Scenarios for further improvements of air quality in Switzerland

IIASA report
commissioned by the
Swiss Federal Office for the Environment

Gaston Theis
45th TFIAM Meeting, Lisbon

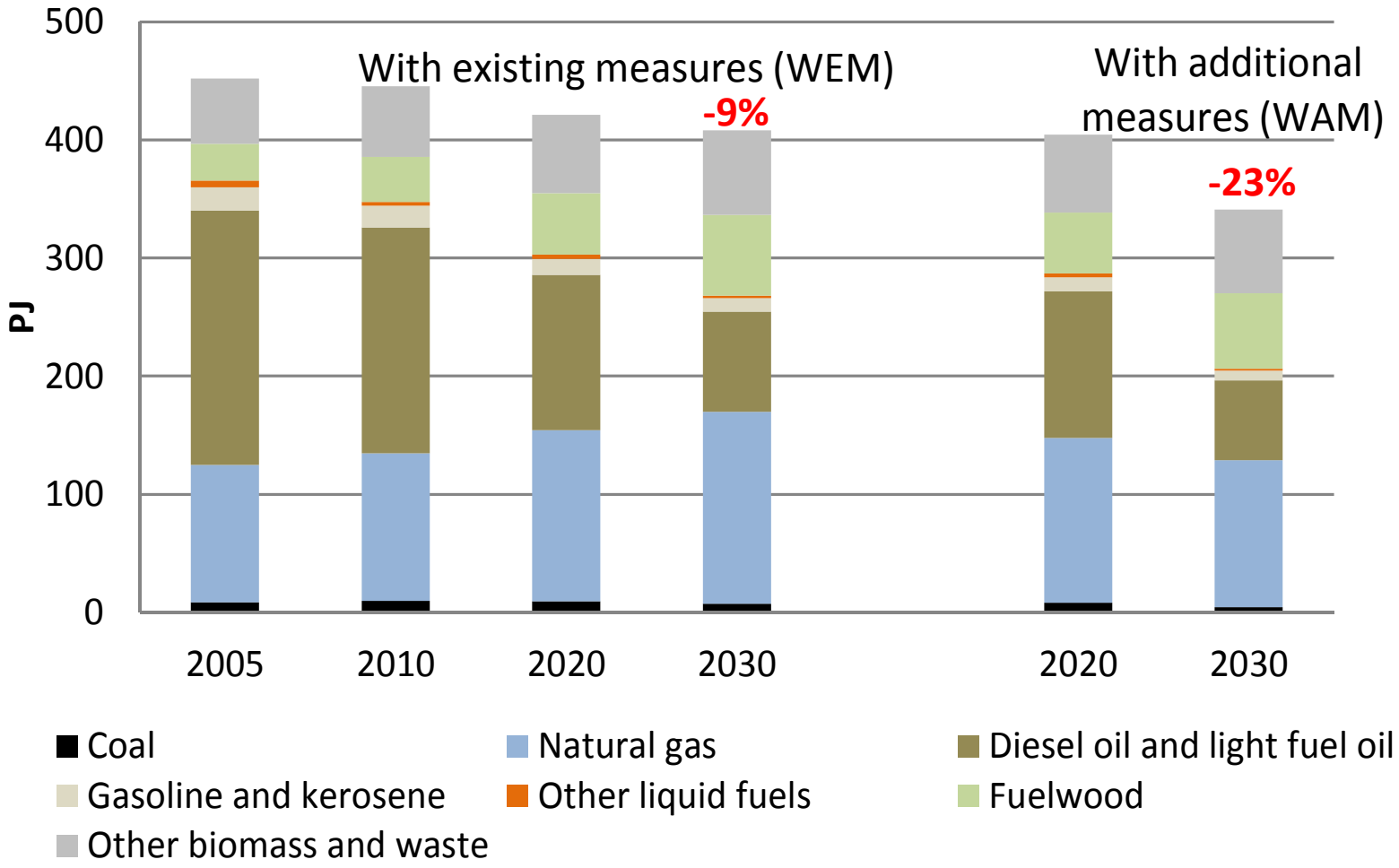
Objectives

- develop reference projection of emissions (REF/WEM) with GAINS
  - with implementation of current air pollution control legislation (CLE)
  - with maximum technically feasible reductions (MTFR)
- develop alternative projection of emissions with assumptions on additional climate & energy policy measures (WAM)
  - with implementation of current air pollution control legislation (CLE)
  - maximum control efforts (MCE)
- evaluate scope for further emission reductions for small wood combustion installations and agriculture
- estimate costs of additional air pollution control measures
- examine compliance of the scenarios with AQ limit values
- examine health and environmental impacts of the scenarios

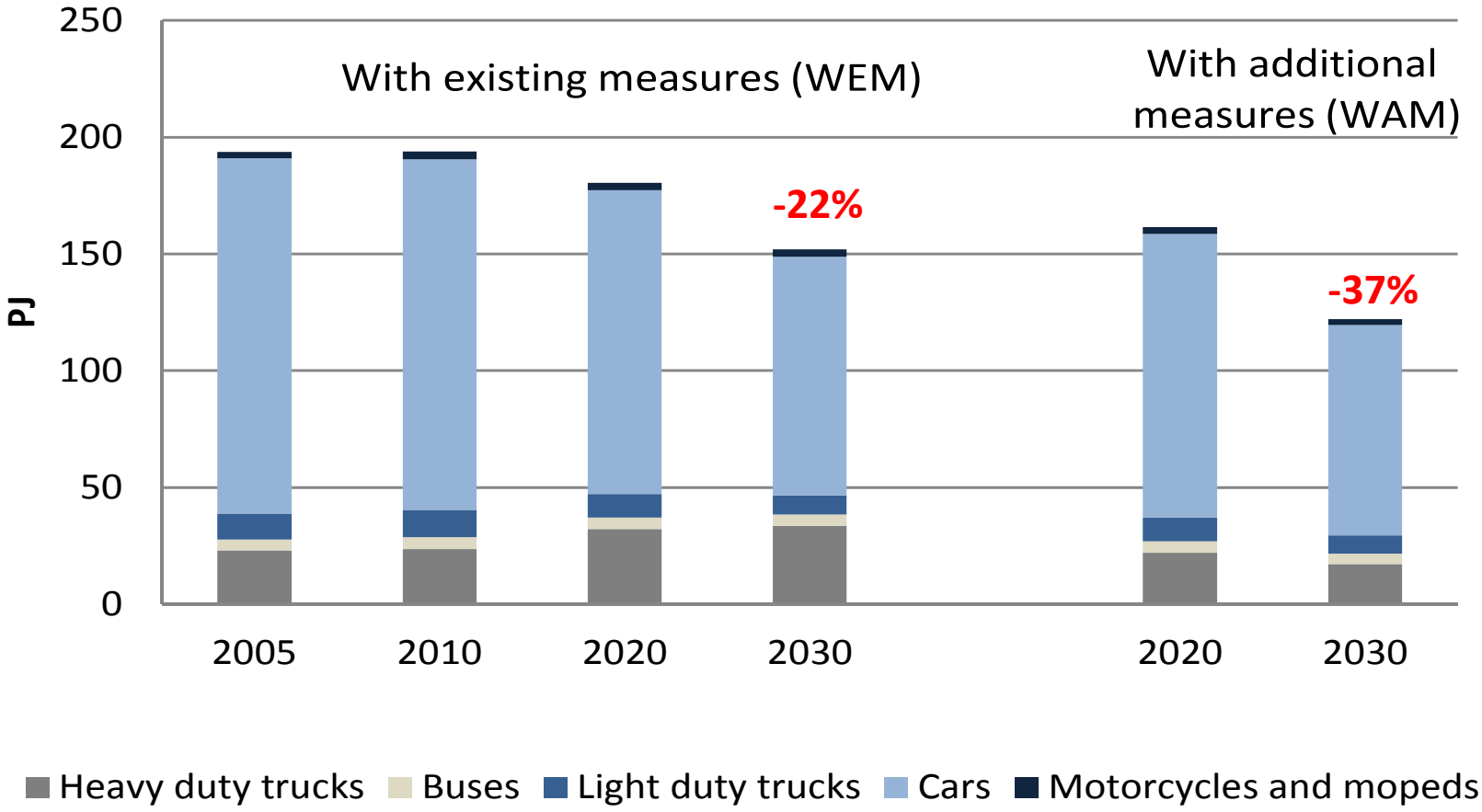
Trend of key factors WEM scenario

Indicator	2010 - 2030
Population	+12%
GDP	+23%
Energy reference area	+22%
Passenger transport (pass.-km)	+24%
Freight transport	+45%

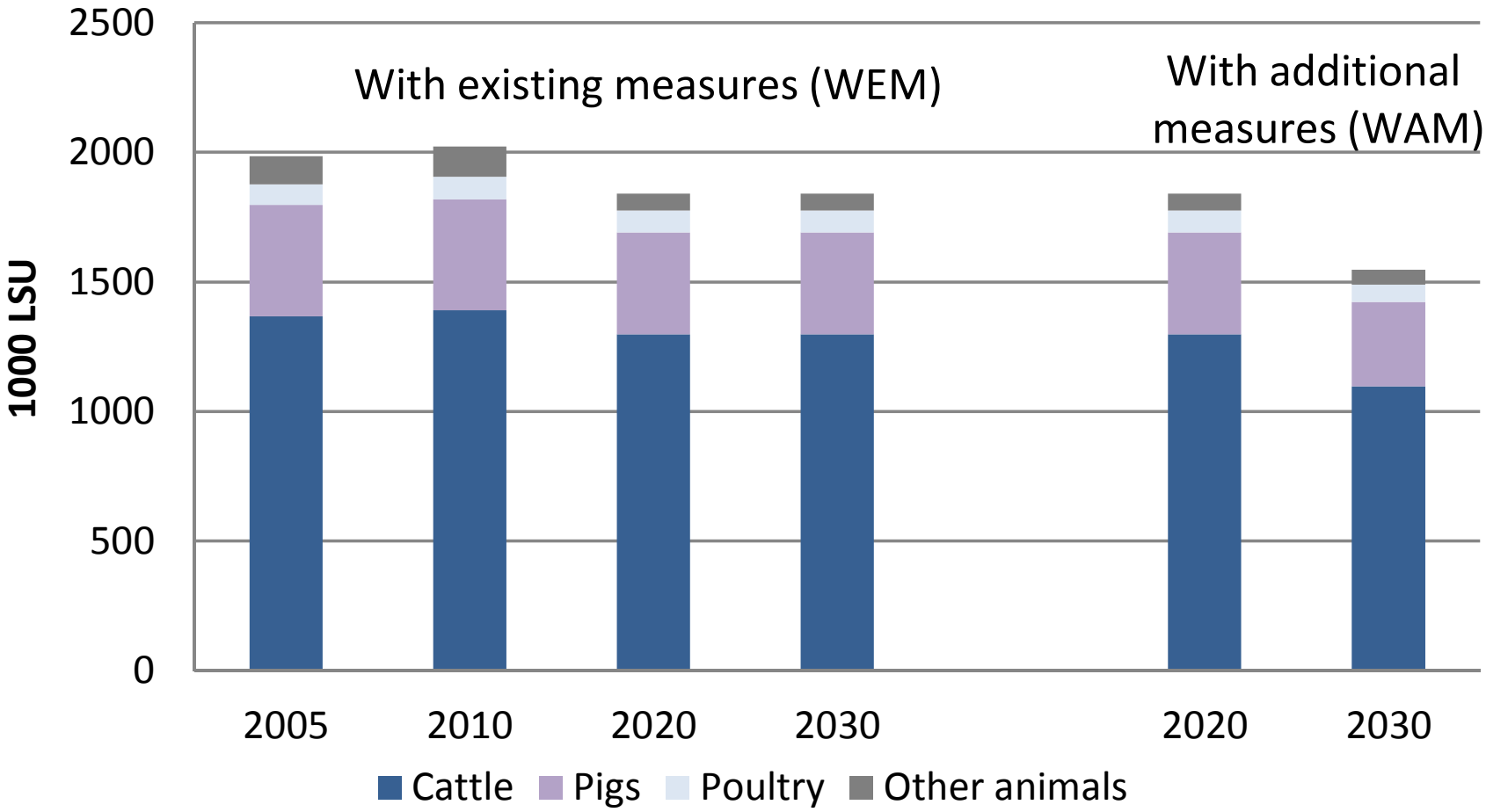
Energy consumption of stationary sources (PJ)



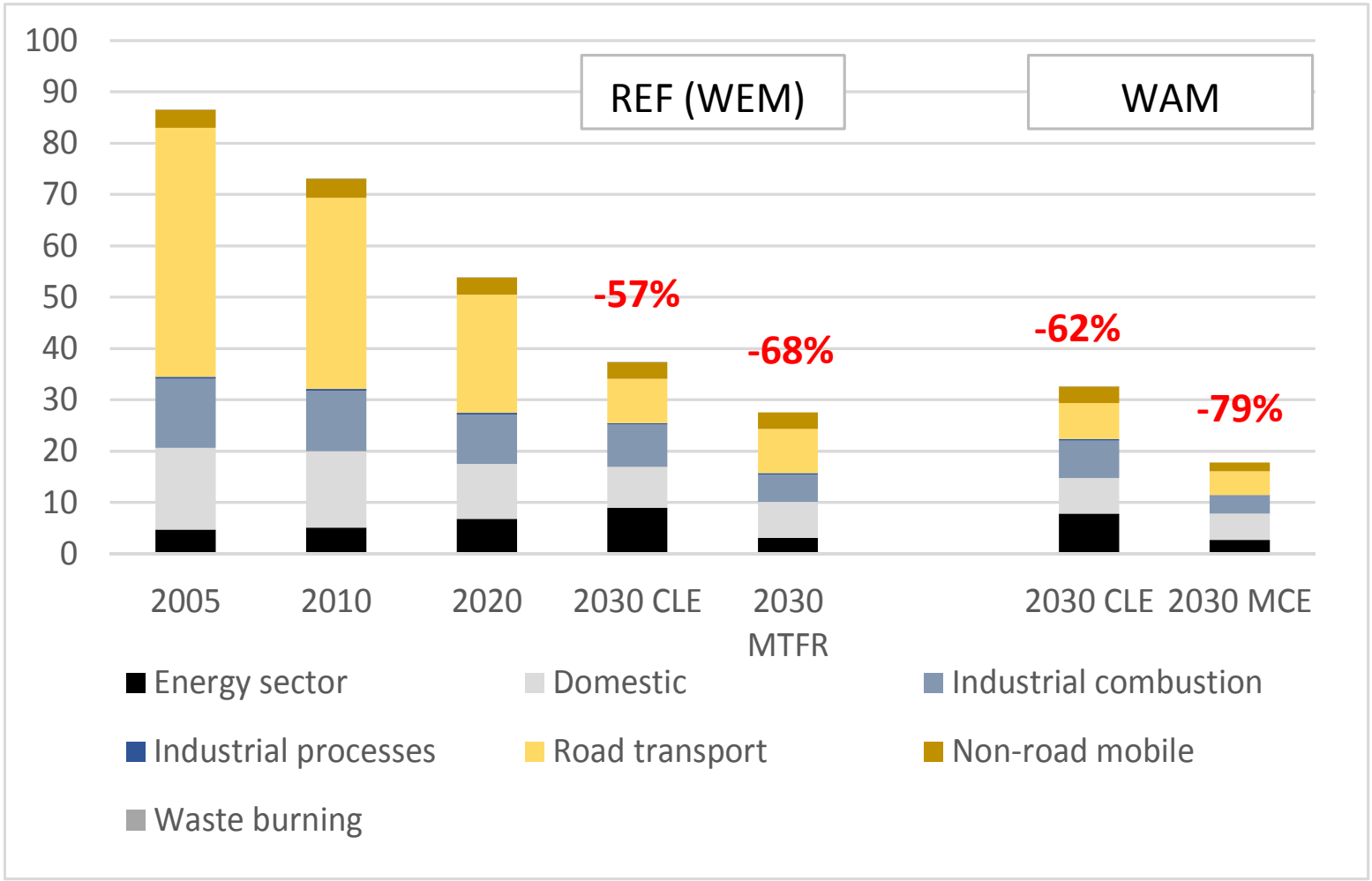
Fuel consumption of road transport (PJ)



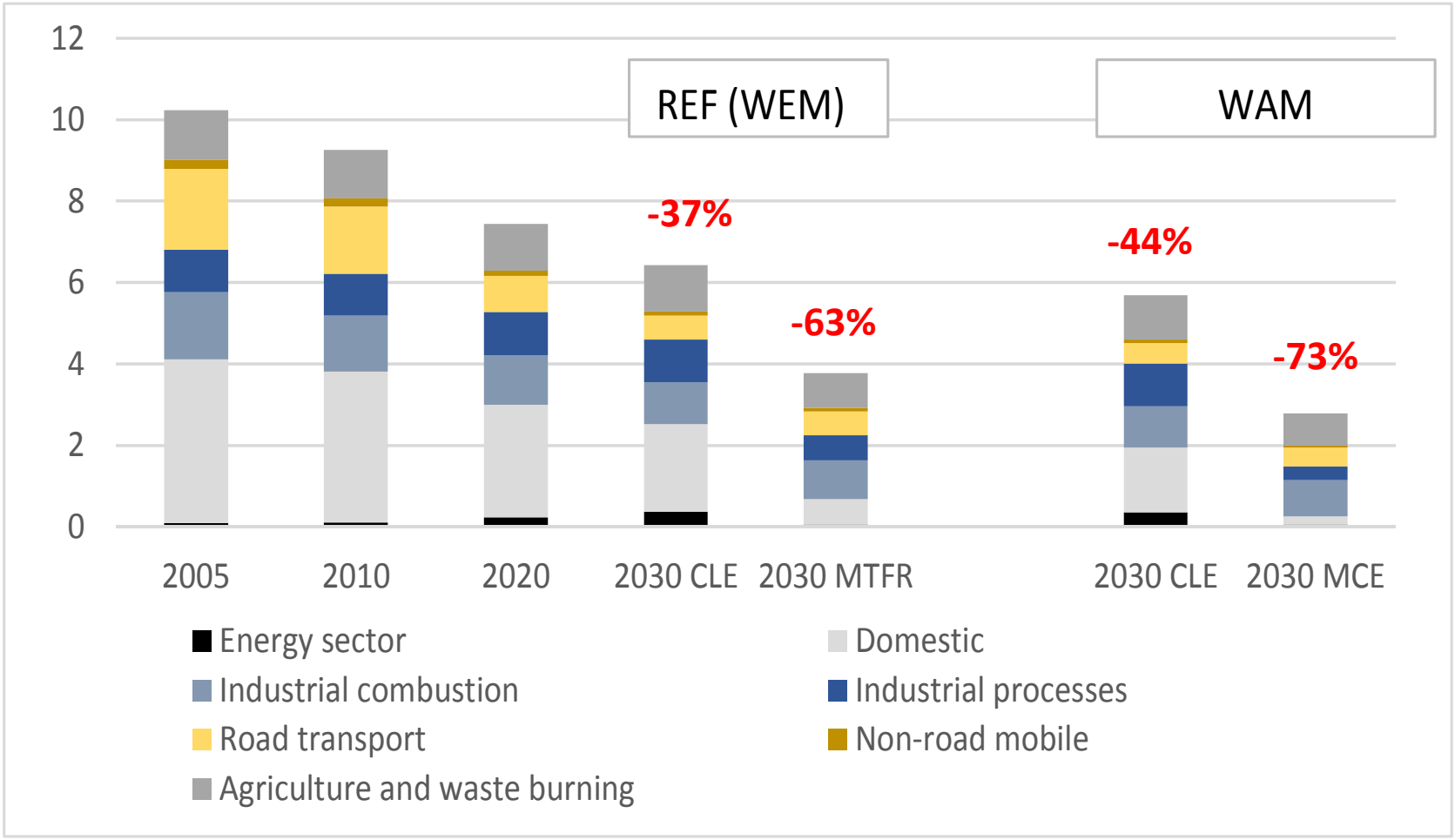
Projection of livestock in Switzerland (1000 livestock units LSU)



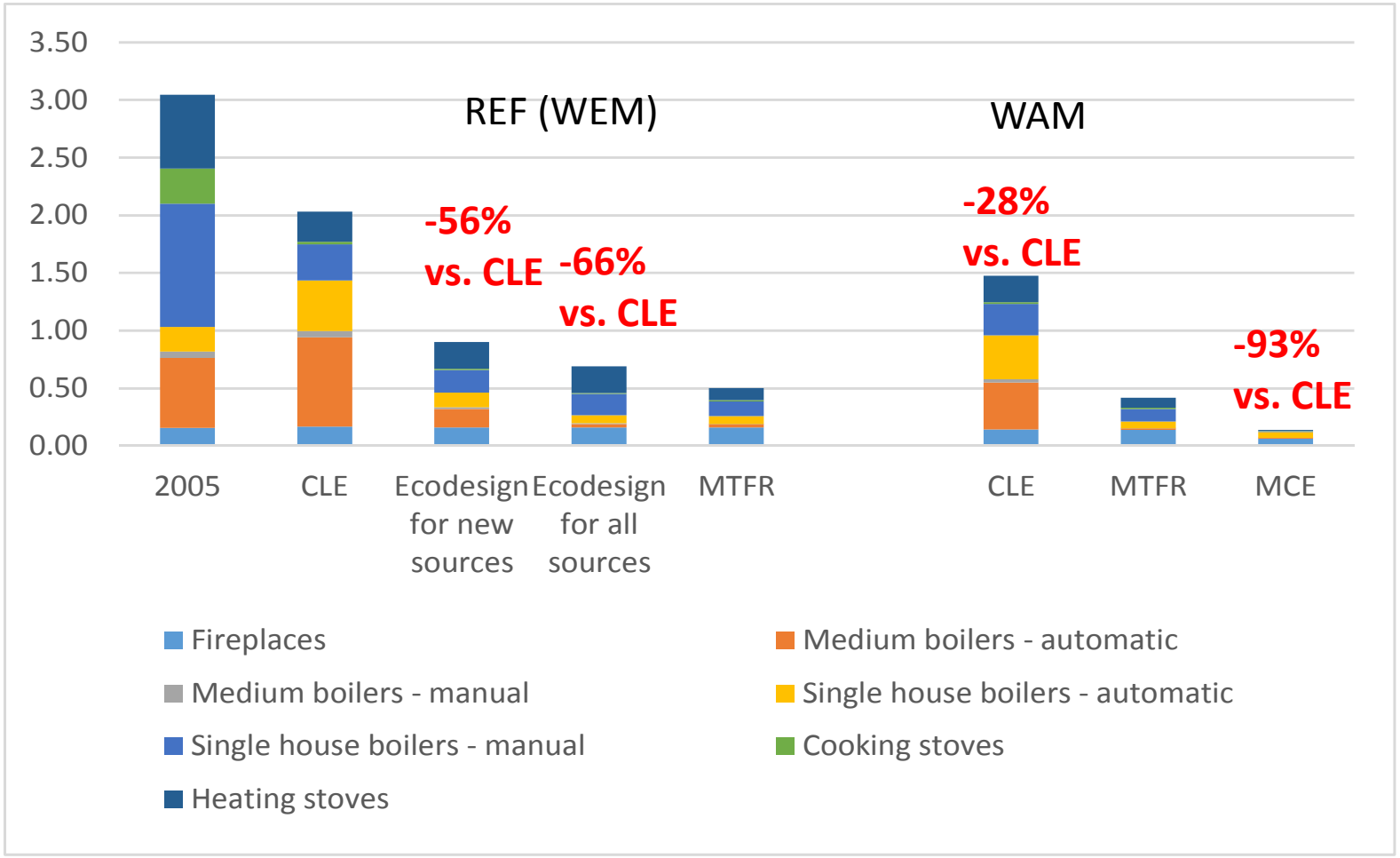
NO_x emissions by sector, current legislation (CLE) vs. MTFR/MCE controls (kt)



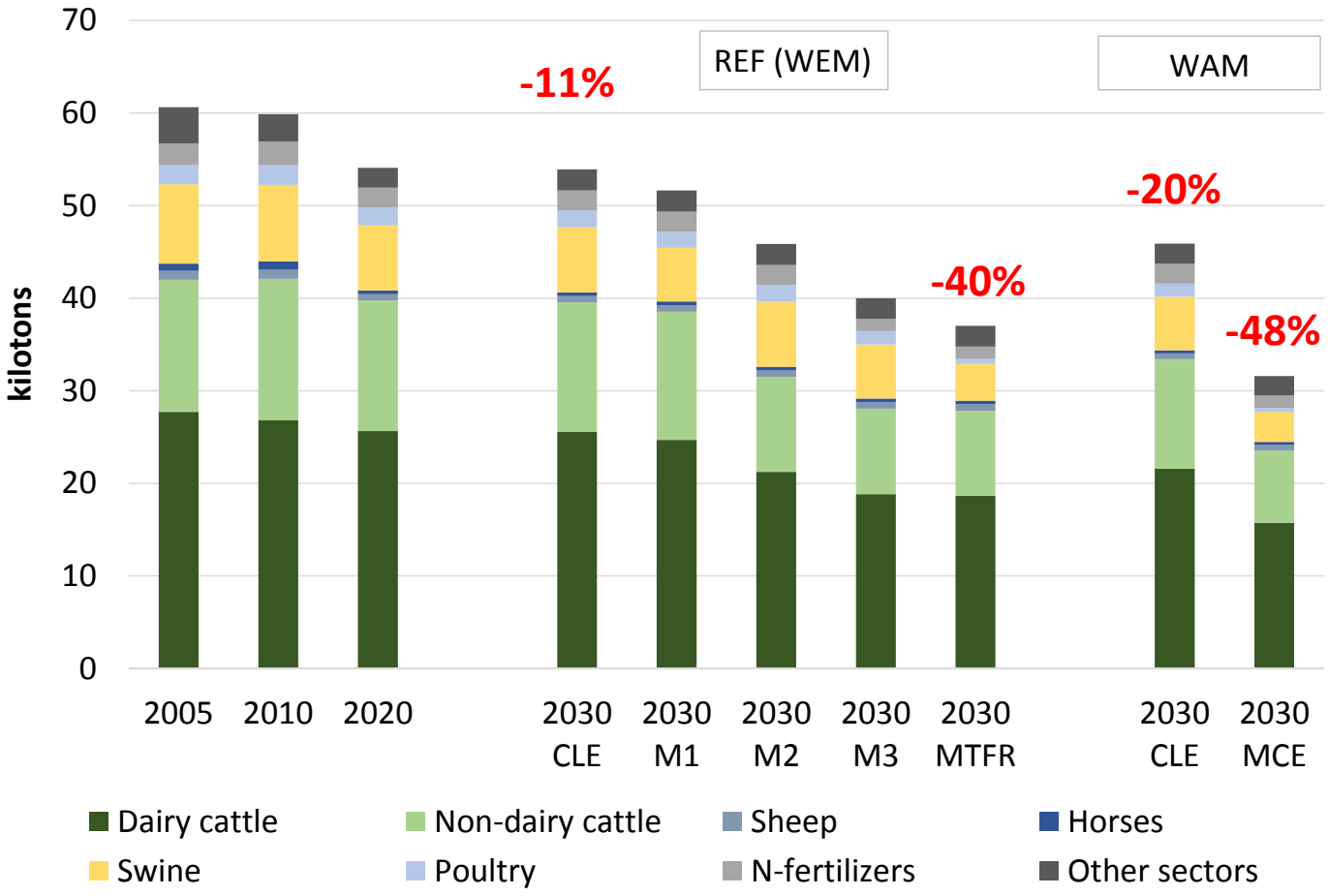
PM2.5 emissions by sector, current legislation (CLE) vs. MTFR/MCE controls (kt)



Emissions of PM2.5 from wood combustion in the resid./comm. sector, 2005 and 2030 [kilotons]



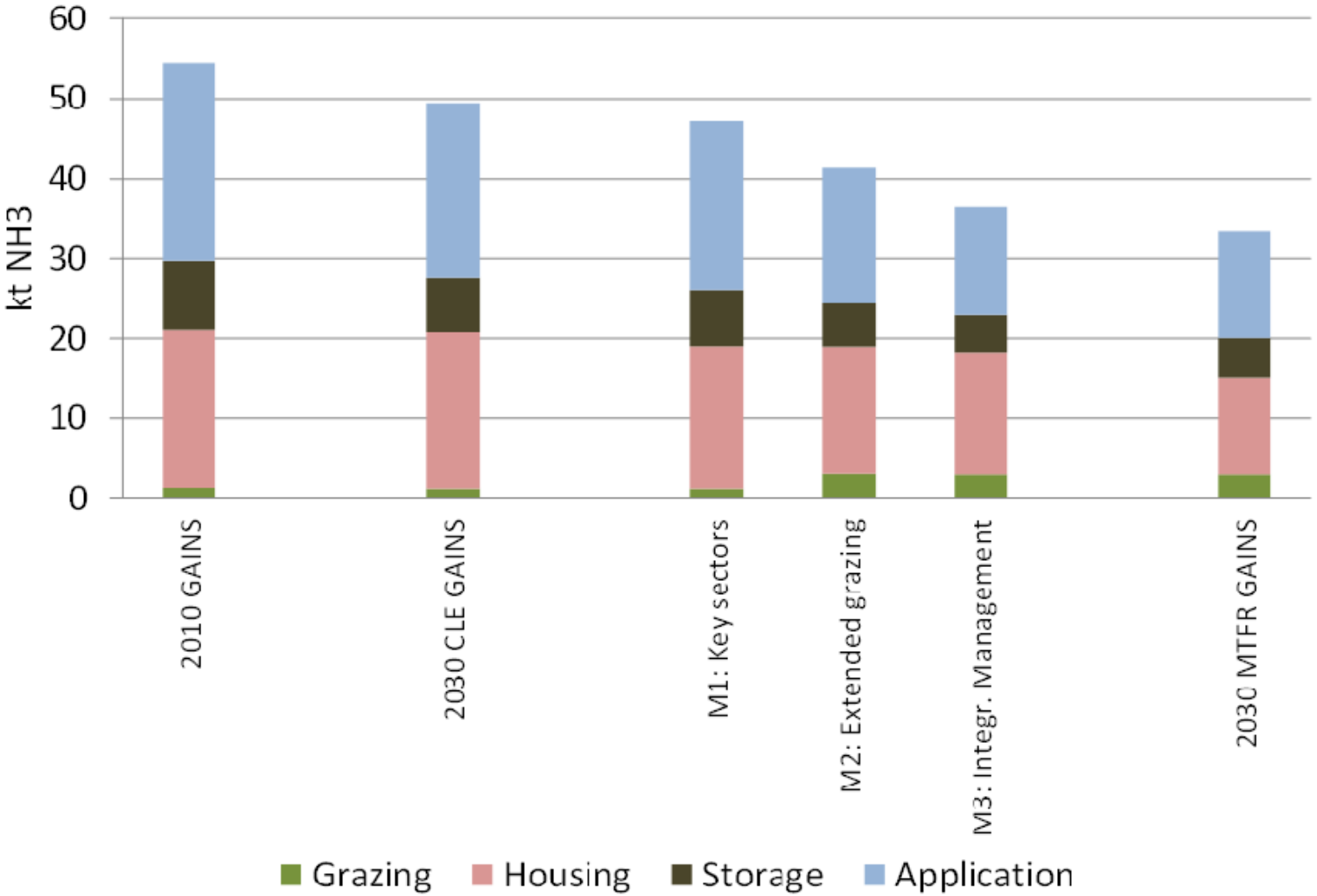
Ammonia emissions by source category [kilotons]



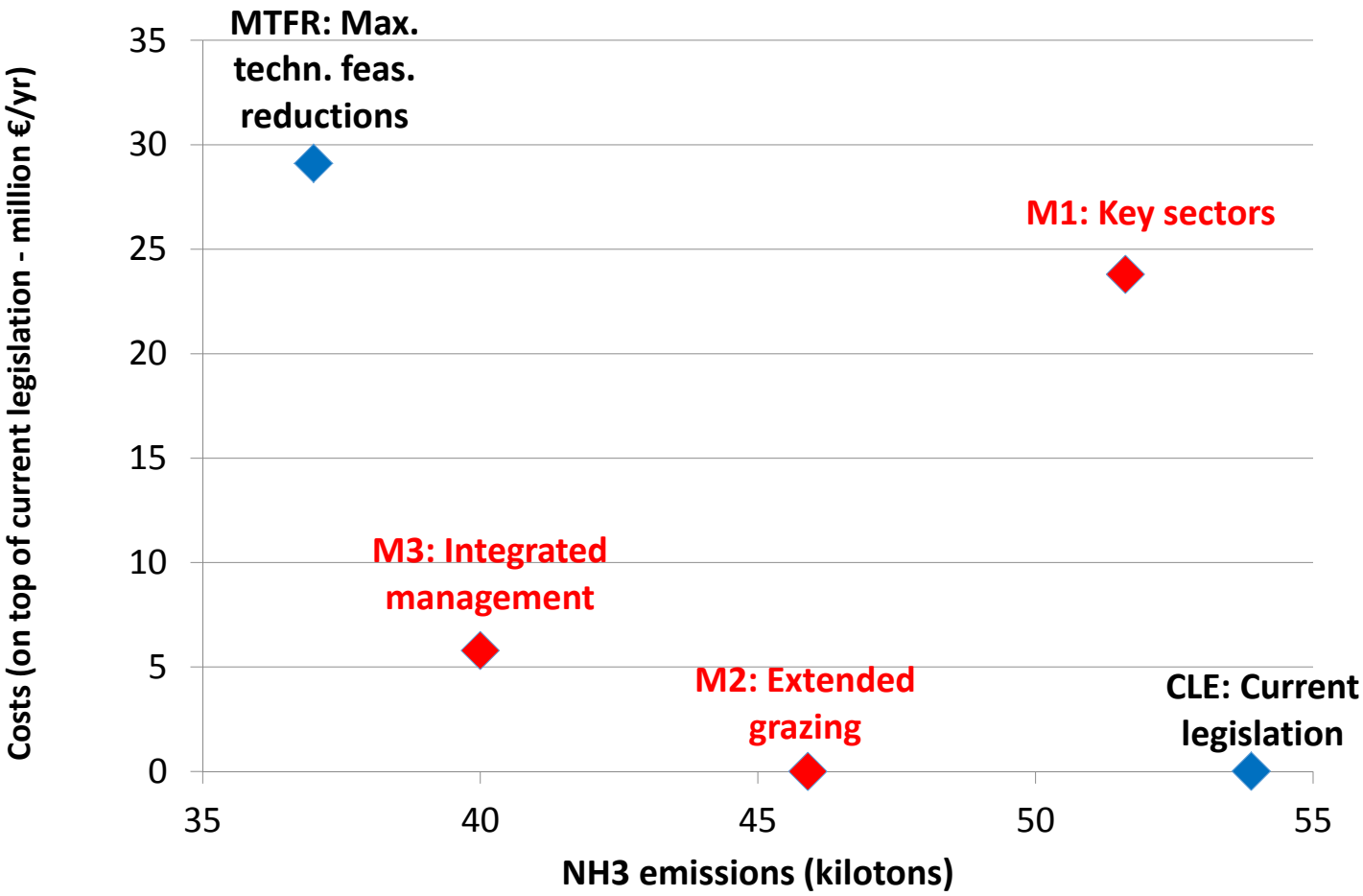
Scenarios for agriculture

- **M1: focus on key sectors** **-5% vs. CLE in 2030**
  - low emission housing
  - low emission slurry application
  - low protein feed
- **M2: extended grazing** **-16% vs. CLE in 2030**
- **M3: integrated management** **-26% vs. CLE in 2030**
  - low protein feed
  - extended grazing
  - tight covered slurry storage
  - deep injection slurry application
  - rapid incorporation of solid manure

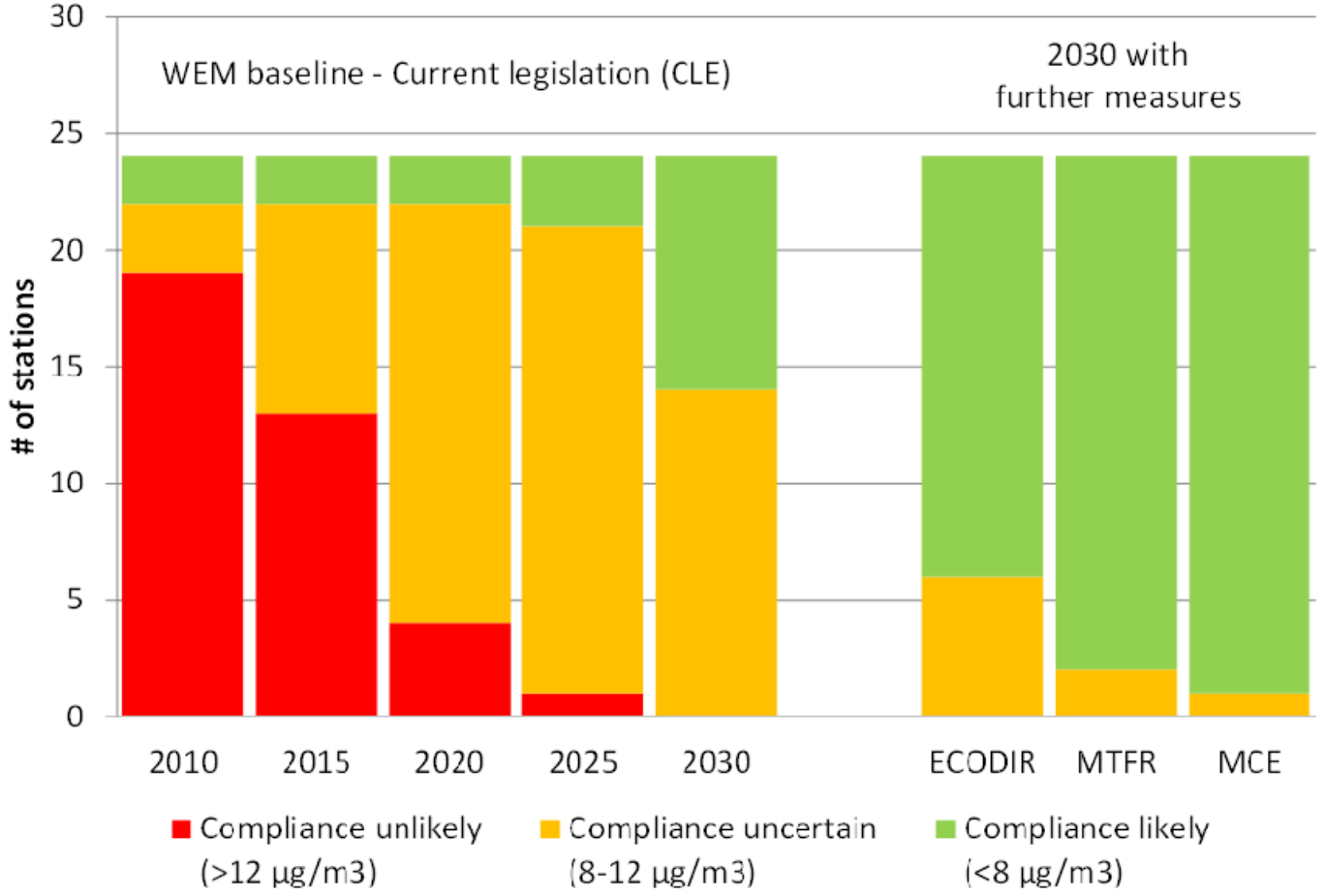
NH_3 emissions from livestock farming



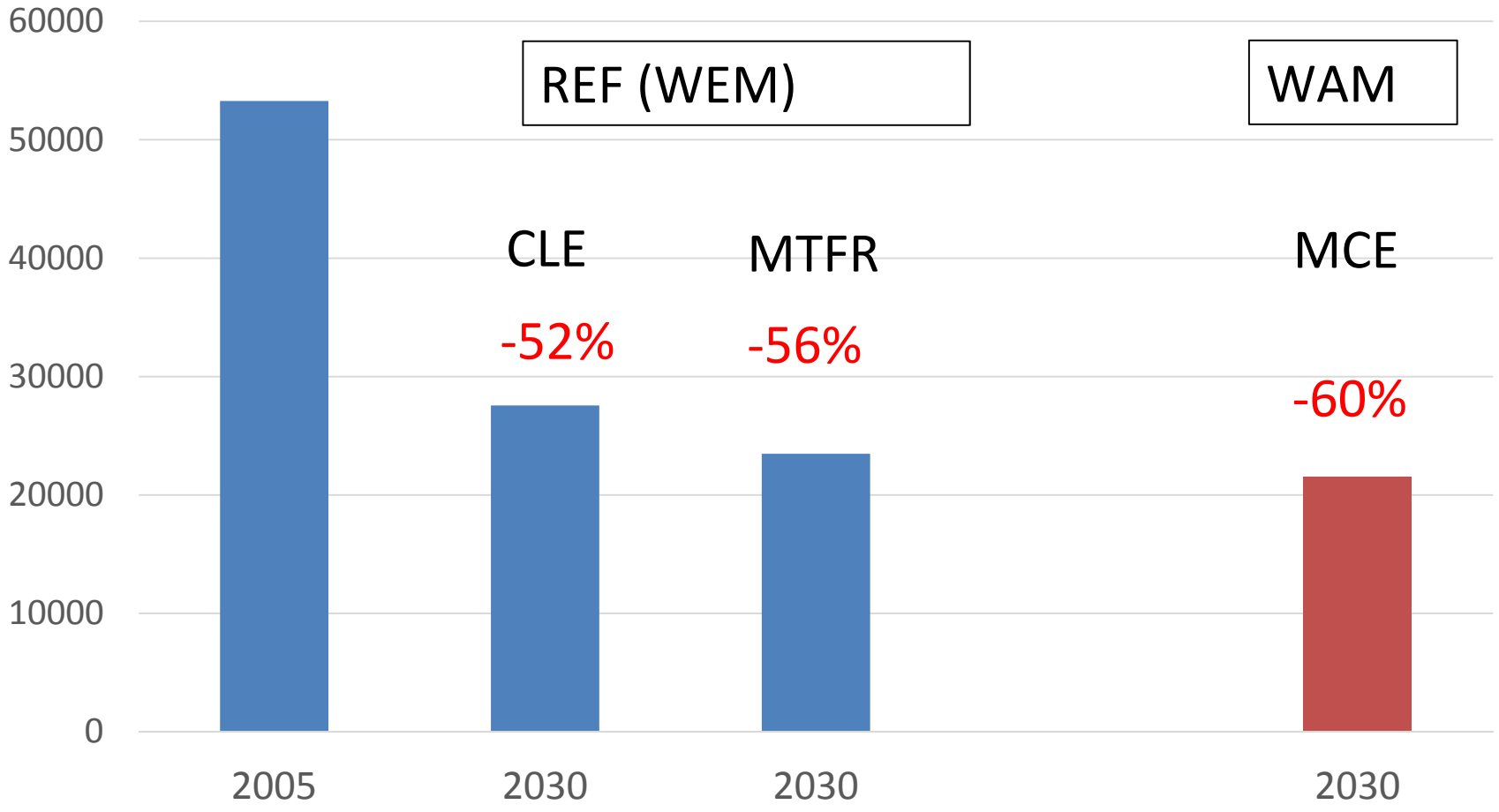
Agricultural NH3 emissions and emission control costs in 2030



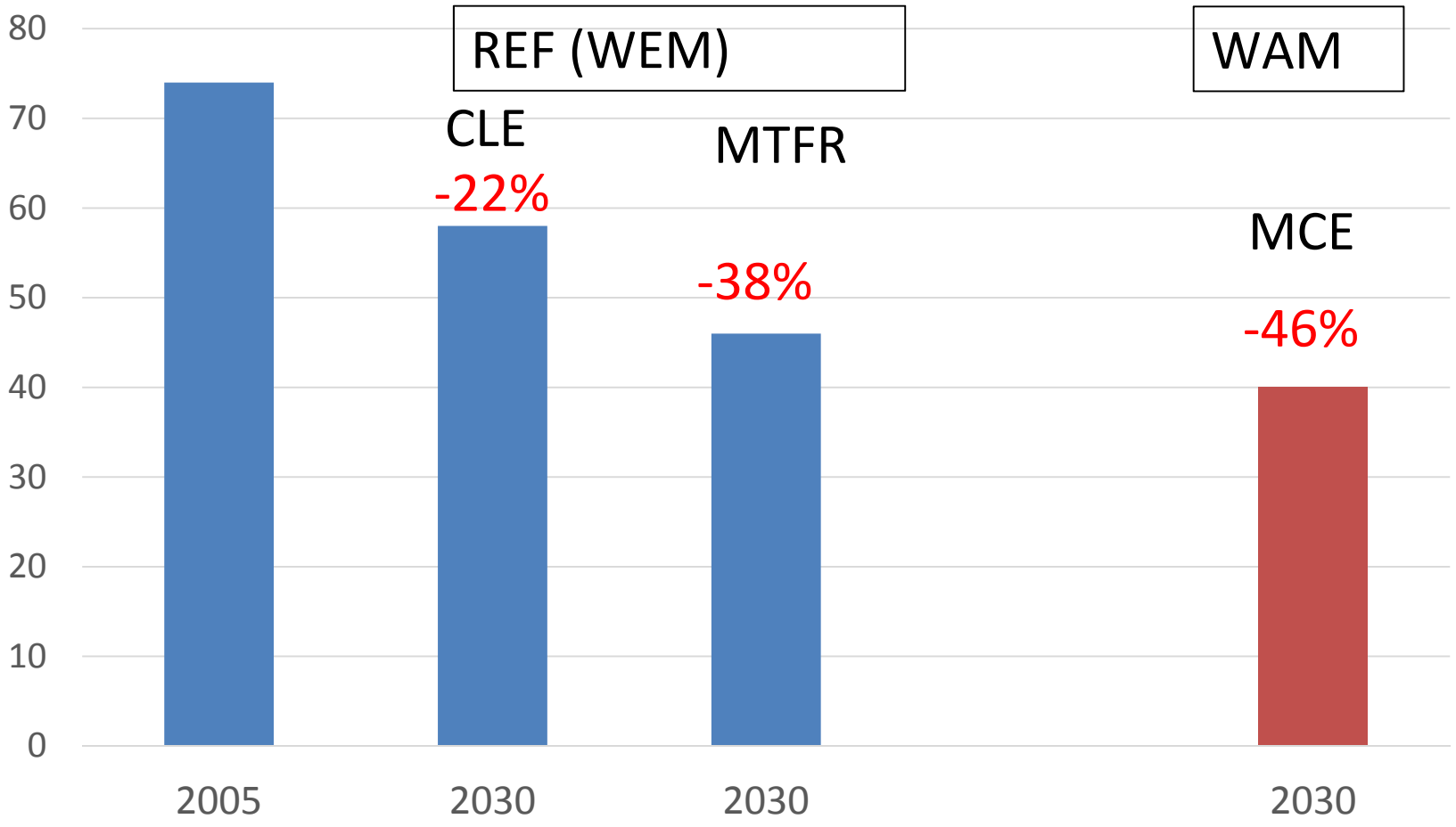
Modeling of compliance with WHO guideline value for PM2.5



Health impacts due to PM (YOLL/yr)



Impacts on ecosystems
(% area with N deposition > CL)



Conclusions

- Reference scenario: substantial health impacts and impacts on ecosystems remain despite significant reduction of emissions by 2030
- Further climate and energy policy measures, together with additional air quality measures would enable likely achievement of AQ limit values for NO_2 and PM10, and WHO guideline for PM2.5
- At a small fraction of costs of MTFR scenario, about half of the potential health benefits could be attained by introducing stricter PM ELVs for small wood combustion installations
- Cost-effective measures are also available to reduce agricultural NH3 emissions by 25% beyond current legislation

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