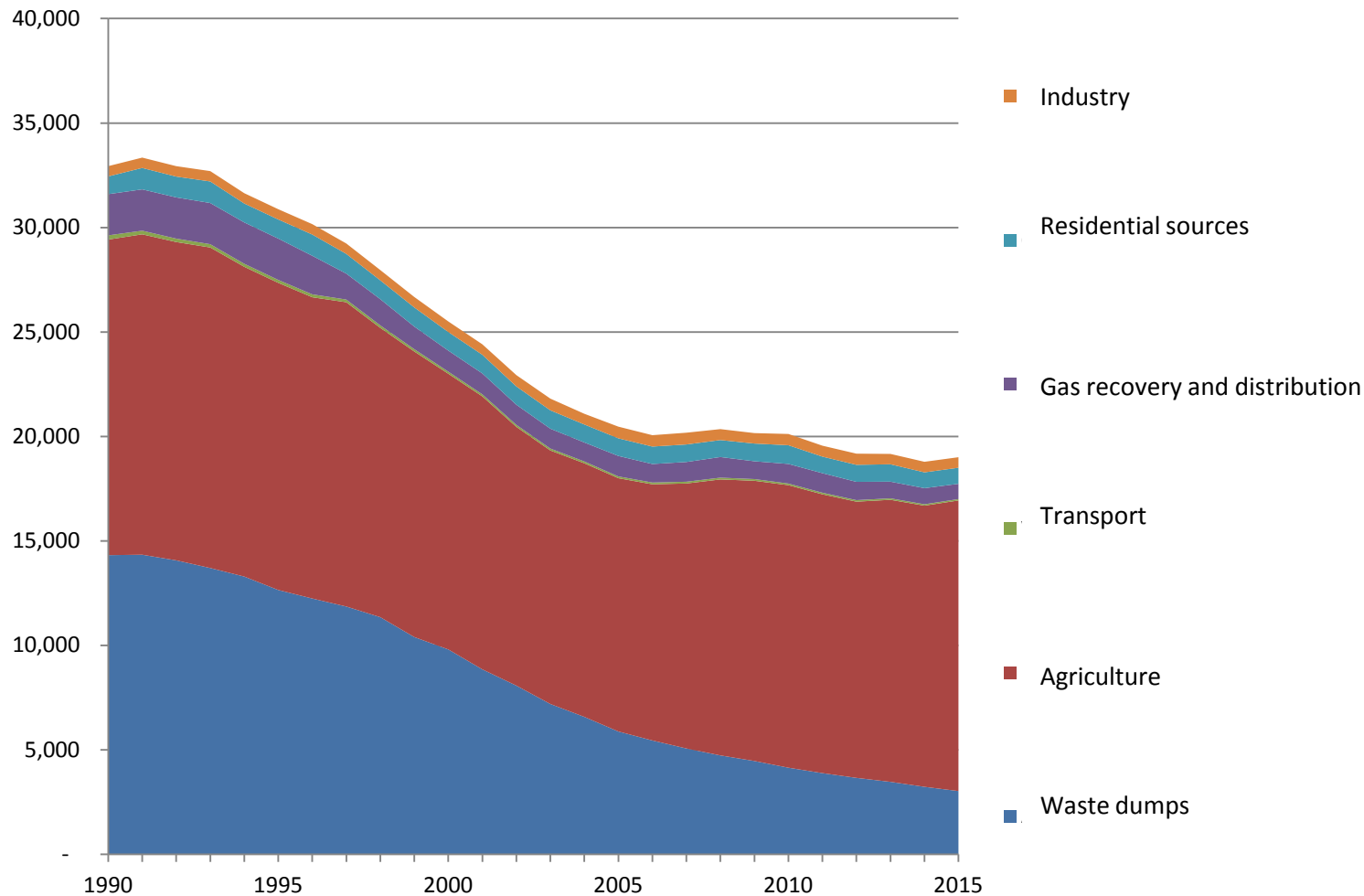


# **Methane scenarios for the Netherlands**

Rob Maas, TFIAM, 3 May 2017

# Methane emission Netherlands (Mton CO<sub>2</sub> eq)



Source: National Emission Inventory

# Uncertainties

- Reported emission trend 1990-2015 based on FCCC-emission factors: -43%
- Emission trend based on measurements and inversed modelling: -20%

(Bergamaschi et al, <http://www.atmos-chem-phys.net/15/715/2015/acp-15-715-2015.pdf>)

*Do we overestimate efficiency of gas recovery from waste? (+/- 21%)*

*Do we underestimate emissions from cattle? (+/-24%)*

# Methane emissions from agriculture (kg CH<sub>4</sub>)



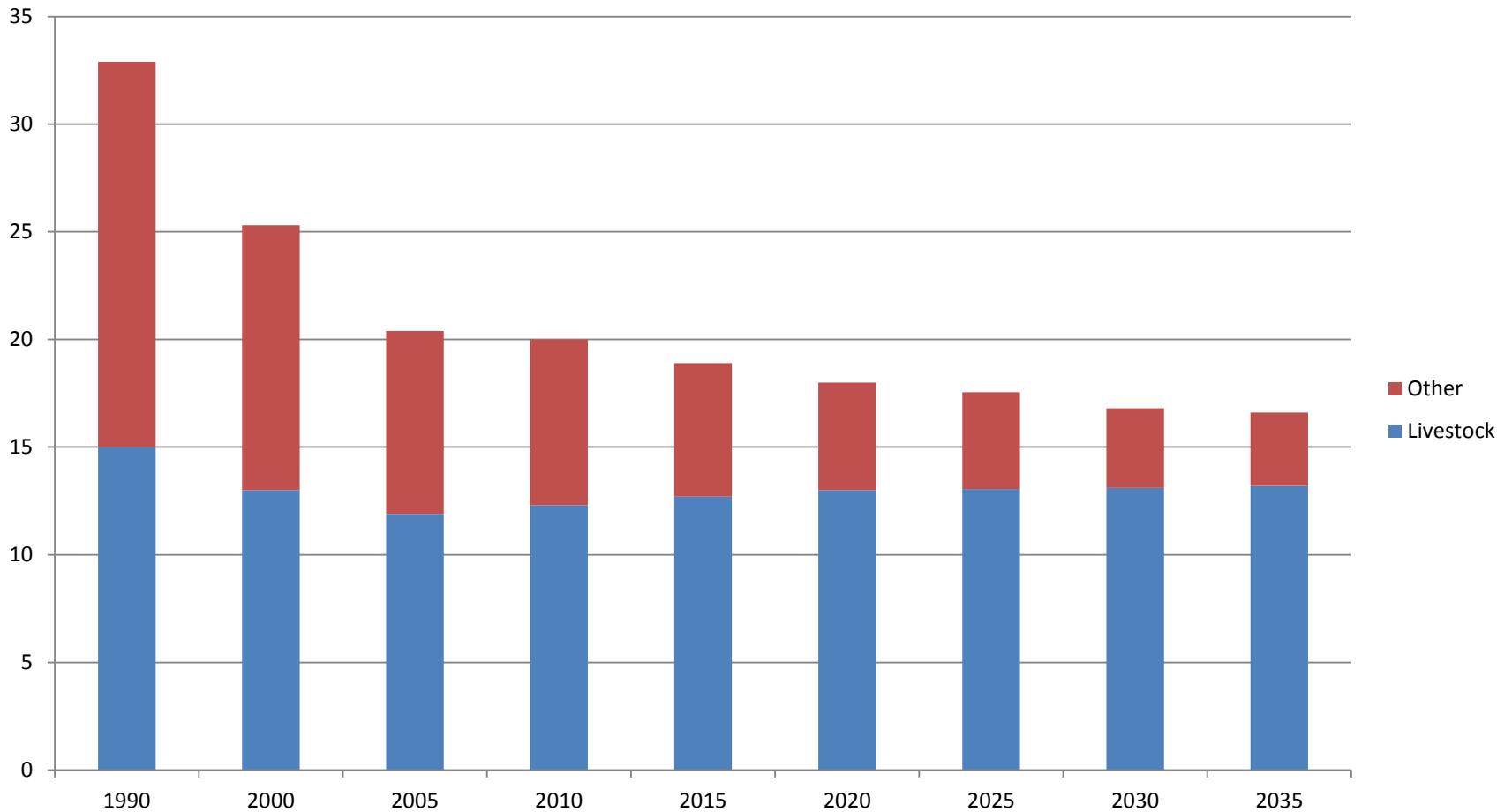
Source: National Emission Inventory

# Increasing emissions per cow

*Table 5.5 CH<sub>4</sub> implied emission factor (kg/animal/year) for manure management specified by animal category, 1990–2014*

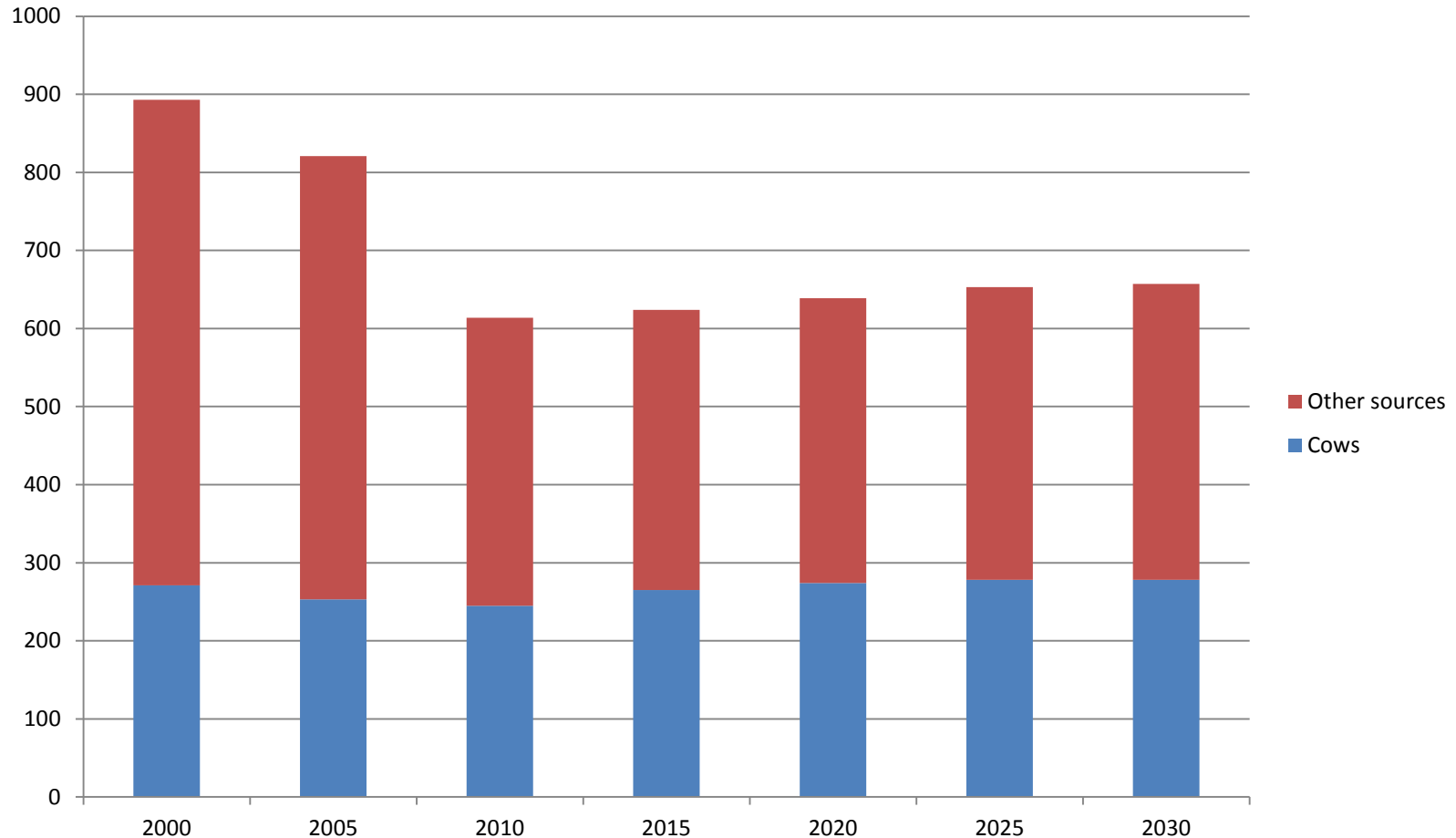
<b>Animal type</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2010</b>	<b>2013</b>	<b>2014</b>
Cattle							
- dairy cattle	26.21	27.39	31.79	35.31	40.22	41.45	41.55
- non-dairy cattle	8.43	8.55	8.52	8.91	9.14	9.10	9.10
- young cattle	7.75	7.90	7.34	6.92	7.80	8.61	8.58
Sheep	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Goats	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Horses	1.56	1.56	1.56	1.56	1.56	1.56	1.56
Mules and asses	NO	NO	NO	NO	0.76	0.76	0.76
Swine*	10.03	9.62	9.57	8.55	7.42	6.83	6.77
Swine excl piglets	16.00	15.73	15.66	14.33	12.76	12.03	12.09
- fattening pigs	13.33	12.96	12.78	11.53	10.27	9.52	9.52
- breeding swine	27.03	27.51	28.04	26.70	24.70	24.21	24.18
Poultry	0.20	0.14	0.08	0.05	0.03	0.03	0.03
Other animals	0.33	0.37	0.44	0.48	0.54	0.54	0.53

# National projection (WAM, in Mton CO<sub>2</sub>-eq)



Source: PBL – National Energy Outlook, 2016

# Netherlands methane emissions (GAINS CLE – projection in Mton)



Source: IIASA – GAINS database

# Possible measures

- Change cattle feed → more  $\text{NH}_3$
- Anaerobic digestion (pig manure) → more  $\text{NH}_3$ , if ..
- Less cows (more imports?)
- Less food waste (dairy, meat)
- Less dairy and meat consumption
  - Dietary advice (“healthy & sustainable”)
  - Taxation
  - ....?