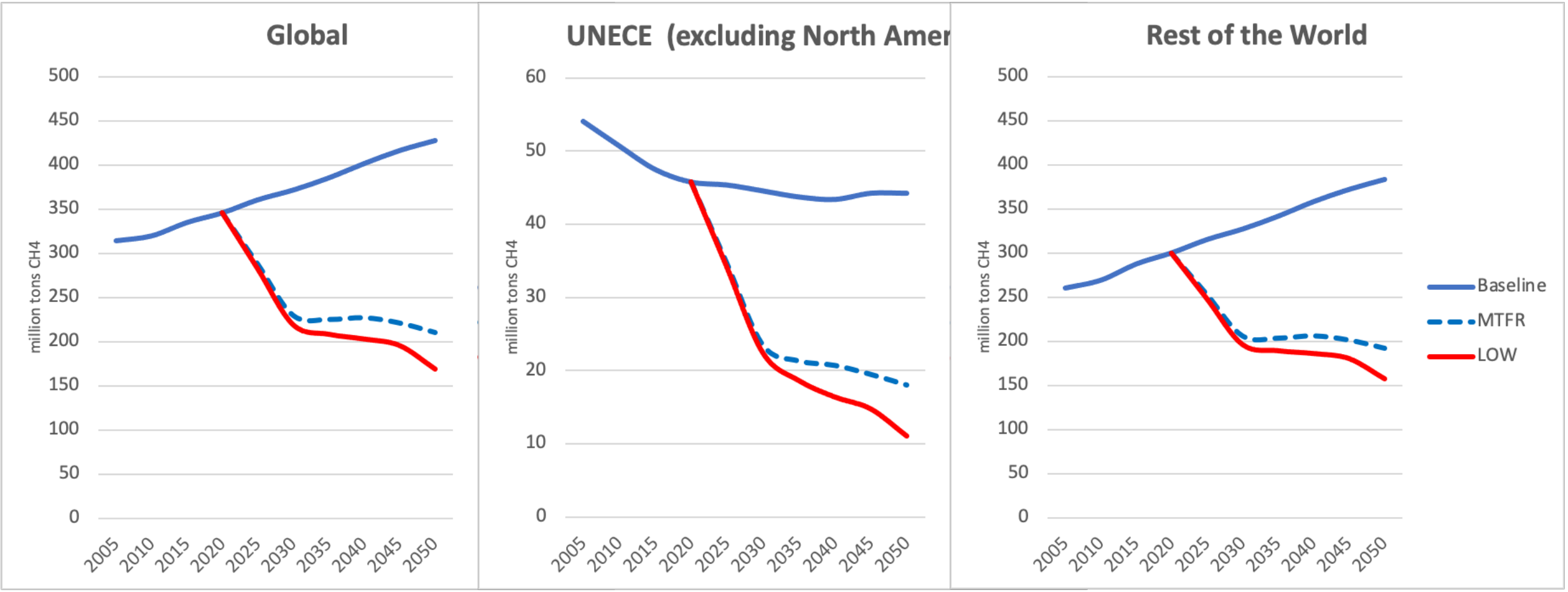
CIAM/IIASA, Univ of Leeds, and MSC-W

EMEP-SB WGE 9, 11-15 Sept 2023

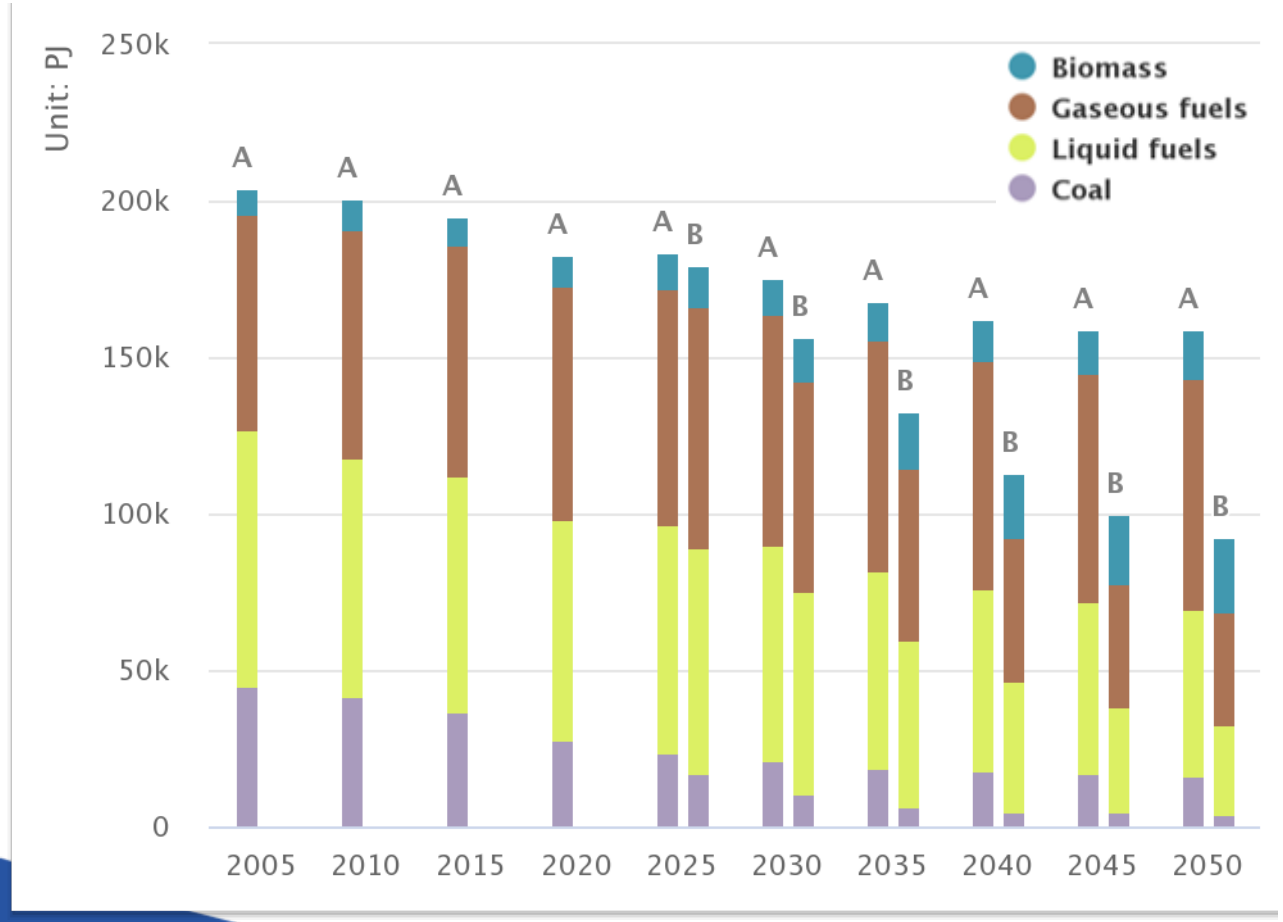
Anthropogenic emissions of methane



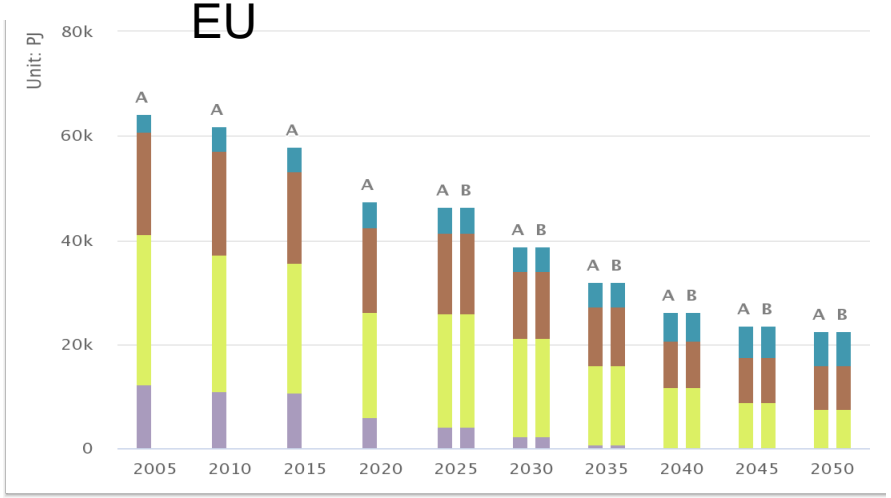
Fossil fuel use in the scenarios

[A] – *Baseline, MFR*
[B] – *Low*

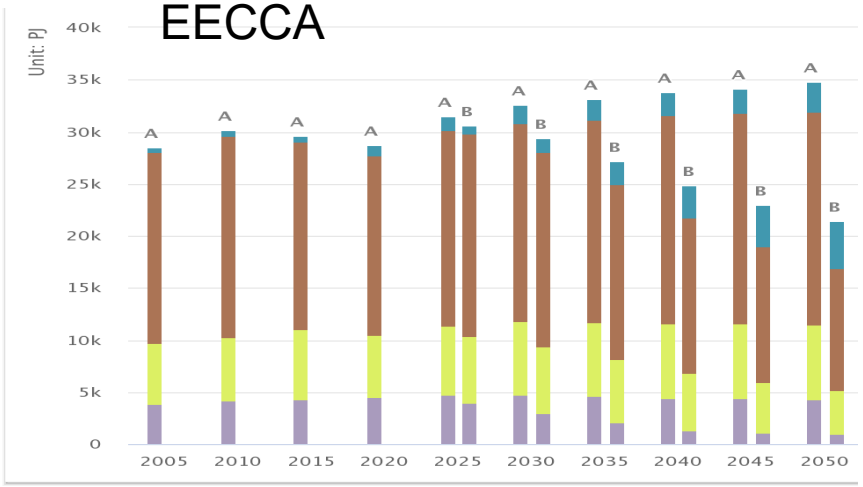
UNECE (including North America)



EU

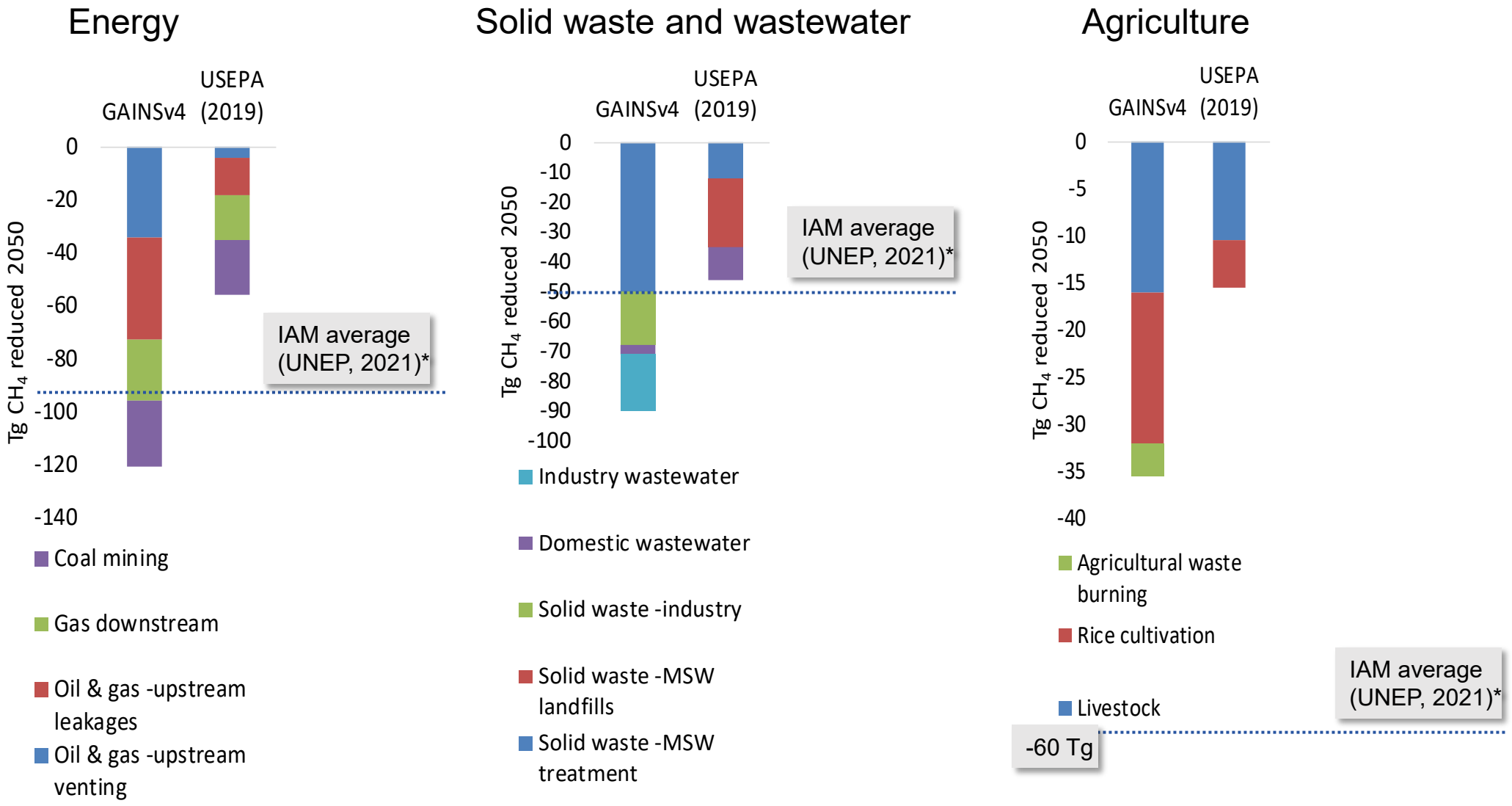


EECCA



Global CH_4 mitigation potential estimates – 2050

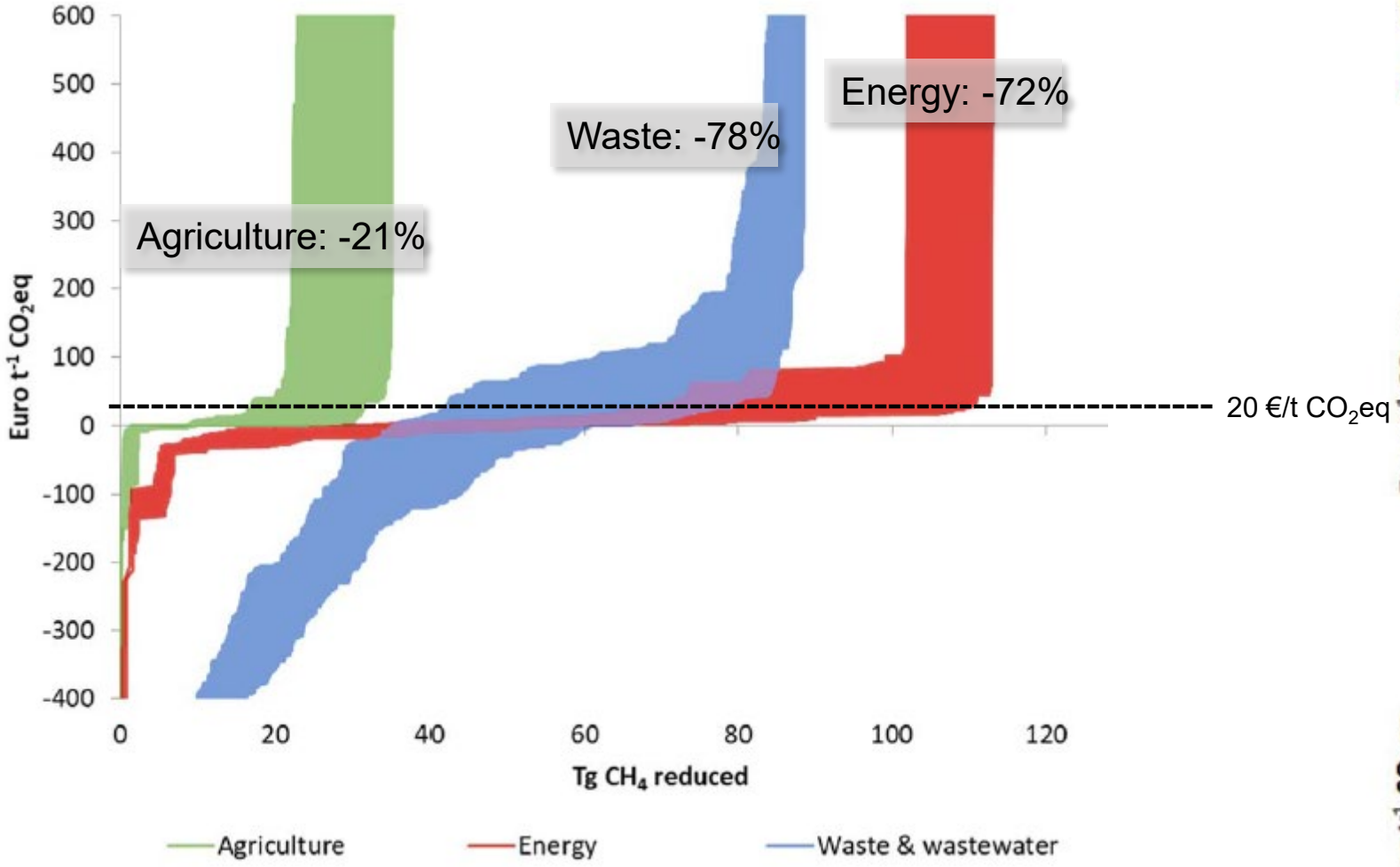
(estimates of mitigation potential for 2030 are quite similar)

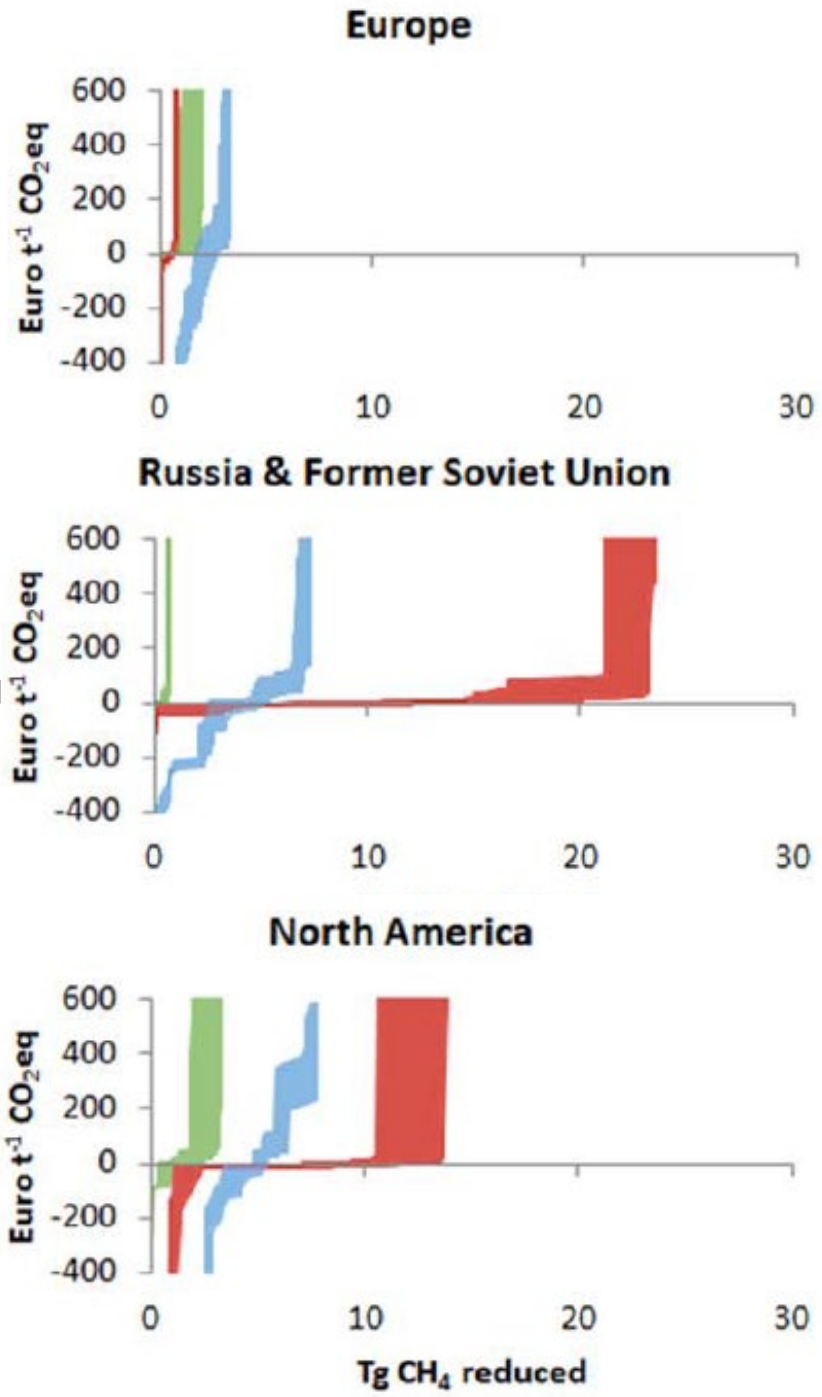


* Global Methane Assessment (UNEP, 2021)

Source: GAINSv4; Höglund-Isaksson et al., 2020 (https://doi.org/10.1088/2515-7620/ab7457)

Marginal abatement cost curves (ranges*) for global and regional CH_4 mitigation in 2050





* Ranges reflect private sector (upper) and social planner (lower) investment perspectives as well as inclusion of technological progress/development

Source: GAINSv4; Höglund-Isaksson et al., 2020 (https://doi.org/10.1088/2515-7620/ab7457)

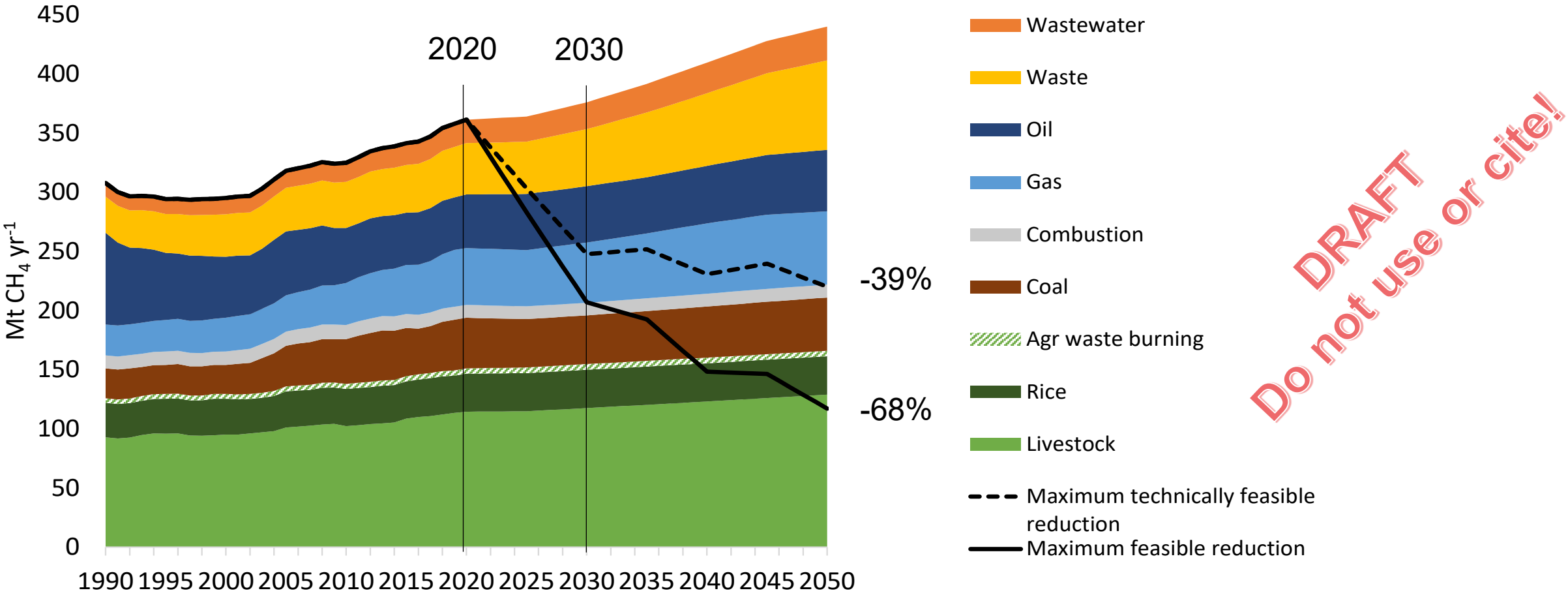
New (not published yet) work on methane

Exploring potential for technical and non-technicalCH4 mitigation and its impacts

L. Hoglund-Issakson and Chris Smith

Global anthropogenic CH_4 emissions, changes from 2020:

Baseline (IEA-WEO 2021 NPS):	+4% (to 2030)	+22% (to 2050)
Maximum **technically** feasible reduction:	-31% (to 2030)	-39% (to 2050)
Maximum feasible reduction **incl. non-technical**:	-43% (to 2030)	-68% (to 2050)



Source: IIASA-GAINS

Exploring limits of technical and non-technical CH_4 mitigation options – scenario development:

Assumed order of mitigation adoption:

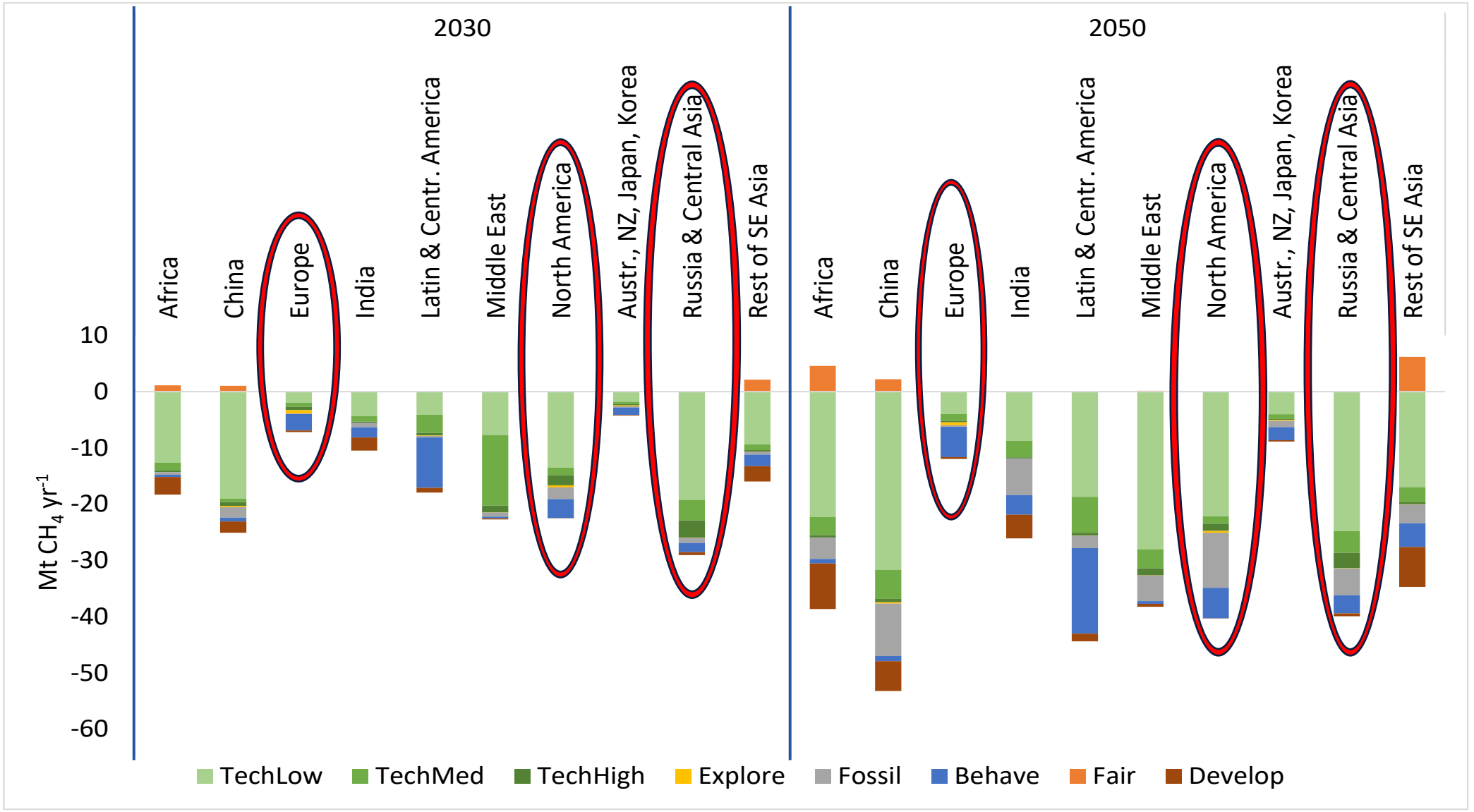
1. **Technical** **"TechLow"**: technical < 20 €/tCO_2eq
   "TechMed": technical 20-100 €/tCO_2eq
   "TechHigh": technical >100 €/tCO_2eq (see Höglund-Isaksson et al., 2020)
2. **"Explore"**: Technologies still in exploration (VAMOX in barns; Improved wood stoves in rich regions)
3. **"Fossil"**: Complete (linear) phase-out of fossil fuels until 2050
4. **"Behave"**: Limit "overconsumption" dairy & beef meat; Food waste -50% in all regions with electricity
5. **"Fair"**: Increase dairy production and consumption in countries with low protein intake
6. **"Develop"**:

Enhance resilience in pastoralist communities to reduce reliance on livestock herds for risk management;

Improve access to electricity to reduce food waste

Extend wastewater treatment to all urban areas

Summary: CH_4 mitigation potentials by Region



Climate impact analysis & uncertainty

GAINS CH_4 mitigation potentials 2020-2050 adapted to the activity drivers of 112 IPCC AR6 scenarios 2020-2100 (with full air pollution information available & fossil fuel drivers)

Temperature impacts assessed using the FAiR (Chris Smith) model (median levels)

Mid-century: Max ~ -0.10°C from technical

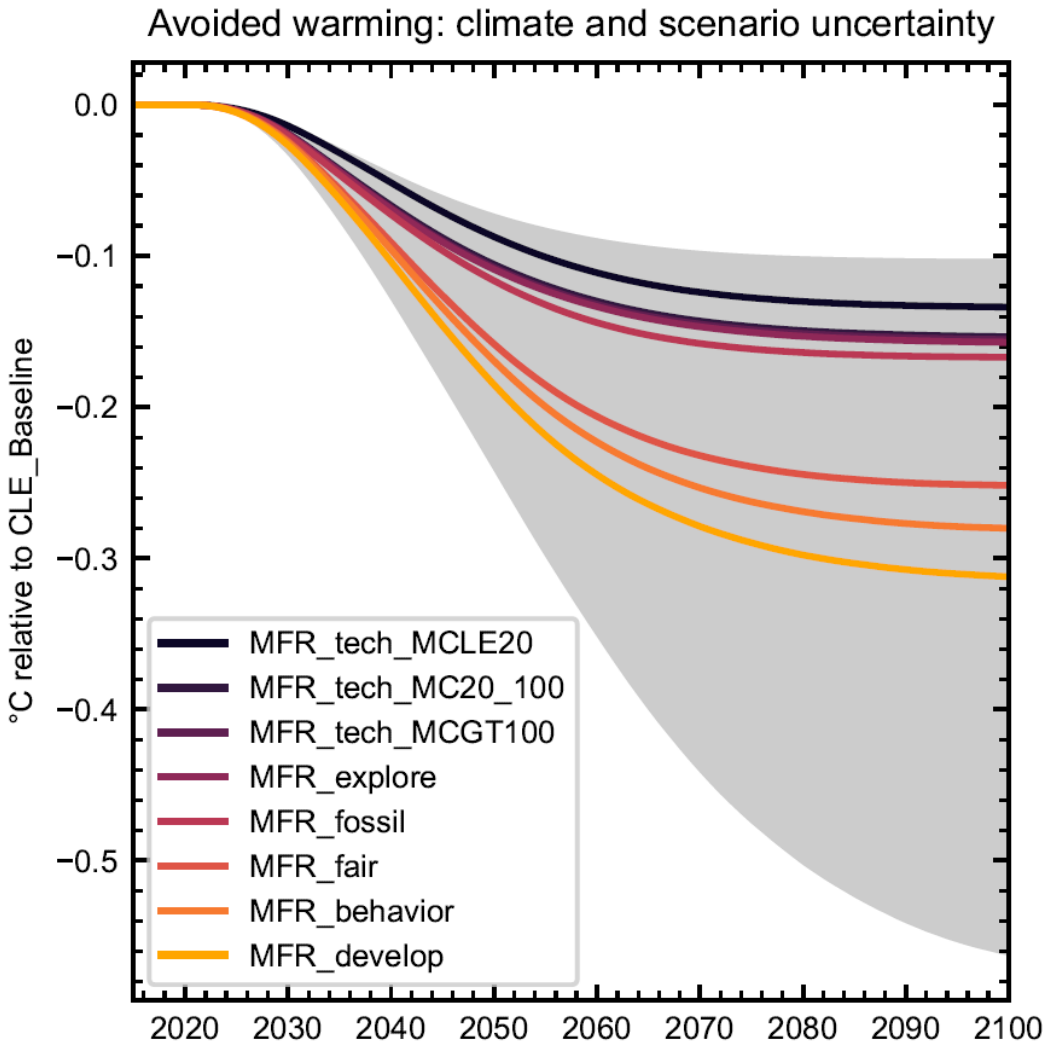
Max ~ -0.20°C from technical+non-technical

End-century: Max ~ -0.15°C from technical

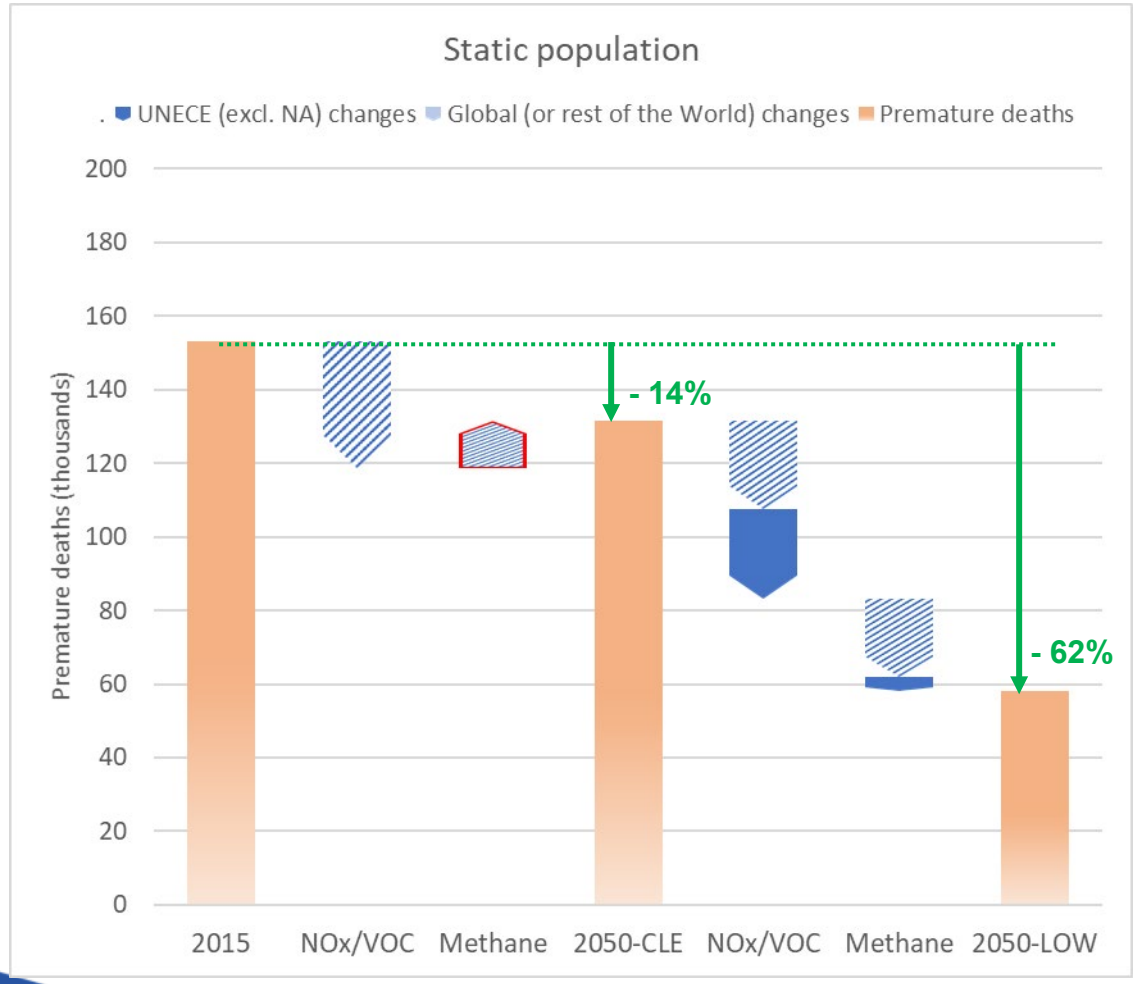
Max ~ -0.30°C from technical+non-technical

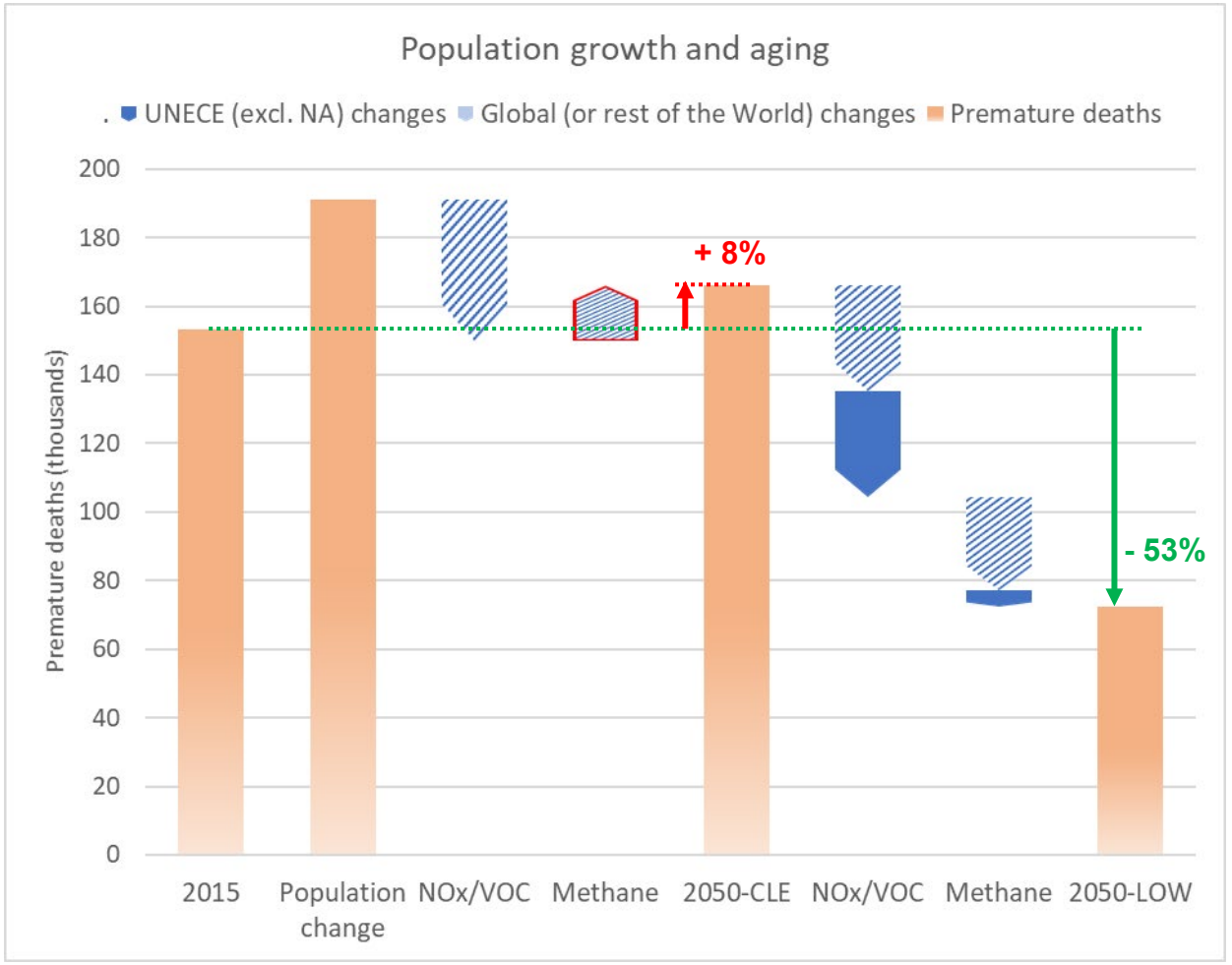
But uncertainty high!

DRAFT
Do not use or cite!



Potential health benefits in the UNECE (excluding North America) of (global) ozone policies





Source: EMEP and GAINS models (MSC-W/CIAM);
Split of impacts from UNECE vs global NOx/VOC reductions preliminary and not yet available for 2015 to 2050CLE case

Summary

- Current baseline estimates show continued growth of global methane emissions with strong regional variation
- Energy transition – decarbonization policies – essential element of successful methane reduction strategy
- Undeniably mitigation potential exists and is well understood in some sectors, e.g., fossil fuel production and distribution, waste management
- Scope and cost of mitigation varies significantly across the regions, but energy, waste, and agriculture are always key
- Large uncertainties in estimates and feasibility of methane mitigation from agriculture sector
- Understanding of scope and costs of non-technical measures (including important regional sensitivities) appears high priority
- Current air pollution policies addressing ozone largely offset by global increase in methane
- Ambitious ozone reduction targets become more dependent on global cooperation to reduce ozone precursors, including methane