



Multi-criteria decision analysis

A case study for ammonia abatement from livestock farming (including changes in human consumption)

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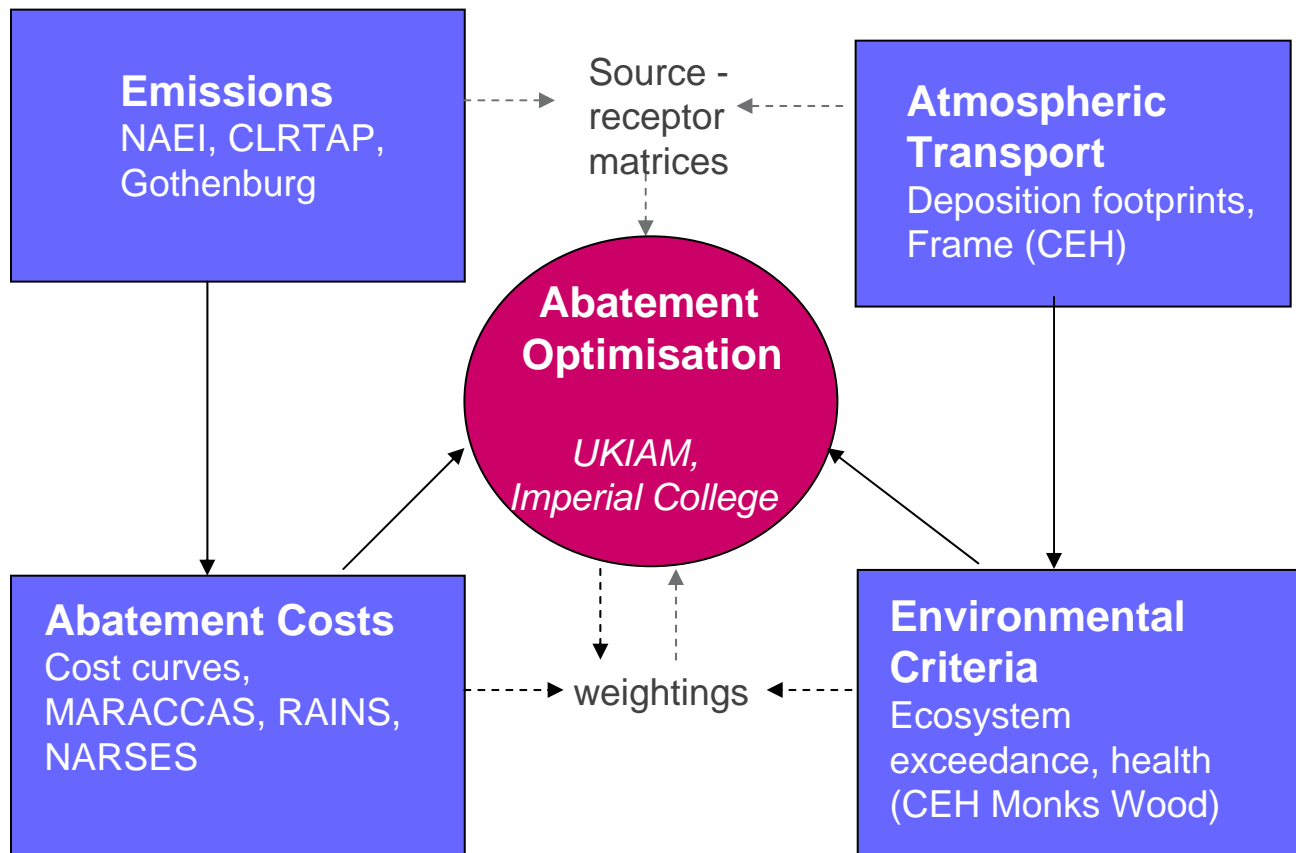
A broader approach to NH₃ abatement covering different stakeholder interests

-> multicriteria analysis as a complementary tool to integrated assessment modelling

Illustration for some basic scenarios

Extension to scenarios with changes in human consumption and diet for meat

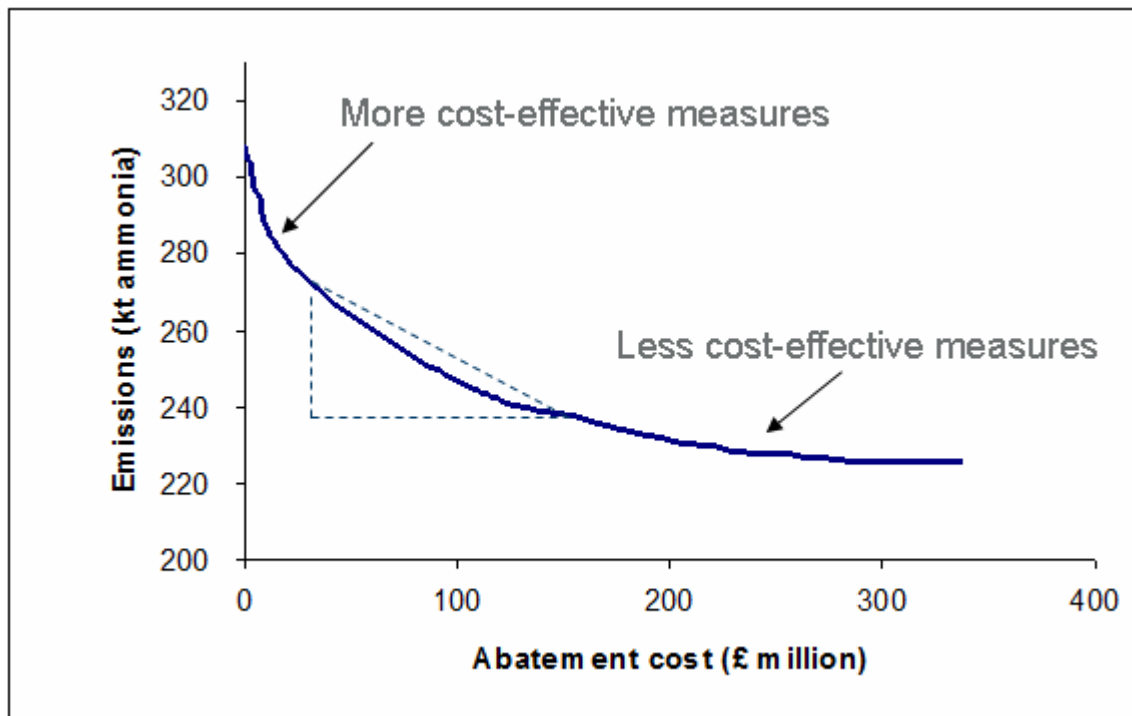
Simplified architecture of integrated assessment models



Modified from Oxley et al. 2003

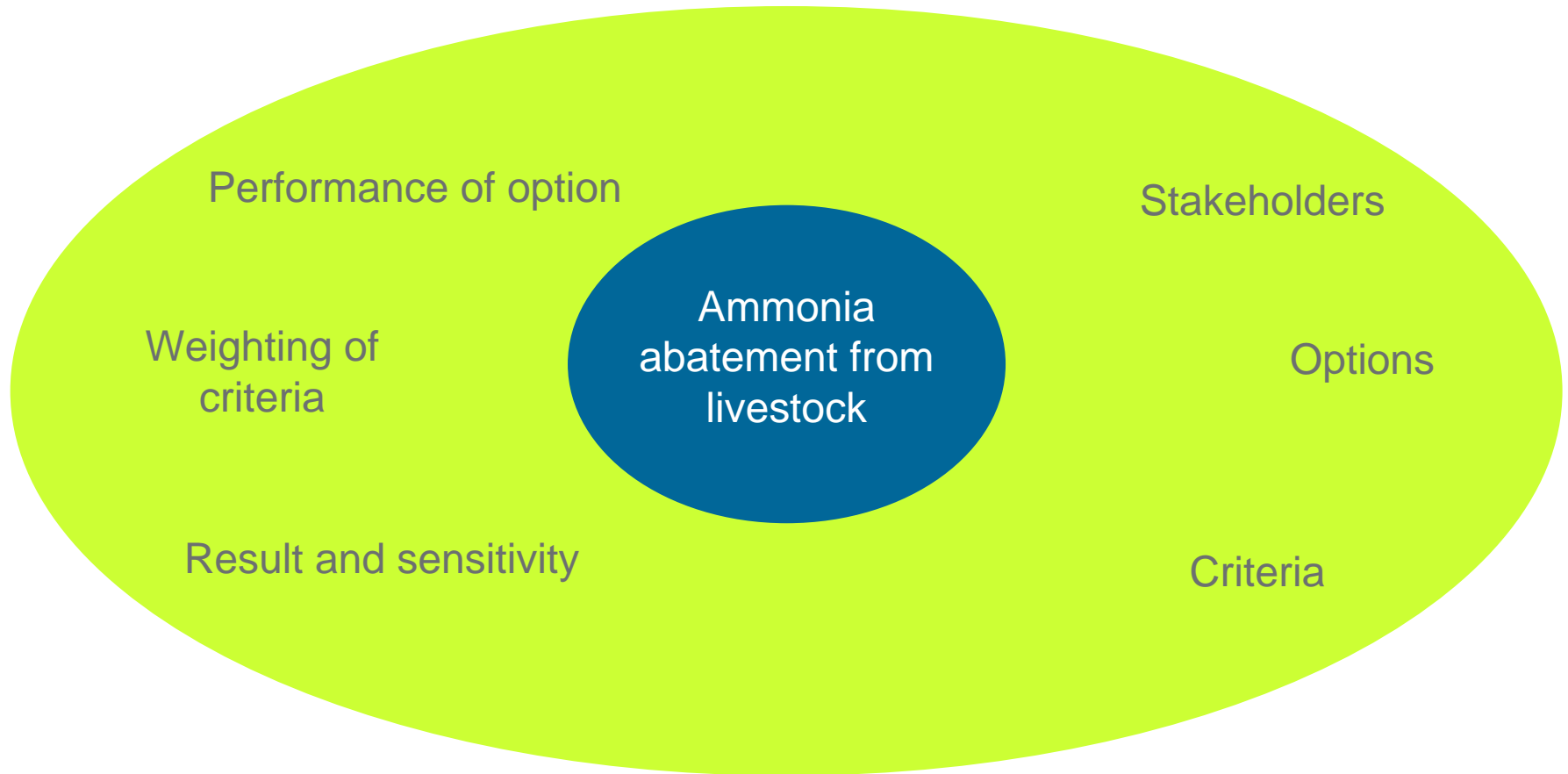
Integrated assessment models

NH₃ abatement options summarised in cost curves (technical measures)



Courtesy Tom Misselbrook, North Wyke Research, 2008

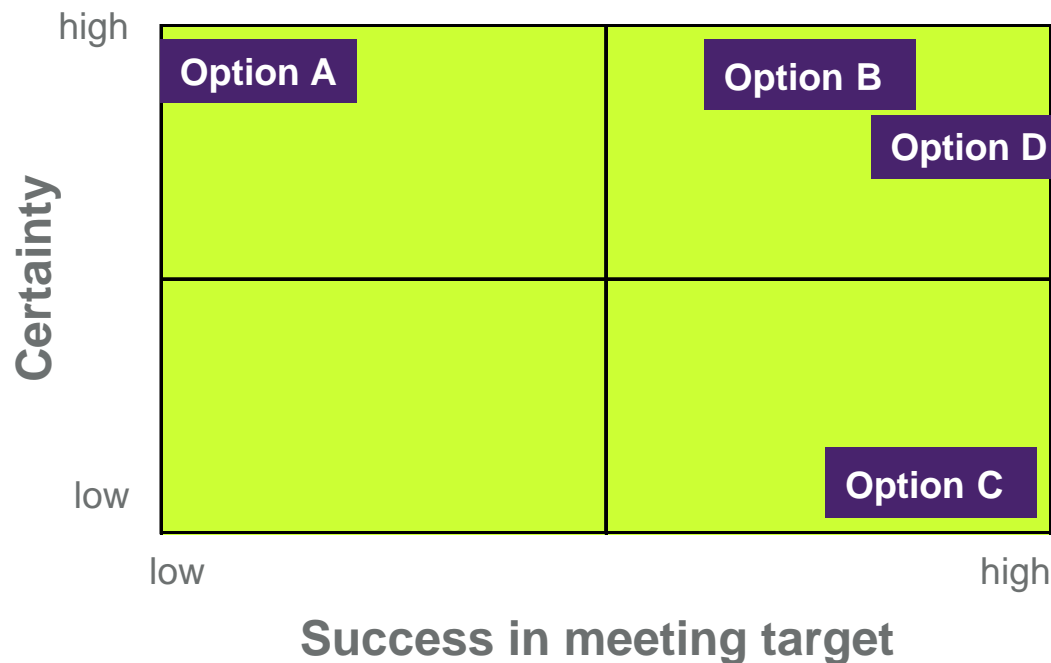
Multi-criteria decision analysis framework: Widening the analysis



Case study for the livestock sector for 2020

Goal – 2010 ceiling 297 kt ammonia, tighter ceilings for 2020

Stakeholders

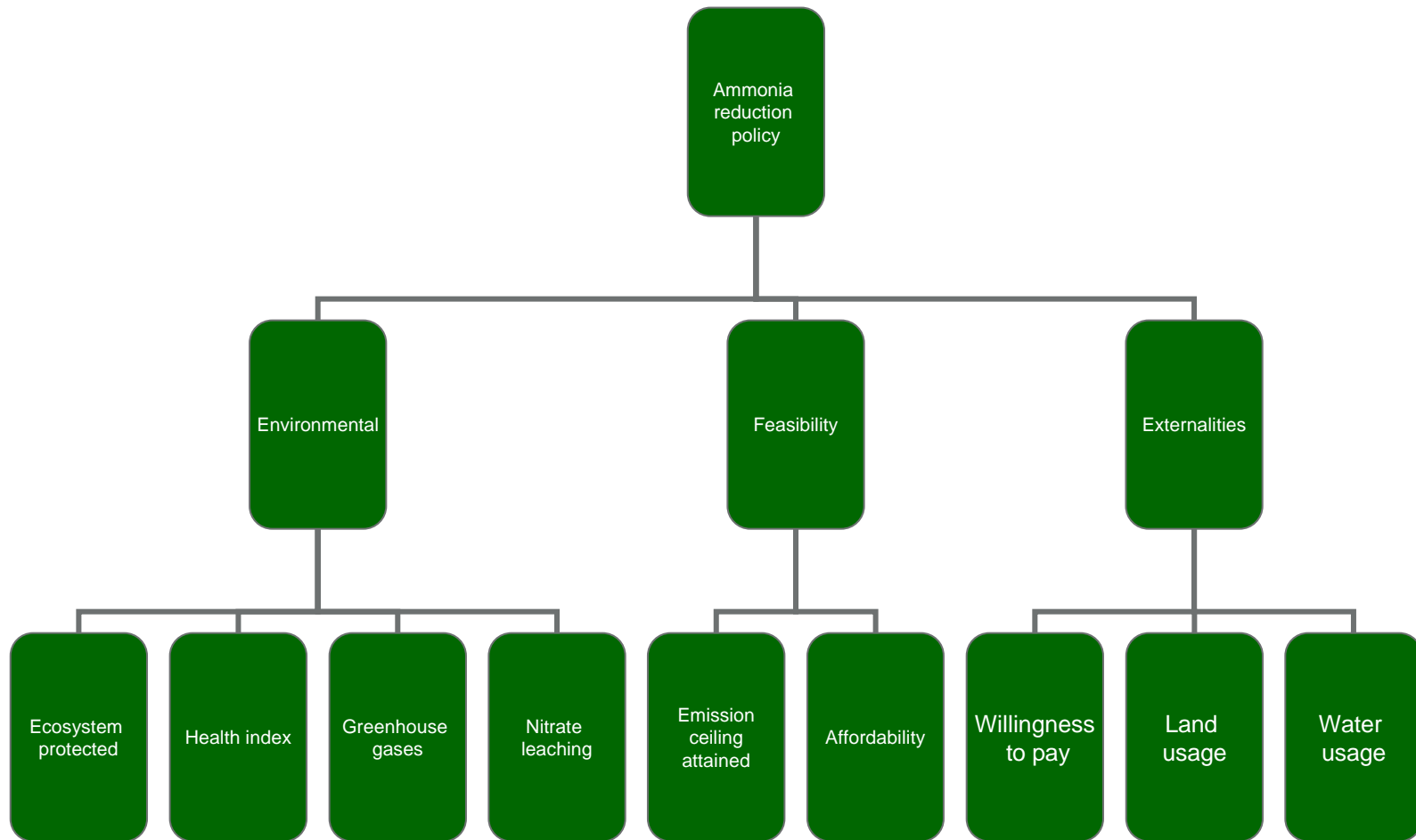


Option A: Current legislation

Option B: Extended current legislation

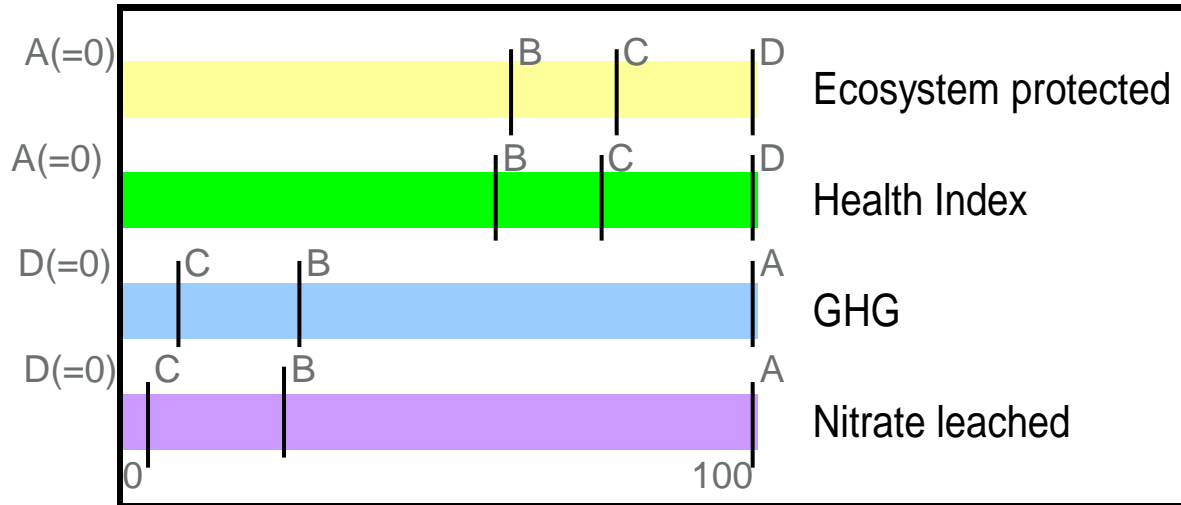
Option C: Most cost-effective measures to meet target

Option D: Cost-effective measures going beyond target

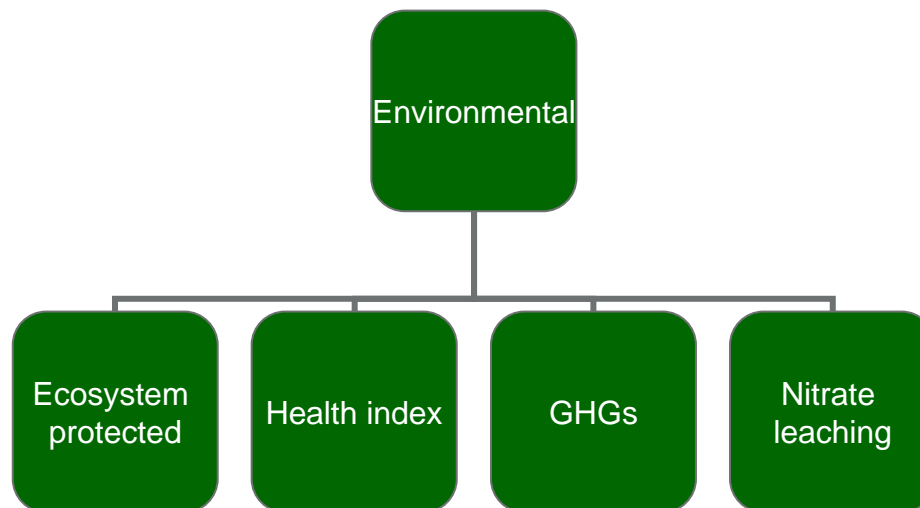


Suitable indicators for criteria - data availability

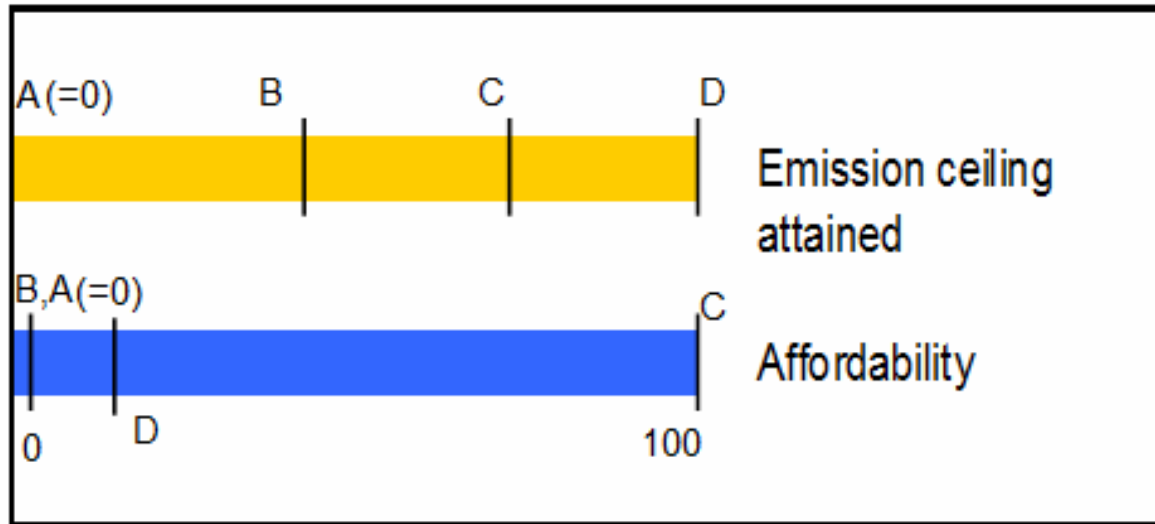
Performance of option on criteria: Environmental



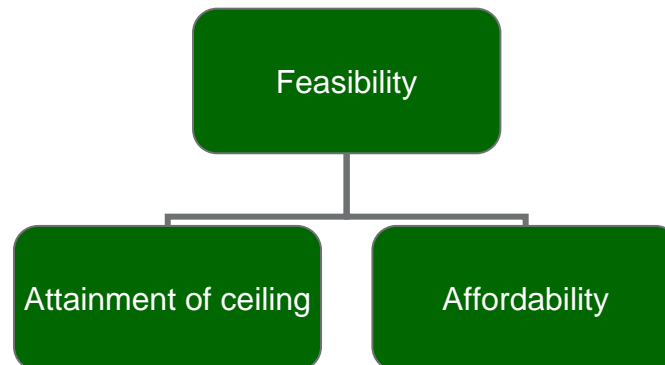
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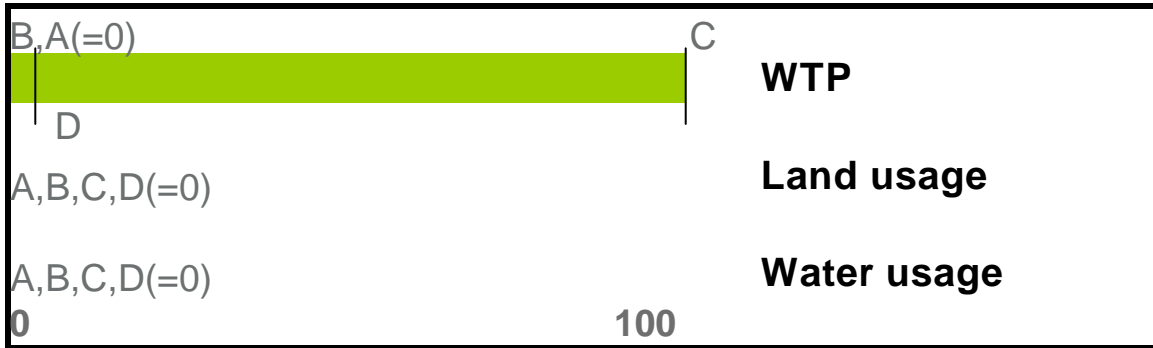
Performance of option on criteria: Feasibility



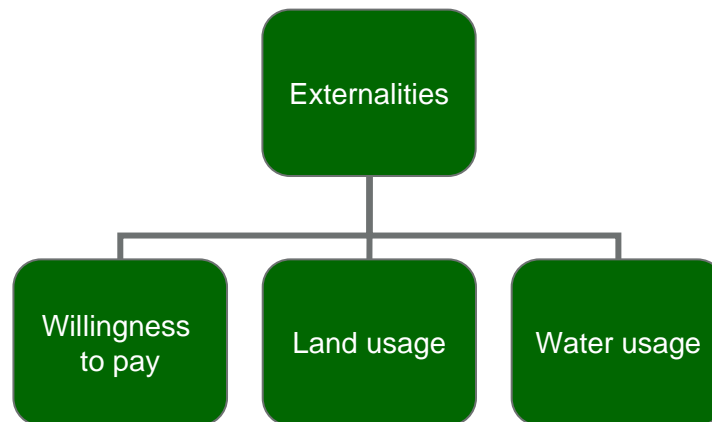
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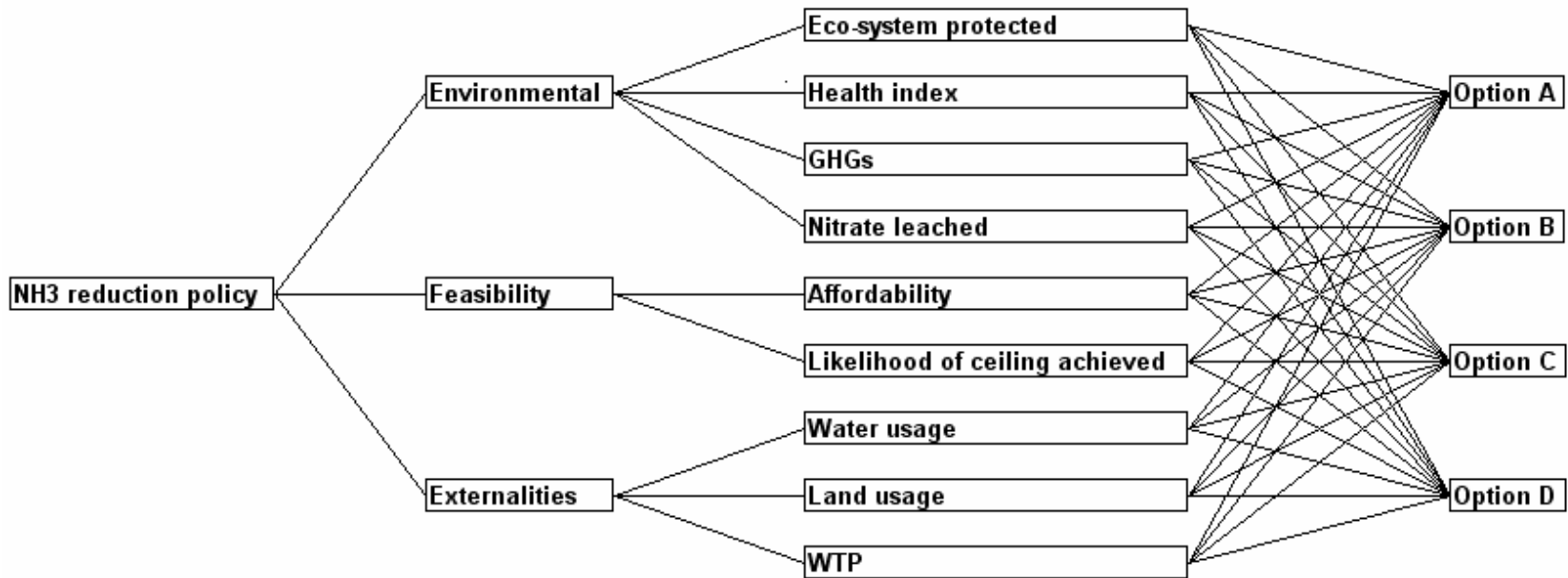


Performance of option on criteria: Externalities



- Option A:** Current legislation
- Option B:** Extended current legislation
- Option C:** Most cost-effective measures to meet target
- Option D:** Cost-effective measures going beyond target

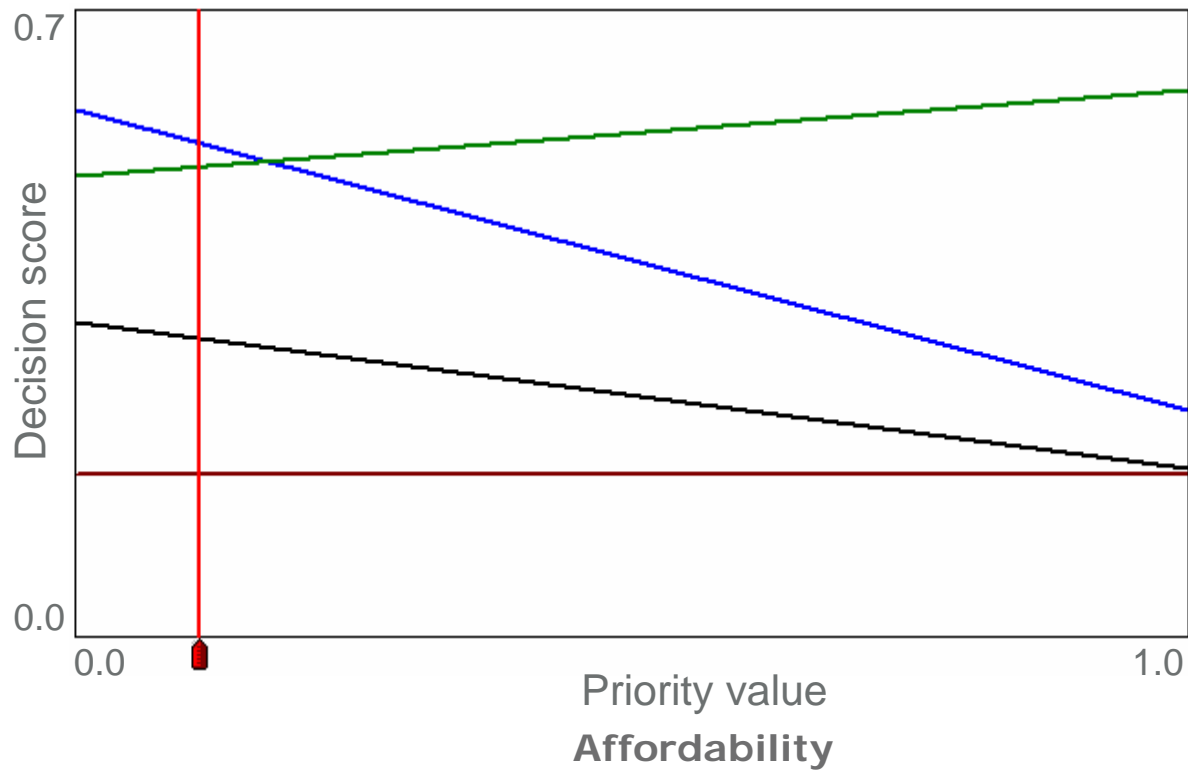




- Weight each criteria
- Aggregate performance value and weight to get overall value for each option

Results: Sensitivity analysis

How sensitive is the final choice to the weightings given?



Alternatives:

Option D: Cost-effective measures going beyond target

Option C: Most cost-effective measures to meet target

Option A: Current legislation

Option B: Extended current legislation

Current value: 0.11

Cross-over value: 0.17

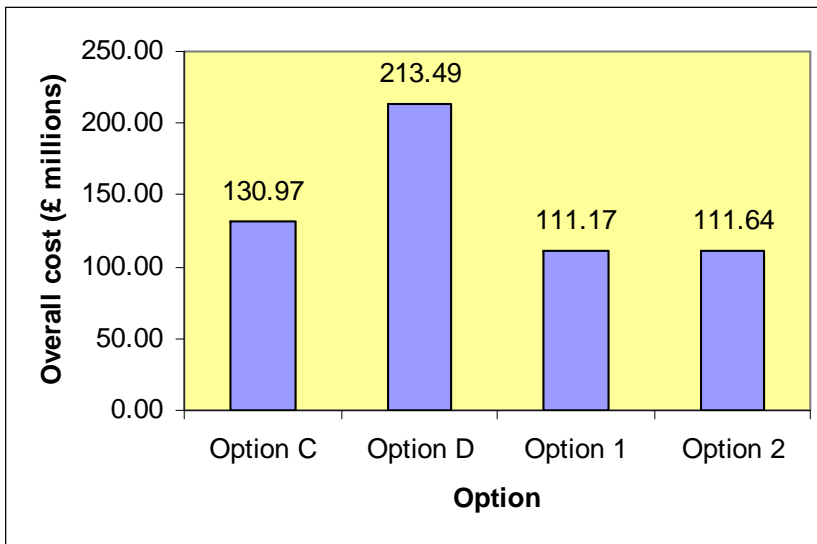
Forecasting of national activity levels post CAP has not taken changes in consumer behaviour and human diet into account

There are many examples of changes $>10\%$ in consumption of food products e.g. beef

WTP studies can be used as indications of what the public are willing to pay for “environmental” products

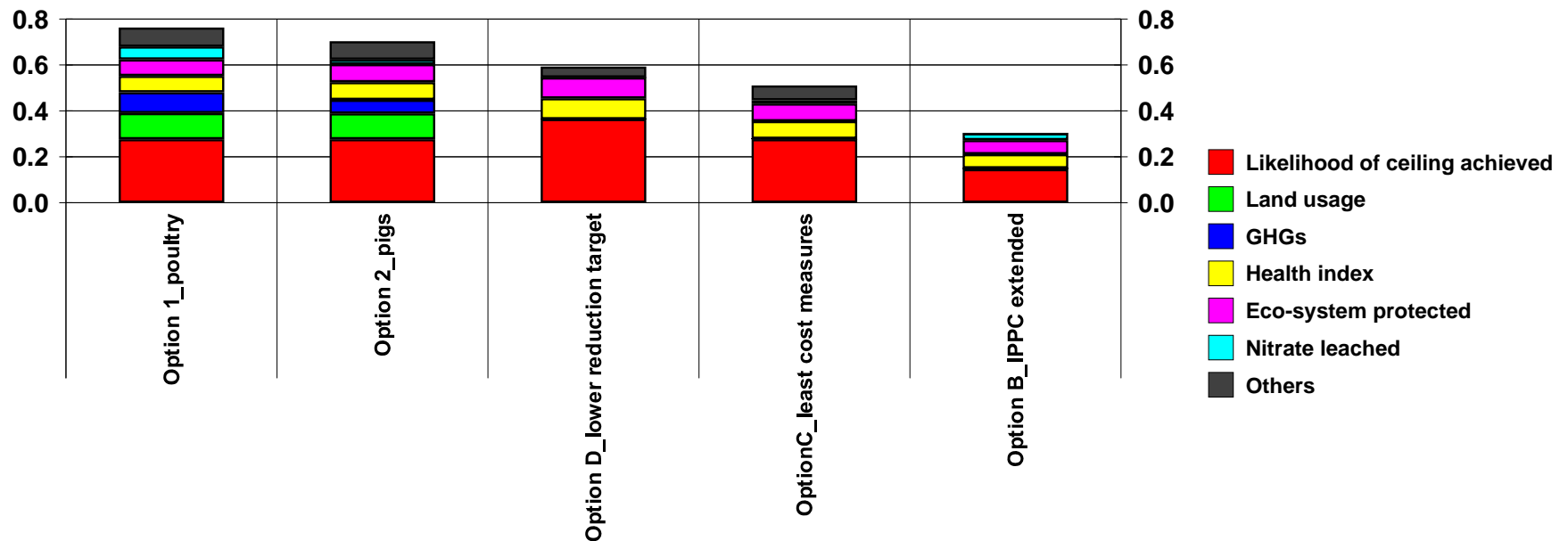
Externalities: Changes in consumer behaviour -> additional scenarios

- No reduction in total meat consumption
- Same emission target based on IIASA studies



- Option C:** Most cost-effective measures to meet target
- Option D:** Cost-effective measures going beyond target
- Option 1:** Poultry meat substitutes 10% reduction in beef consumption
- Option 2:** Pig meat substitutes 10% reduction in beef consumption

Contributions to NH3 reduction policy from Level:Level
3



Easier to achieve overall target – more favourable than the most stringent measure, Option D

Conclusions

- Analysis widened, more holistic decisions using MCDA approach
- Representing different stake holder interests -greater consensus

Changes in consumer behaviour

- Changes in diet can reduce costs for abatement measures and show other benefits as well compared with reliance on technical measures

Thank you