Decarbonisation pathways for ALULUCF in the UK

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SAC, Edinburgh
19th November 2009

Full report at: http://www.theccc.org.uk/reports/supporting-research/

Mitigation: the challenge

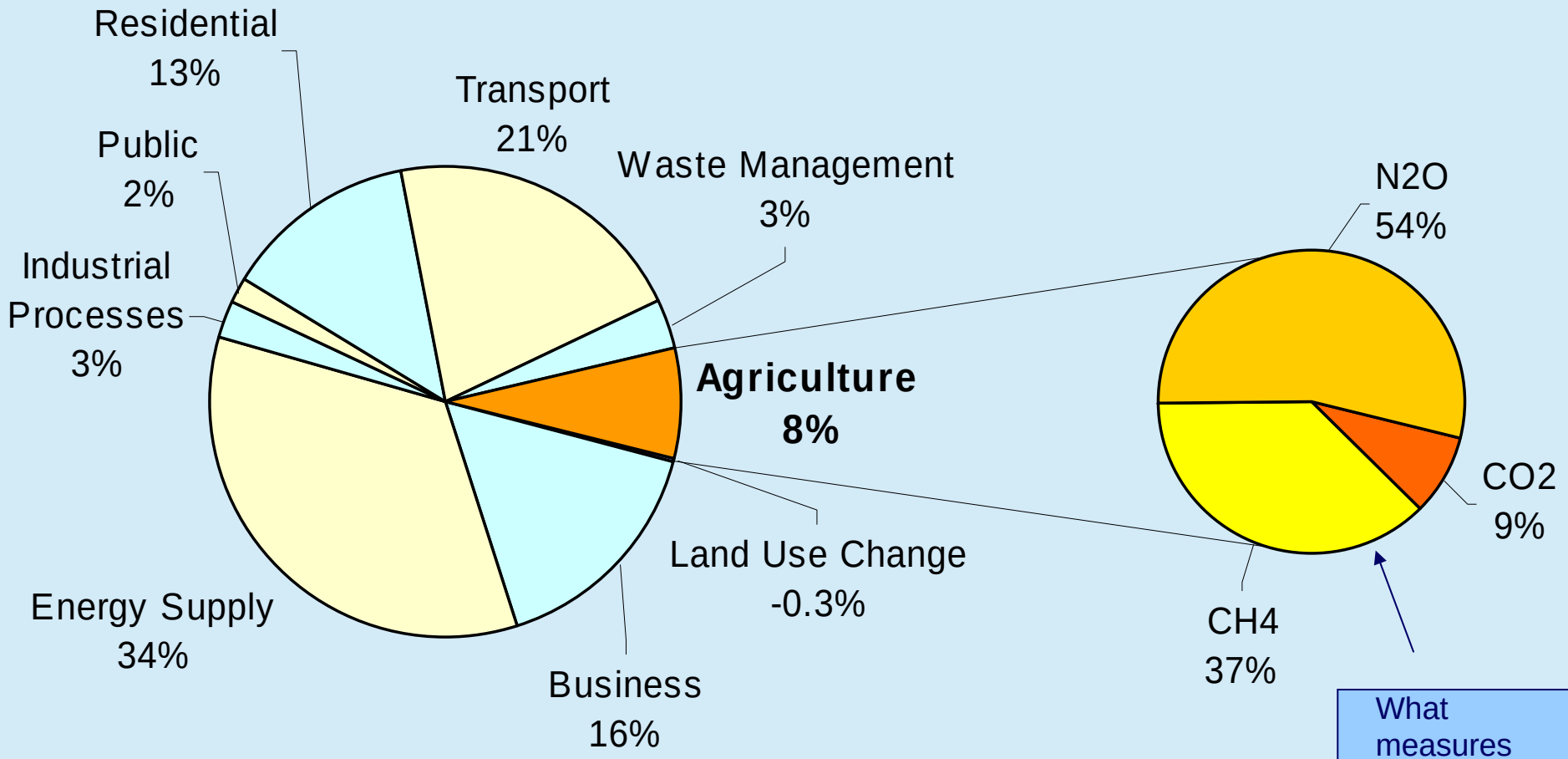
- Greenhouse gas emissions from agriculture, land use, land use change and forestry (ALULUCF) represent approximately 8% of UK anthropogenic emissions, mainly as nitrous oxide and methane.
- Climate Change Act of 2008, UK Government committed to ambitious targets of 80% of 1990 levels by 2050
- Budgeting handed to Committee on Climate Change
- How to reduce efficiently? How to derive a budget for the sector?
- Bottom-up Marginal Abatement Cost Curves (MACCs)

Emerging mitigation agenda

- Agricultural emissions approximately 8 % of UK emissions – much higher in Scotland
- What contribution should the sector make?
- What policy instruments to deliver an emissions budget from the sector?

UK agricultural emissions

Total GHG emissions, UK, 2005 (695 Mt CO2e)



What measures to reduce?

Emerging popular storylines

Climatic Change
DOI 10.1007/s10584-008-9534-6

Climate benefits of changing diet

Elke Stehfest · Lex Bouwman · Detlef P. van Vu
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Abstract Climate change mitigation policies tend to focus on the energy sector, wh
the livestock sector receives surprisingly little attention, despite the fact that it a
counts for 18% of the greenhouse gas emissions and for 80% of total anthropoger
land use. From a dietary perspective, new insights in the adverse health effects
beef and pork have lead to a revision of meat consumption recommendations. He

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Livestock-related greenhouse gas emissions: impacts and options for policy makers

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ABSTRACT

Research shows that livestock account for a significant proportion of greenhouse gas (GHG) emissions and global consumption of livestock products is growing rapidly. This paper reviews the life cycle analysis (LCA) approach to quantifying these emissions and argues that, given the dynamic complexity of our food system, it offers a limited understanding of cts. It is argued that LCA's conclusions need rather to be considered eptual framework that incorporates three key additional perspectives. tanding of the indirect second order effects of livestock production on associated CO_2 emissions. The second compares the opportunity cost sources to rear animals with their use for other food or non-food erspective is need—the paper considers how far people need livestock e perspectives are used as lenses through which to explore both the roduction and the mitigation approaches that are being proposed. The roadened to consider whether it is possible to substantially reduce hrough technological measures alone, or whether reductions in live- ill additionally be required. The paper argues for policy strategies that HG mitigation with measures to improve food security and concludes further research.

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indeed 18% of global GHG emissions (FAO, 2006). However, global consumption of livestock products is growing. Demand

Welcome to the Committee on Climate Change (CCC)

The Committee on Climate Change (CCC) is an independent body established under the Climate Change Act to advise the UK Government on setting carbon budgets, and to report to Parliament on the progress made in reducing greenhouse gas emissions.

Carbon Budgets

The CCC (Committee on Climate Change) has proposed levels for the first three carbon budgets from 2008-2022...

Topics

Includes information about climate science and the environment, economic and social impacts, global and UK targets...

Sectors

There is potential for emissions to be reduced across all sectors of the economy. To find out about some of the opportunities and technologies required read on...

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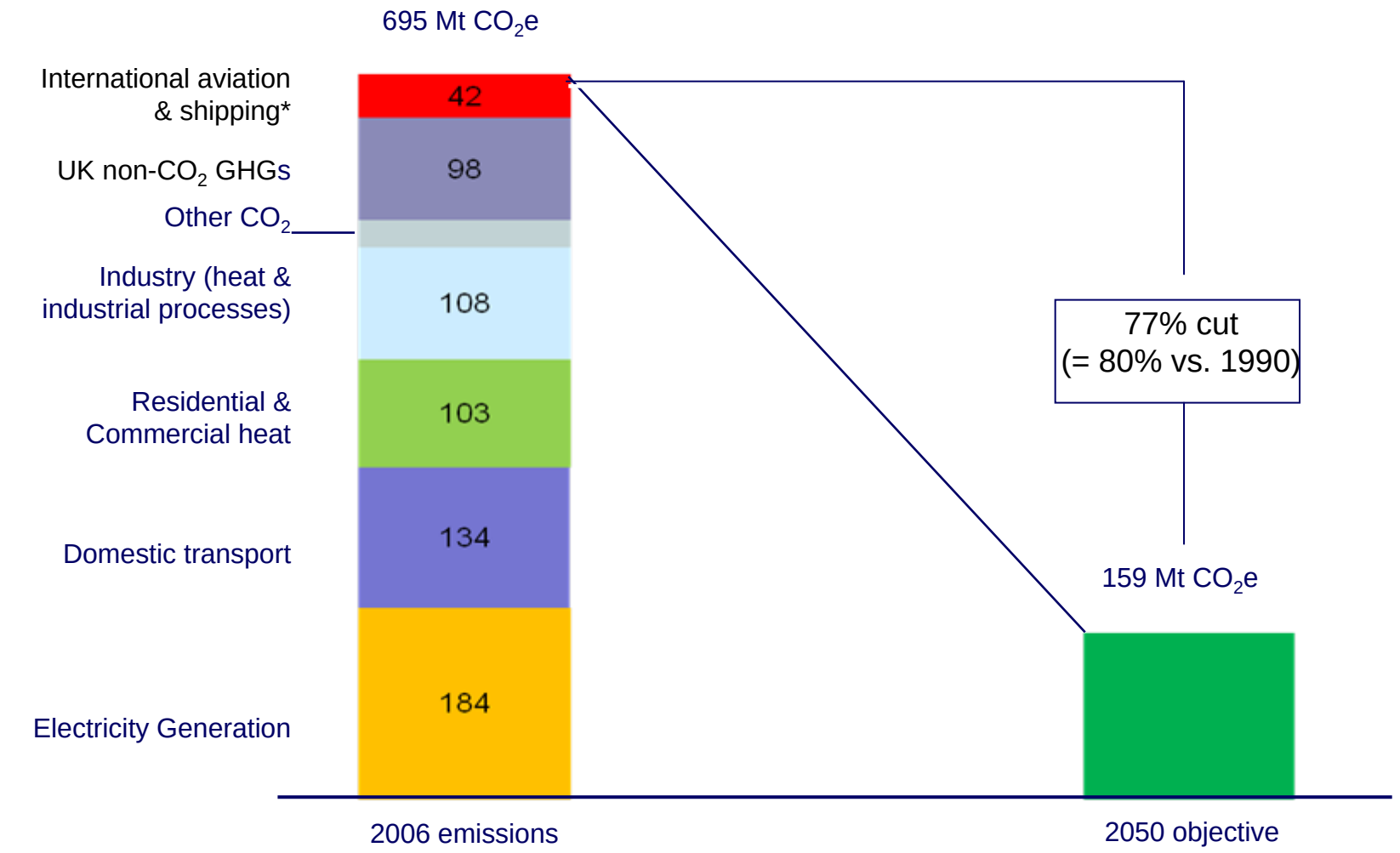
Mitigation: the challenge (UK)



* bunker fuels basis

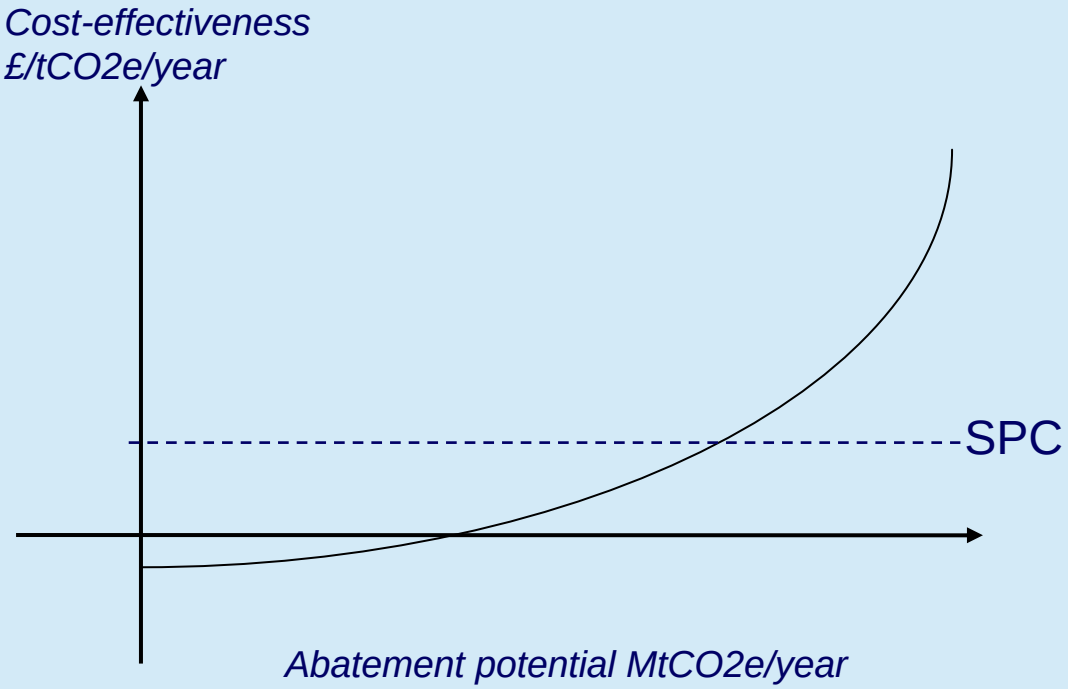
What did we do, and why?

Developed MACCs for the ALULUCF (for a range of time periods, potentials, discount rates etc.).

Build on existing studies: provide analysis with empirical basis and explicit assumptions.

CCC wanted all sectors to develop MACCs using a common framework (e.g. in terms of discounting, abatement potentials etc.).

What are MACCs, and why do we need them?

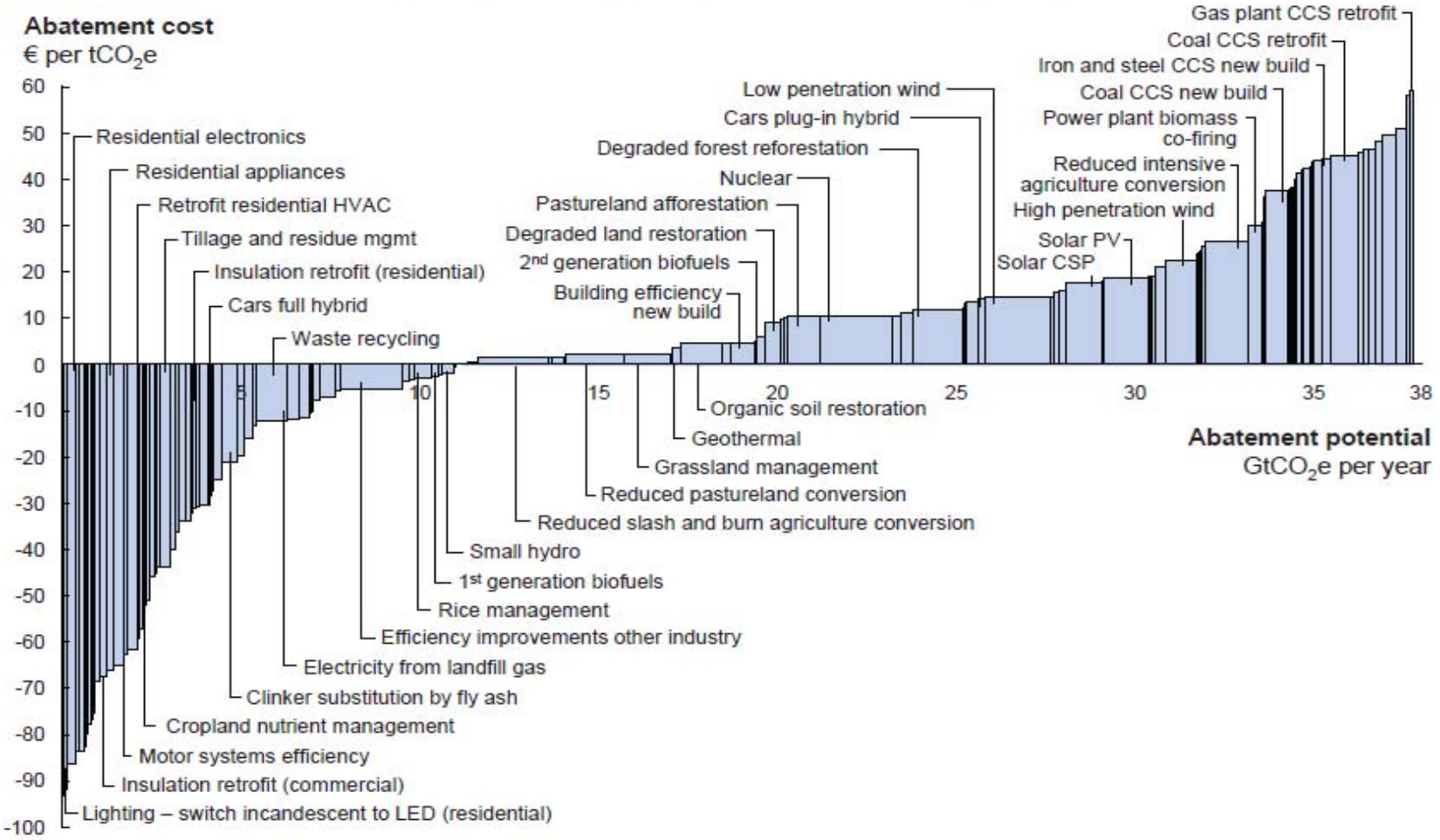


- Identify suite of cost-effective ways of meeting the targets – within and between sectors
- Identify options that cost less than the Shadow Price of Carbon - i.e. the "global damage cost"
- Help to define efficient level of emissions –a budget and therefore inform regulation

Global MACC (McKinsey & Co)

Exhibit 1

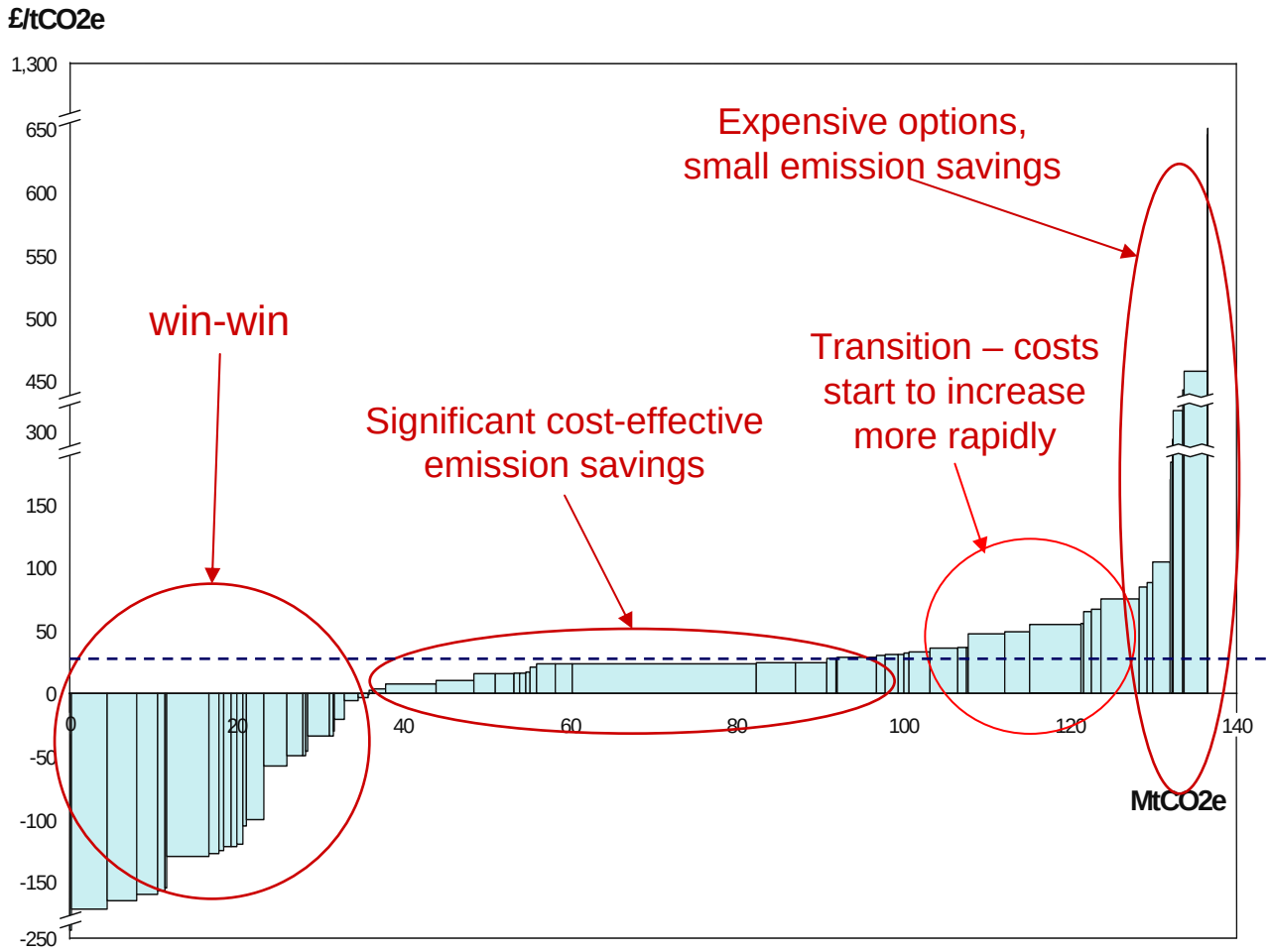
Global GHG abatement cost curve beyond business-as-usual – 2030



Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €60 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.

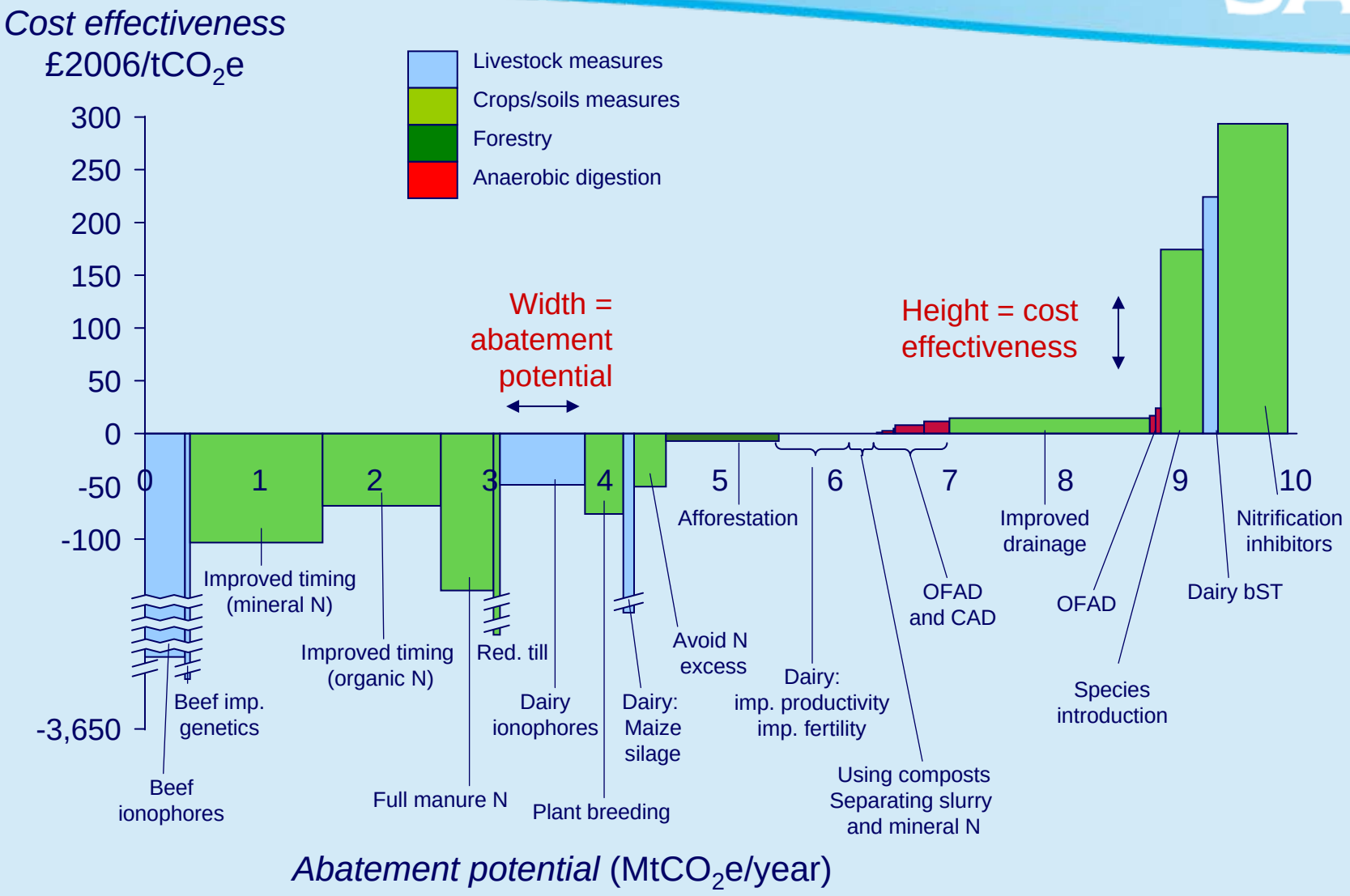
Source: Global GHG Abatement Cost Curve v2.0

Methods – Marginal abatement cost curves



- Measures ranked in decreasing order of cost-effectiveness from left to right
- Width of each bar: abatement potential
- Height of each bar: cost-effectiveness

MACC for ALULUCF (2022, CFP, 3.5%)



Results for livestock measures

(2022, CFP, 3.5%)

Measure	ktCO2e abated	CE [£2006/tCO2e]
Beef Ionophores	347	-1,748
Beef Improved Genetics	46	-3,603
Dairy Ionophores	740	-49
Dairy Maize Silage	96	-263
Dairy Improved Productivity	377	0
Dairy Improved Fertility	346	0
OFAD-Pigs, Large	48	1
OFAD-Beef, Large	98	3
OFAD-Pigs, Medium	16	5
OFAD-Dairy, Large	251	8
CAD-Poultry, 5MW	219	11
OFAD-Beef, Medium	51	17
OFAD-Dairy, Medium	44	24
Dairy-bST	132	224
Dairy-Transgenics	504	1,691
Beef Concentrates	81	2,705

Key findings livestock

- The feasible potentials in 2022 were estimated to range from 1.266 - 5.02MtCO2e
  - an annual abatement of approximately 1.266 - 5.02MtCO2e could be achieved in the livestock sub-sector at a cost of <=£100/t by 2022
- The measures needed to achieve this abatement are, in no particular odder:
  - Beef: ionophores, improved genetics
  - Dairy: current selection, selection for fertility, ionophores, maize silage
  - On farm anaerobic digestion (medium to large farms only)
  - Central anaerobic digestion (CAD)-Poultry-5MW

Conclusions: ALULUCF mitigation is complex

UK: 300,000 small/micro firms managing biological systems = complexity

How do we reduce the uncertainty?

1. *Refine existing assumptions* e.g. in terms of abatement rates, additional abatement potential (e.g. what are current baselines?)

2. *Revise approach*

- Ancillary costs/benefits
- LCA
- Finer-grained analysis: e.g. farm type MACCs
- Integrate with models to account for interactions with region and climate
- Adopt a demand-side perspective?

Why isn't there 100% uptake of win-win measures? Answer = behaviours

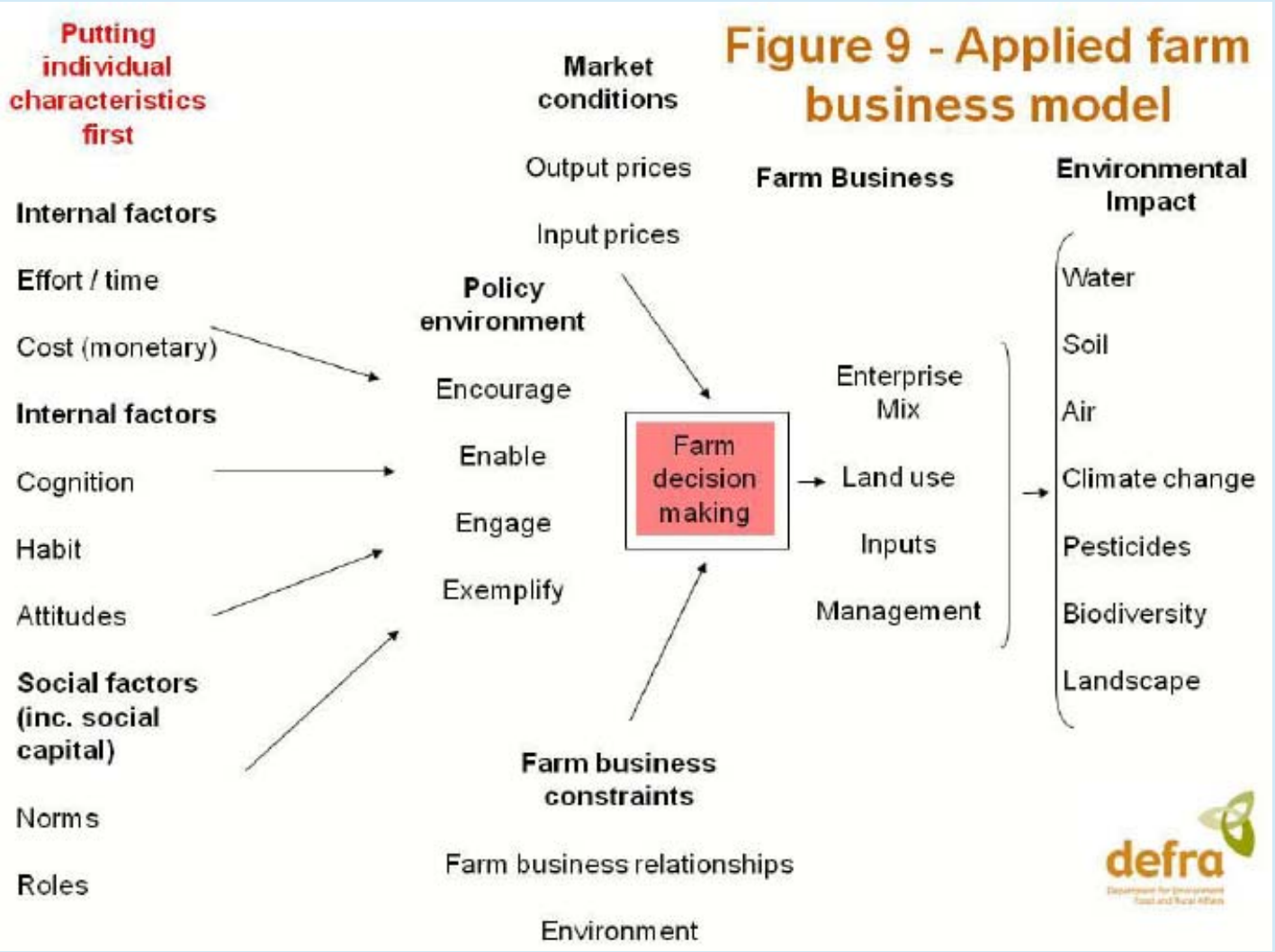
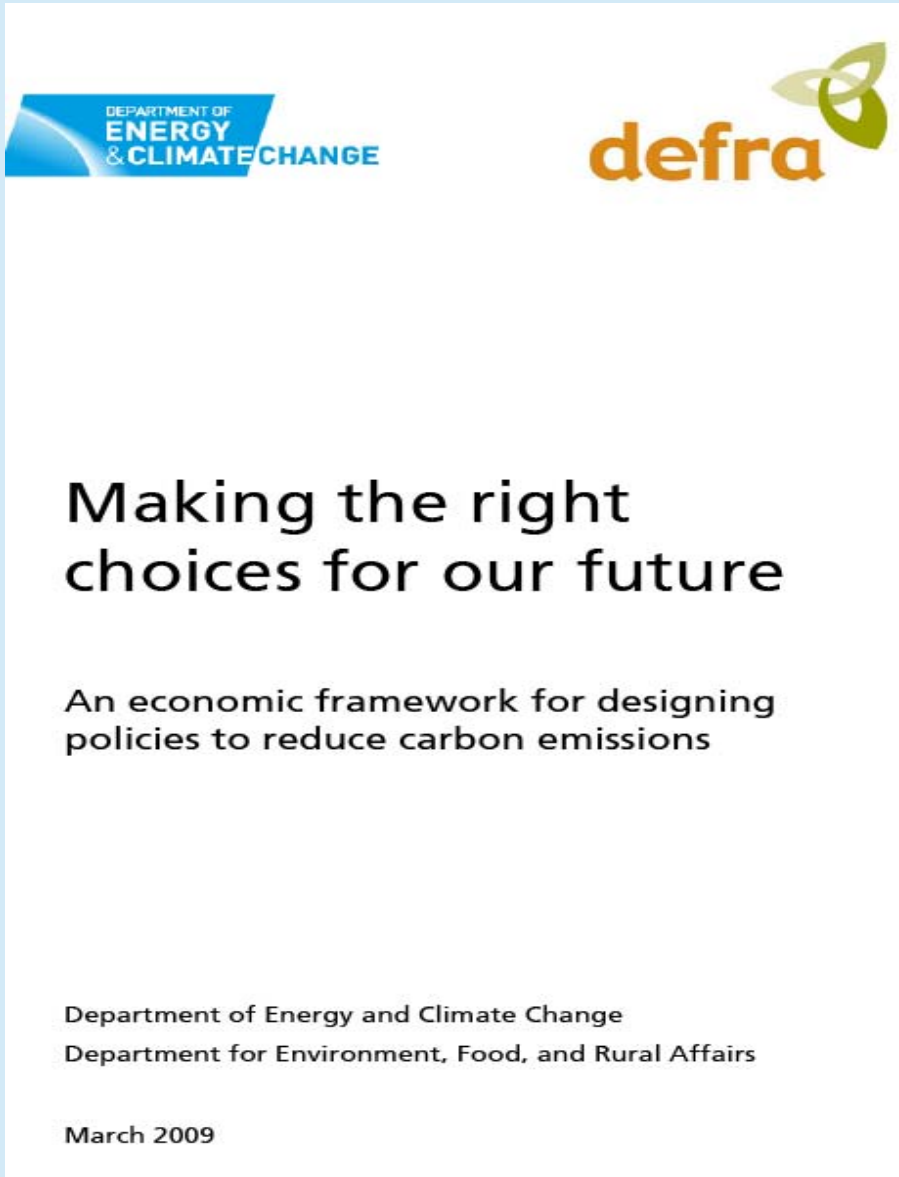


Figure 9 - Applied farm business model

Source: Defra (2008) UNDERSTANDING BEHAVIOURS IN A FARMING CONTEXT: Bringing theoretical and applied evidence together from across Defra and highlighting policy relevance and implications for future research November 2008 Defra Agricultural Change and Environment Observatory Discussion Paper

Policy & delivering ag. emissions budget



- Modifying behaviours
- Agricultural codes
- Bio energy infrastructure
- R&D
- Demand side measures
- Need to avoid displacement

- Emissions trading?

Regional emissions trading systems