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

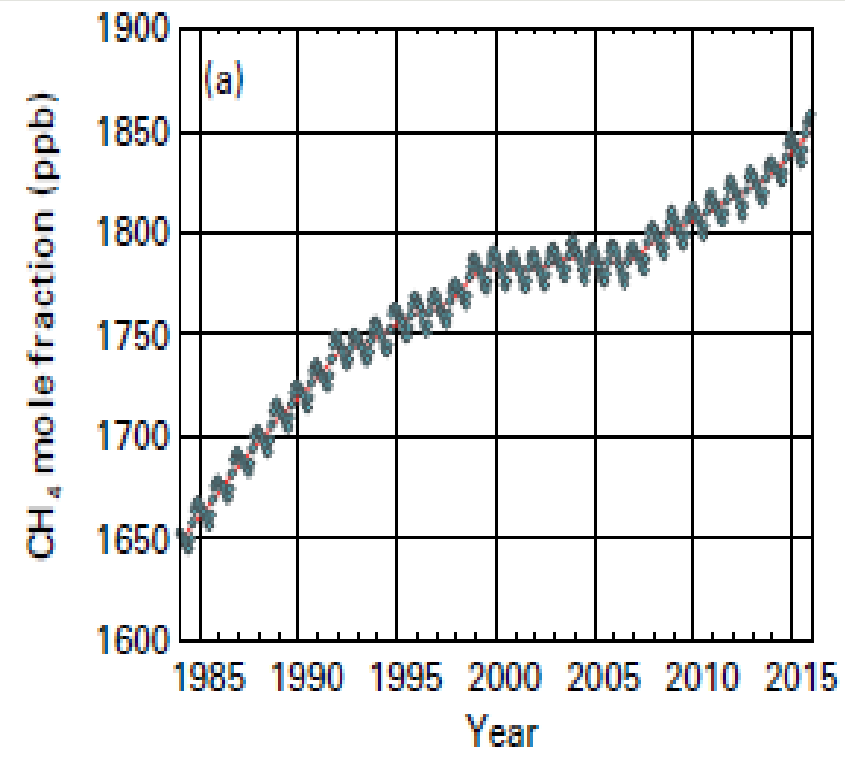
science for global insight

# Scope for future $CH_4$ emissions

Lena Höglund-Isaksson, Markus Amann
EMEP Centre for Integrated Assessment Modelling (CIAM)
International Institute for Applied Systems Analysis (IIASA)

46th Session of the Task Force on Integrated Assessment Modelling, Paris, May 2-3, 2017

# CCAC Science update: Methane emissions

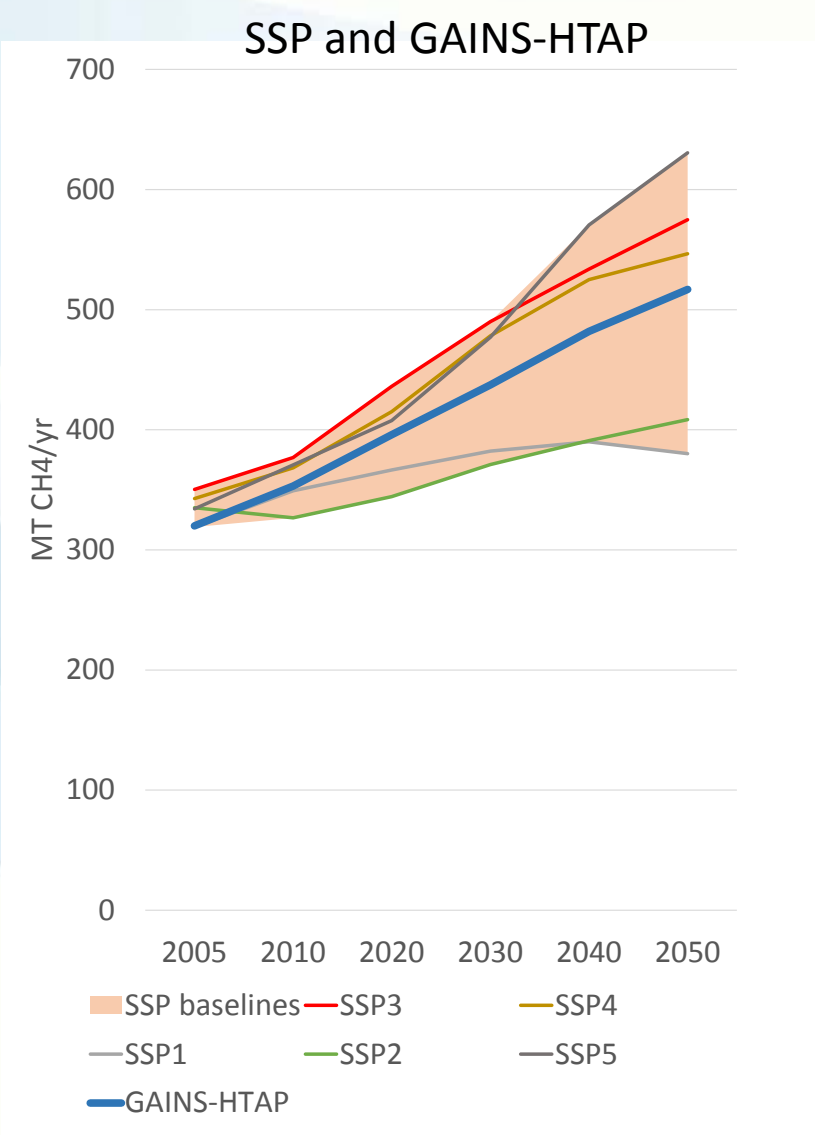


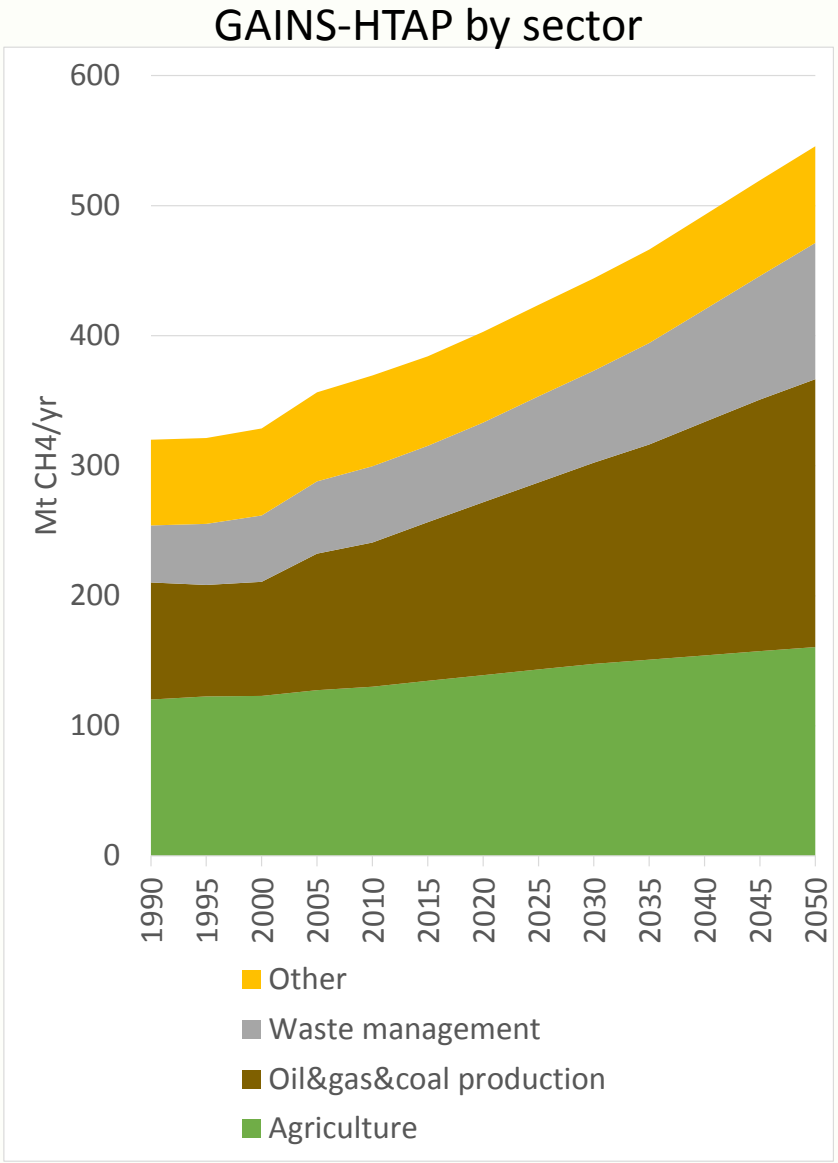

- Concentrations at new high 144% increase compared to pre-industrial

- Studies suggest increased emissions in US and Russia's oil&gas, as well as China's coal sectors are significant contributors.
- Antibiotic use in cattle result in 2x increase in $CH_4$ emissions from dung
- Net global warming impact could be 25% higher due to higher shortwave absorption and positive carbon cycle feedbacks. GPW100 could be 32 up from 28.

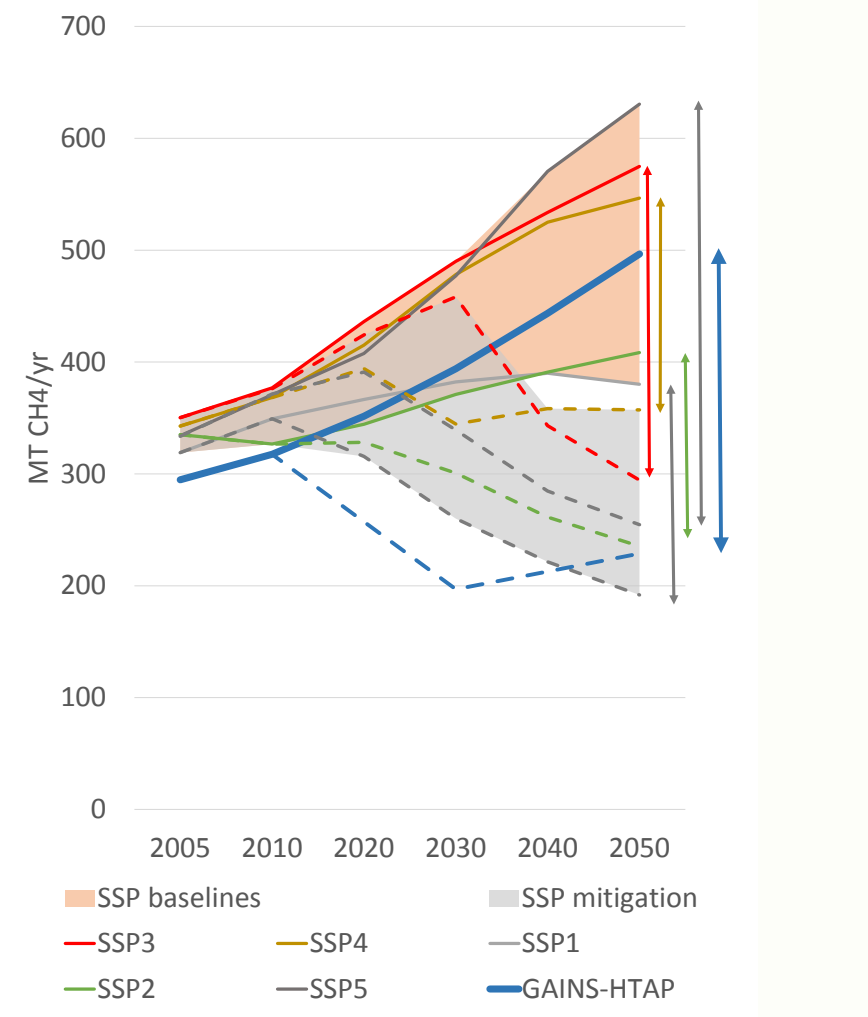
CLIMAT
CLEAN
COALIT
TO REDUCE SHOR

# Global baseline projections of $CH_4$



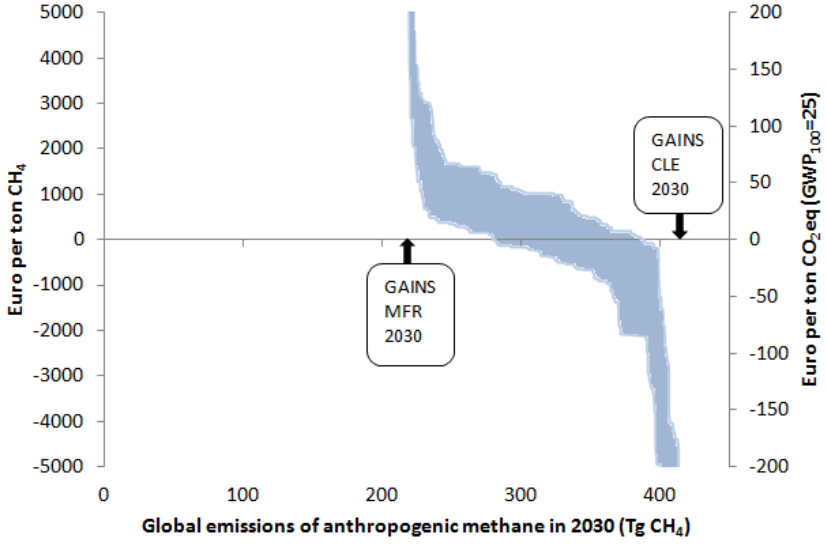



# Mitigation potential for global $CH_4$




- Many measures with low or even negative mitigation costs (e.g., oil&gas production, anaerobic digestion, etc.)

GAINS cost curve for global $CH_4$




Hoglund et al., Atmos. Chem. Phys., 12, 9079–9096, 2012

# CCAC Science update: Mitigation measures

http://www.ccacoalition.org/en/resources/annual-science-update-2016

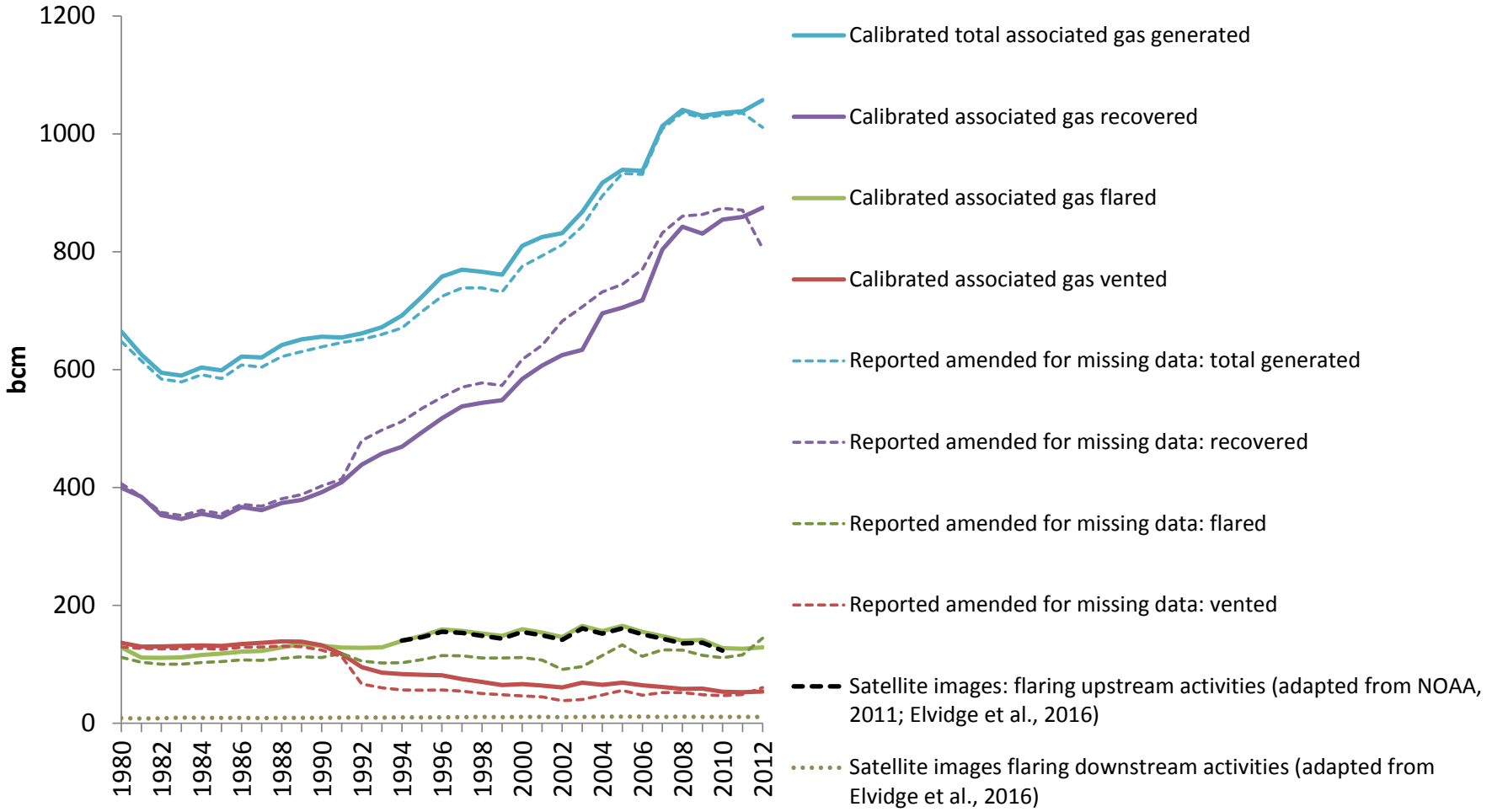
- Converting methane to liquid methanol instead of flaring
- Human dietary changes (up to -70% GHGs from alternative diets)
- Identification and targeting super-emitters in oil and gas production

CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

# ‘Cold venting’ of associated petroleum gas

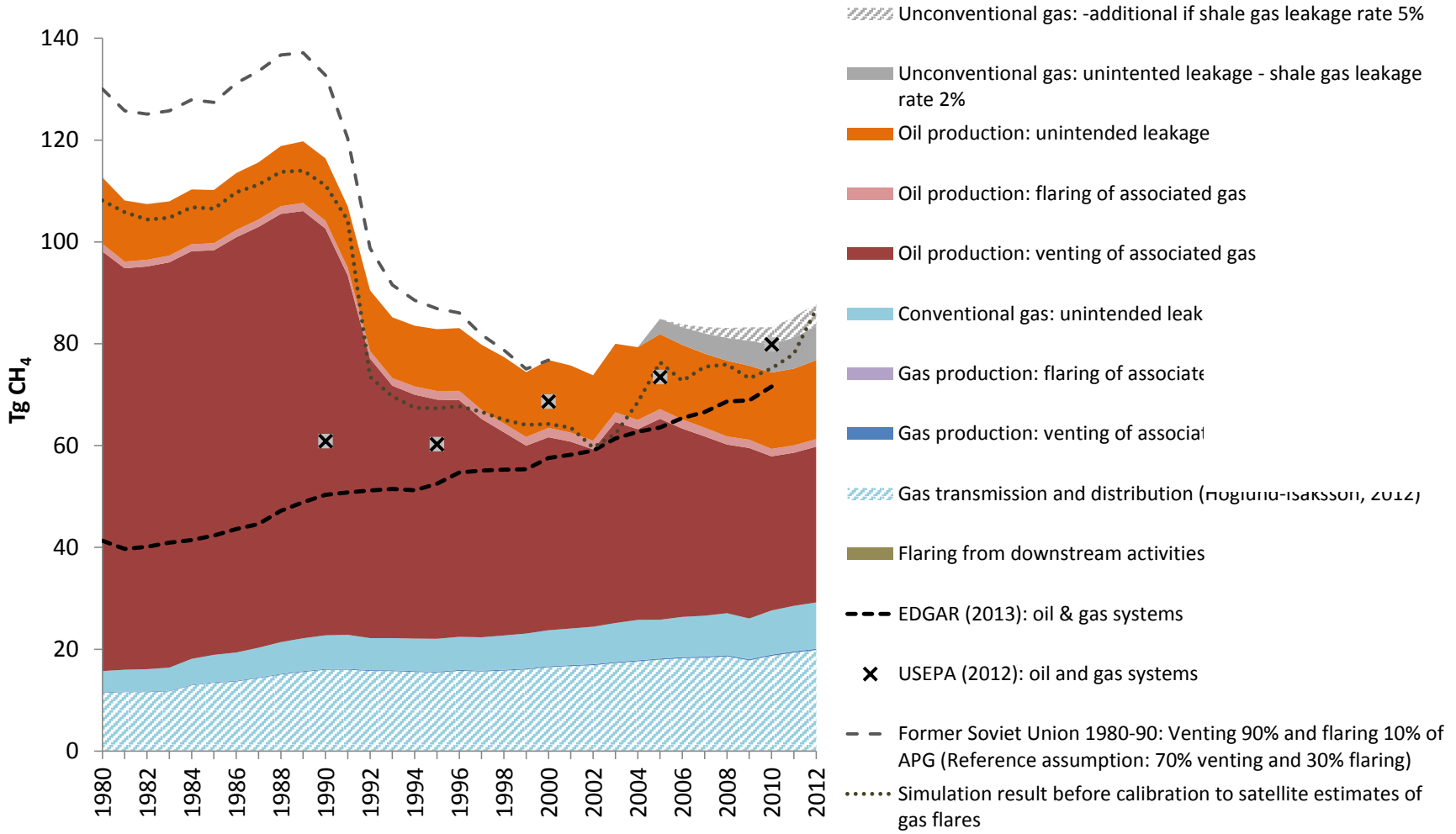
- Existing studies of methane leakage from oil and gas production have assumed associated gas flares run 100% of the time.
- Temporary shut-downs of gas flares due to maintenance activities, unfavorable weather or wind conditions, or too low hydrocarbon content in the gas flow are ignored. During this time gas associated petroleum gas is ‘cold vented’.
- Distribution is highly skewed (5% of sources cause 50% of emissions).
- Höglund-Isaksson L (2017) *ERL* 12 (2):e024007

# Global volumes of associated gas
## 1980-2012




Total generated(blue) = recovered(violet) + flared(green) + vented(red)

# $CH_4$ from methane from oil & gas systems (global) 1980-2012




Red = cold venting of associated petroleum gas
Cold venting due to increased gas recovery

# Findings

- Historical methane emissions from cold venting have been grossly underestimated in existing global emission inventories (i.e., USEPA and EDGAR)
- In 2010, cold-venting of associated gas contributed at least 10% of global anthropogenic methane emissions
- The highly skewed distribution of flare-shut down incidents means compulsory recording of the number and duration of such incidents could lead to cost-effective mitigation strategies (first targeting the few “super-emitting” facilities)
- These findings are not included in GAINS-HTAP scenarios.

# Thank you!

http://gains.iiasa.ac.at