SWIMS: a dynamic optimisation and decision support tool for solid waste management

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Outline

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   1 Solid Waste Management
   2 LCA
   3 SWIMS

2 The National Needs Assessment

3 Outputs
   1 Waste managed
   2 Infrastructure
   3 Financials

4 Concluding remarks

5 Future work and potential of SWIMS

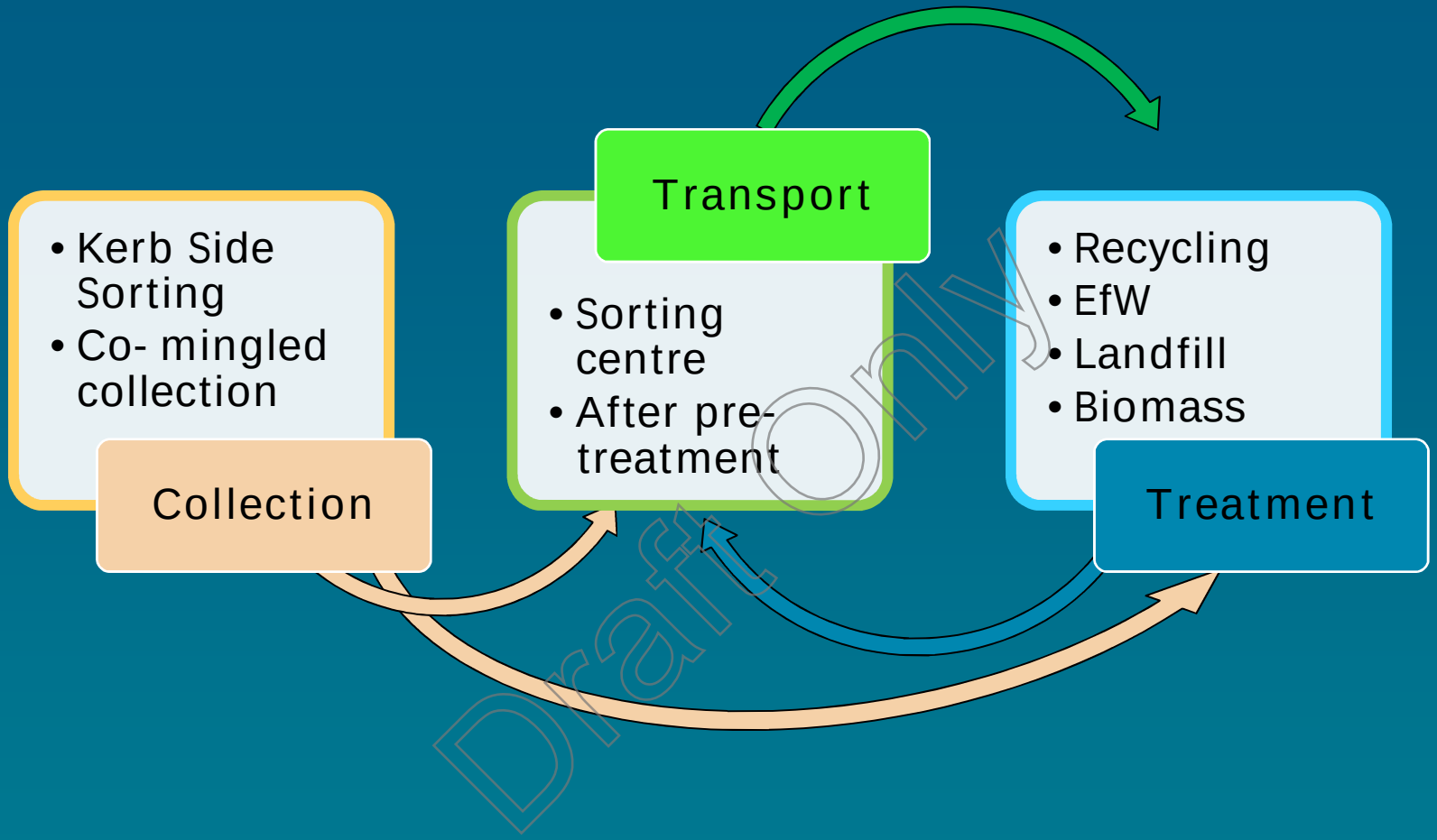
Sorted Waste (EfW)


Anaerobic digester


Landfill

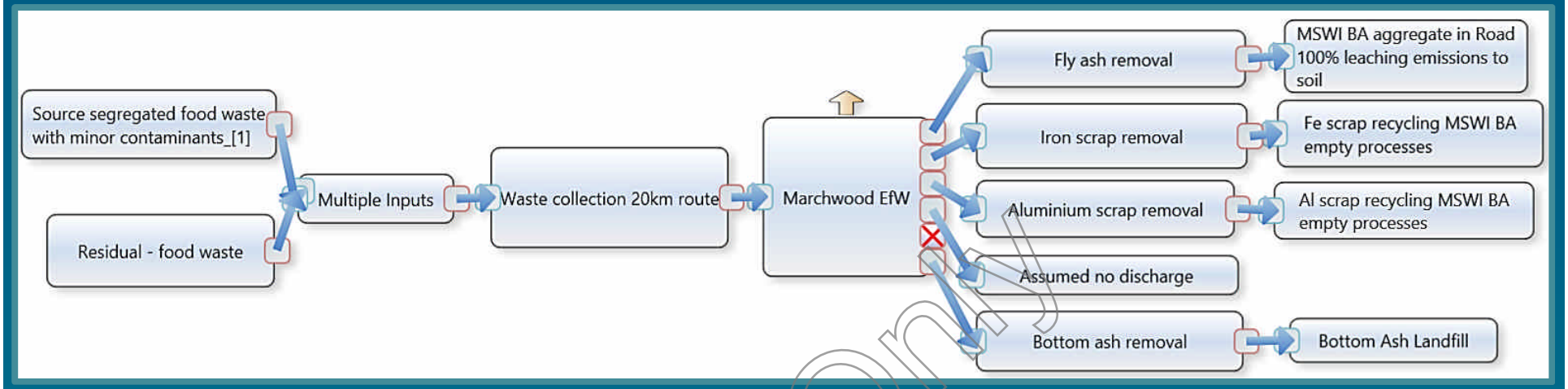

Ash (EfW)

Introduction: Solid Waste Management



Fleet vehicles, transport infrastructure, treatment infrastructure

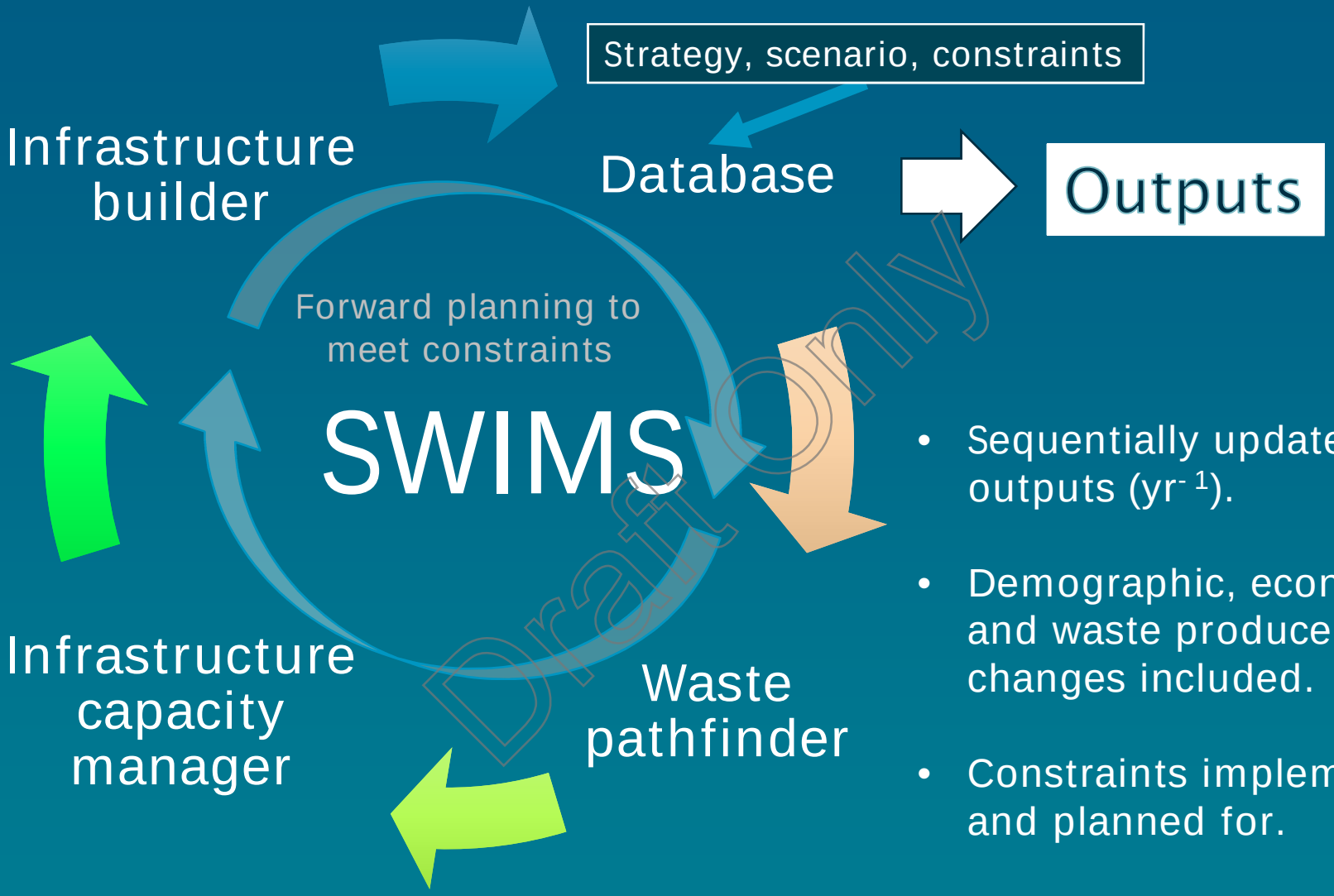
Introduction: LCA



Waste production → Waste collection → Waste treatment → LCA metrics

- SWIMS utilises equations from EASETECH to calculate the LCA and environmental impacts.
- Expanded to add a temporal and relationship aspect.

Introduction: What is SWIMS?



- Sequentially updates outputs (yr^{-1}).
- Demographic, economic and waste producer changes included.
- Constraints implemented and planned for.

National Needs Assessment: NNA

Scenario

Single, central scenario for: Population growth, World economic growth and fossil fuel prices. Starting in 2010, with costs fixed to 2010 (NISMOD 1).

Strategies

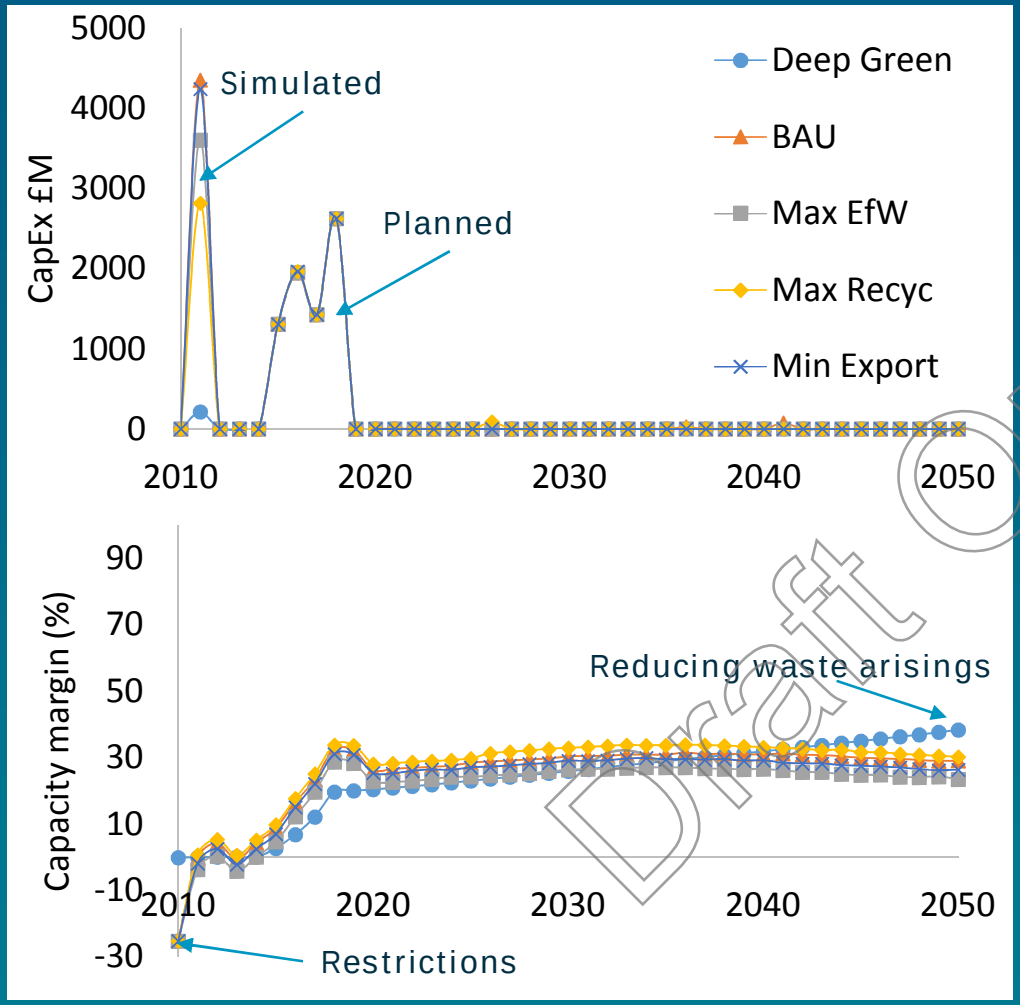
1. Deep Green
2. Business as usual
3. Maximum energy from waste
4. Maximum recycling
5. Minimising international export

Limitations

No aging of facilities: assumed to be maintained and updated.

Exported waste is removed from the system (EIA is not calculated post transport).

Infrastructure



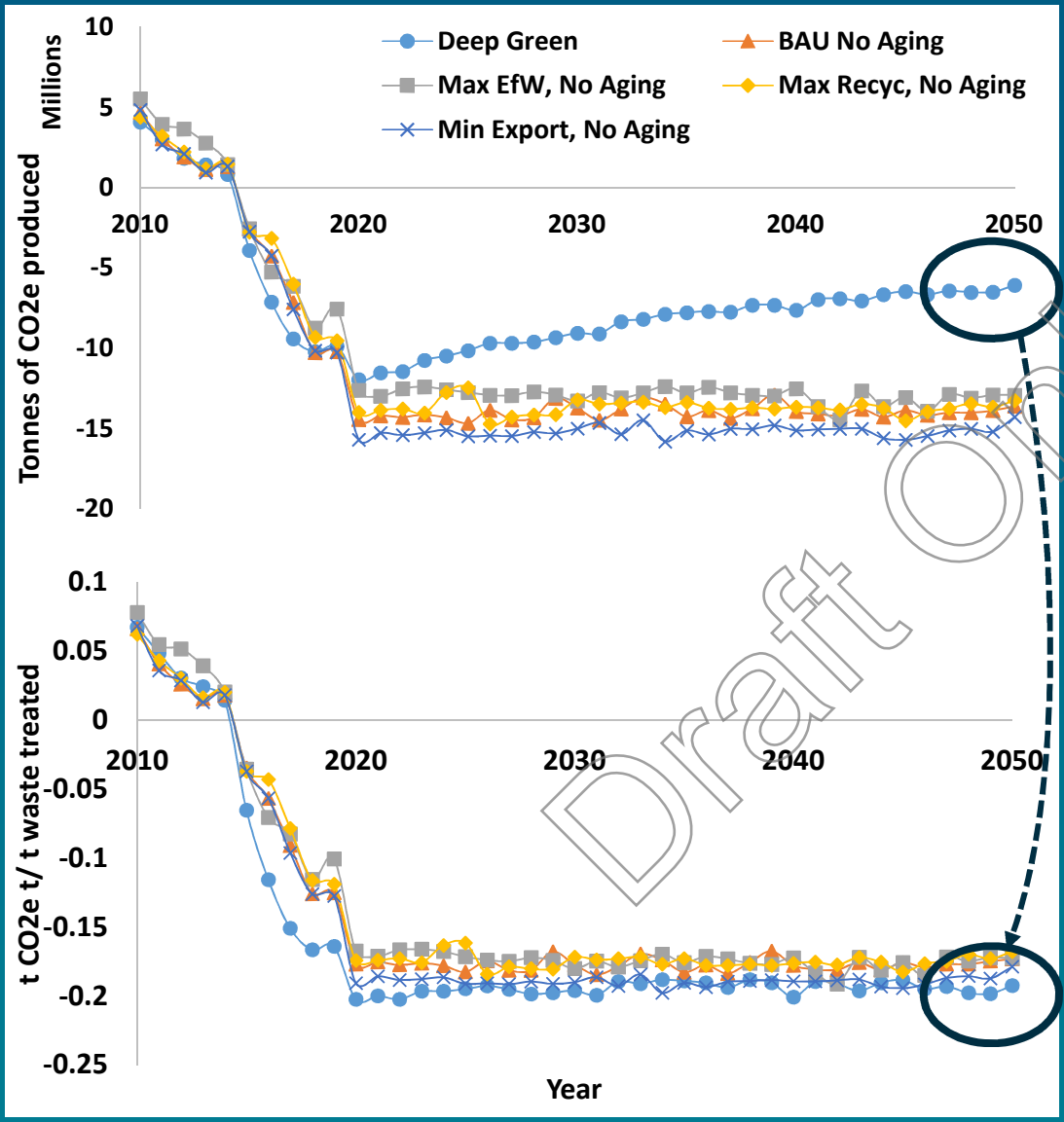
Model invests heavily to meet constraints

Planned infrastructure (2015- 2020)

Year one restrictions cause reduction in capacity margin

Initial investment and planned investment sufficient

Environmental impact



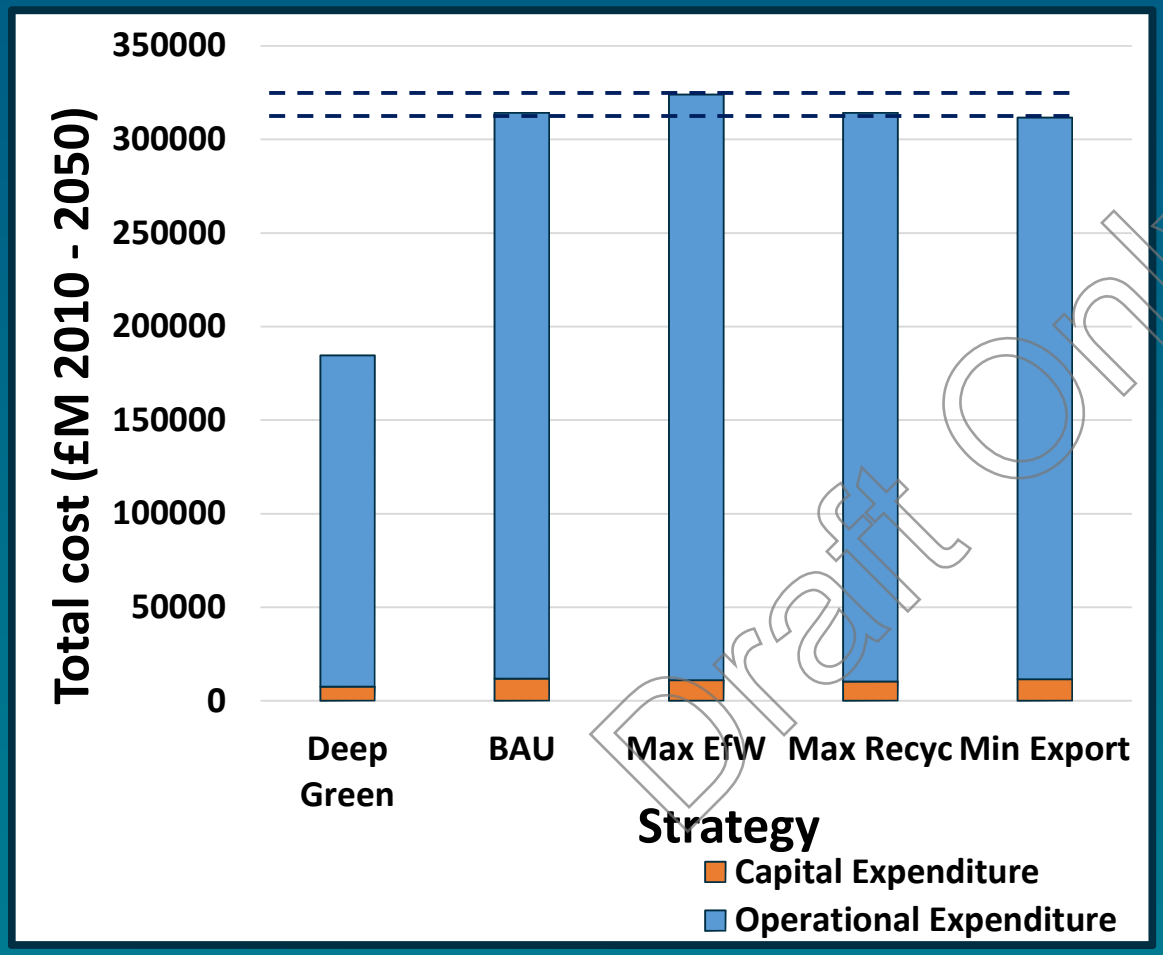
Reduction in carbon footprint

Plateau reached ~2020

Deep green has a reduction in carbon sequestration

Corrected values show deep green as the most environmentally beneficial

Capital & operational costs



Minimal change in CapEx,

Slight changes in OpEx for 4 out of 5 strategies,

Deep Green has the lowest CapEx and OpEx by almost half,

Primarily caused by a decoupled waste arisings to GDP.

Conclusions

Smart investment will allow a reduction in TCO_2e produced in all strategies

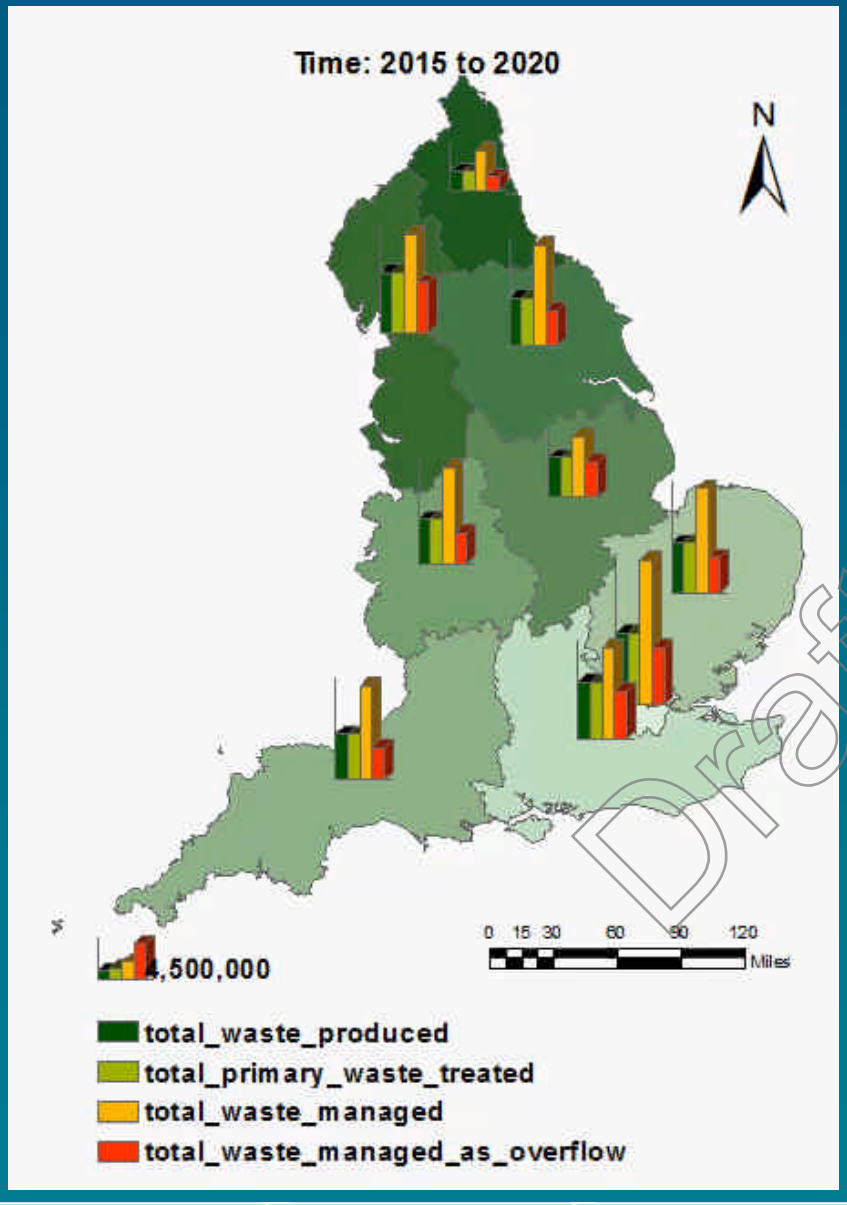
Small fluctuation in CapEx and OpEx costs for 4 out of 5 strategies

Decoupling waste produces the greatest economic benefit

Decoupling waste arising from GDP would increase waste management security

Reducing exports best for carbon reduction, decoupling waste best per tonne of waste treated.

Future Potential



Nation → GOR → LAD (spatial resolution)

Able to track waste from collection to individual facilities.

Multiple environmental impact assessors e.g. displacement of fossil fuels.

Incorporation into a larger system of systems model.

Utilisation of DAFNI.

Thank you for listening