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EUROPEAN FOOD CHAIN SUPPLY TO REDUCE GHG EMISSIONS BY 2050

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Accelerating action to reduce greenhouse gas emissions in the food value chain

Friday 13th June

SINTEF, Rue Guimard 9, Brussels

Road maps and demonstrators from ENOUGH - improving energy efficiency and promoting sustainable refrigeration technologies

Judith Evans

London South Bank University (LSBU)

Road maps - process

Technology reviews → Modelling of case studies to assess impact of technologies → Decarbonisation opportunities

1. Production
2. Storage
3. Transport
4. Retail
5. Food service
6. Home

Processing: meat, dairy, fish, processed products in processing

Post processing foods mixed

Models: EnergyPlus, bespoke models (ice-e, CNR transport model)

Technologies (both technological and operational) to reduce carbon emissions across the whole food chain

Process heating and cooling and HVAC

Identify the reduction in energy and carbon emissions for each carbon reduction measure and assess the cost and time for application

Assess over typical year

Impact to 2050

RCP4.5

Demonstrators

- 21 demos across the food chain
- Real life demonstrations of technologies
- Working with companies to implement demos
- Assessment of energy and carbon savings
- Often companies invested large sums of money to demos

Pillars behind selected technologies

1

✓ Integrate and optimise energy flows

✓ Increase energy efficiency

✓ Eliminate fossil fuels and increase renewables

2

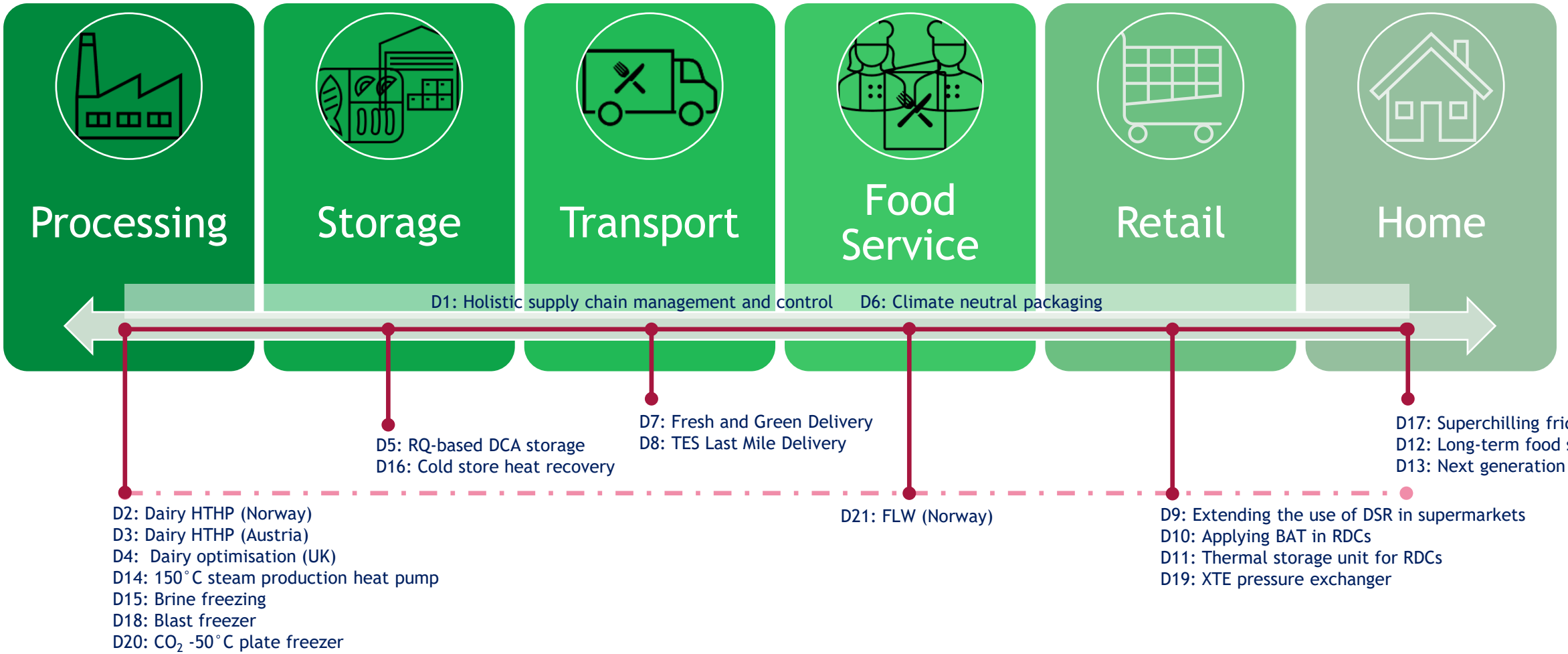
✓ Improve processing and preservation conditions

✓ Reduce food waste

3

✓ Use natural working fluids and materials

Roadmaps and demonstrators



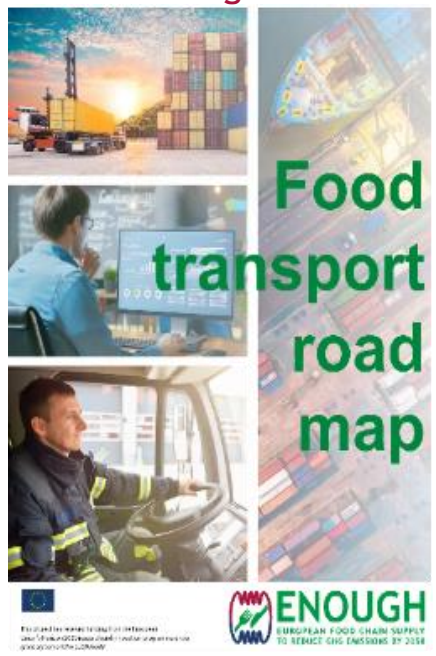
Road maps

Scope 1 + 2 emissions
6 locations

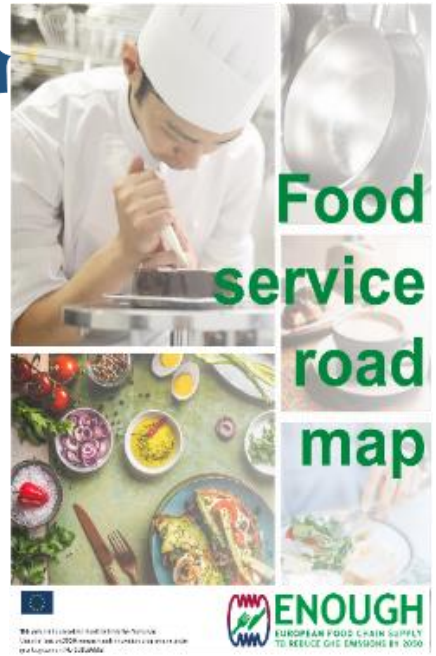
95 technologies

30 technologies

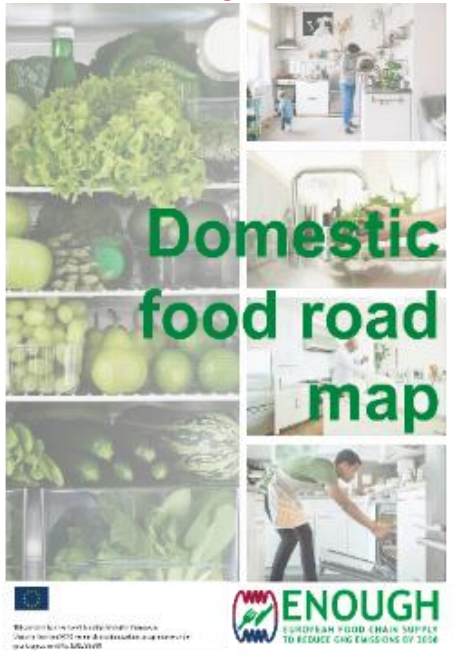
29 technologies



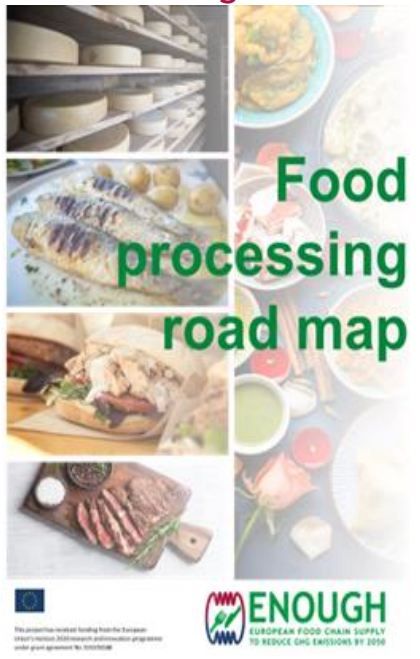
60 technologies



54 technologies



61 technologies

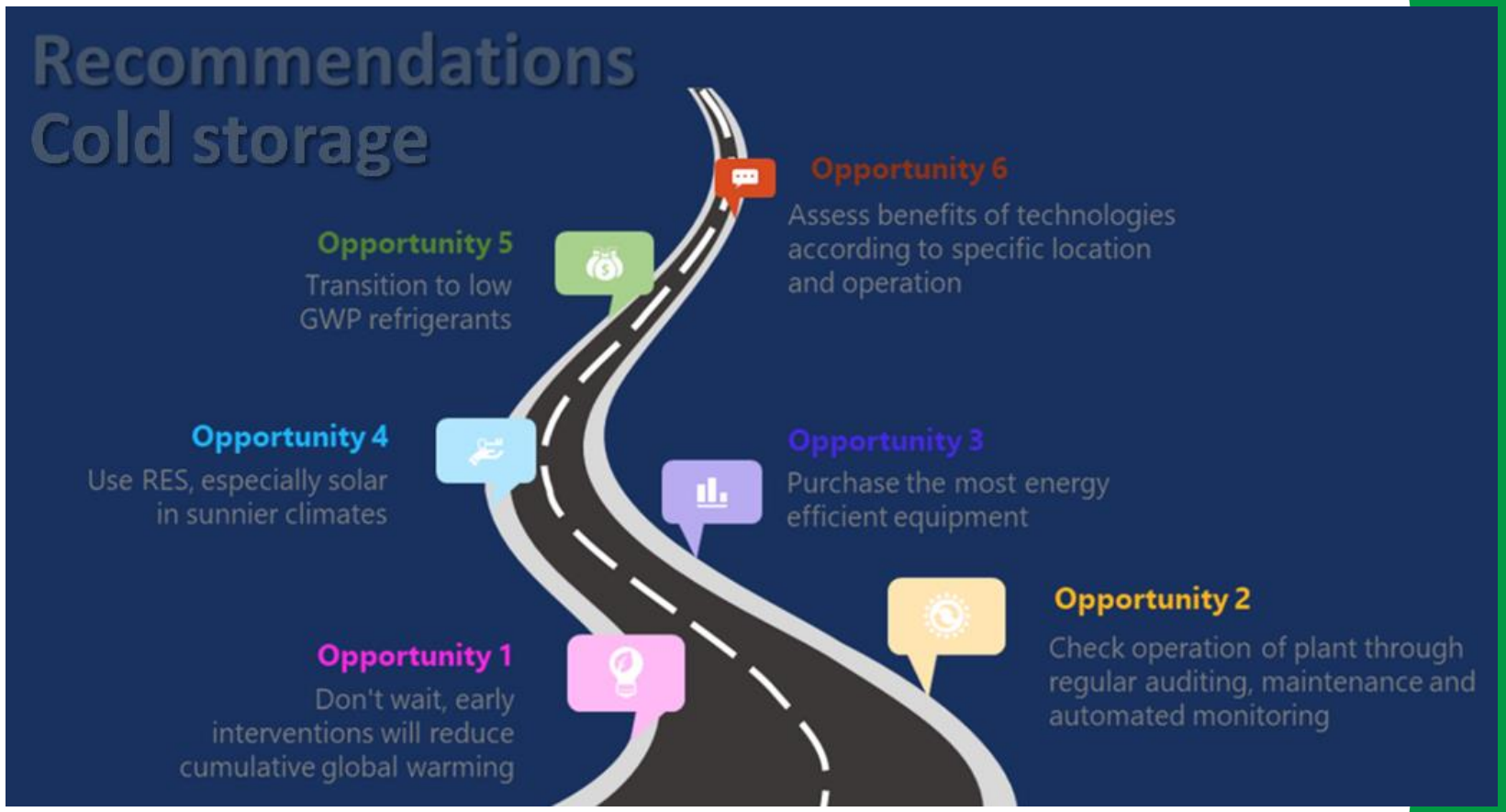


Road maps - retail

Technologies/ strategies	95
Model	EnergyPlus 2,100 m^2 (medium) and 600 m^2 (small) store
Scenarios	Minor retrofit: 1. Store dead band 2. HFO (small store only) 3. Doors on chilled cabinets 4. Combined minor retrofit Major retrofit: 1. Heat pumps 2. 20% better cabinets 3. RES (solar) 4. R744
Carbon savings (now)	Minor retrofit (combined): Medium: 31% Small: 51% +Major retrofit (combined): Medium: 65% Small: 45%

Road maps – cold storage

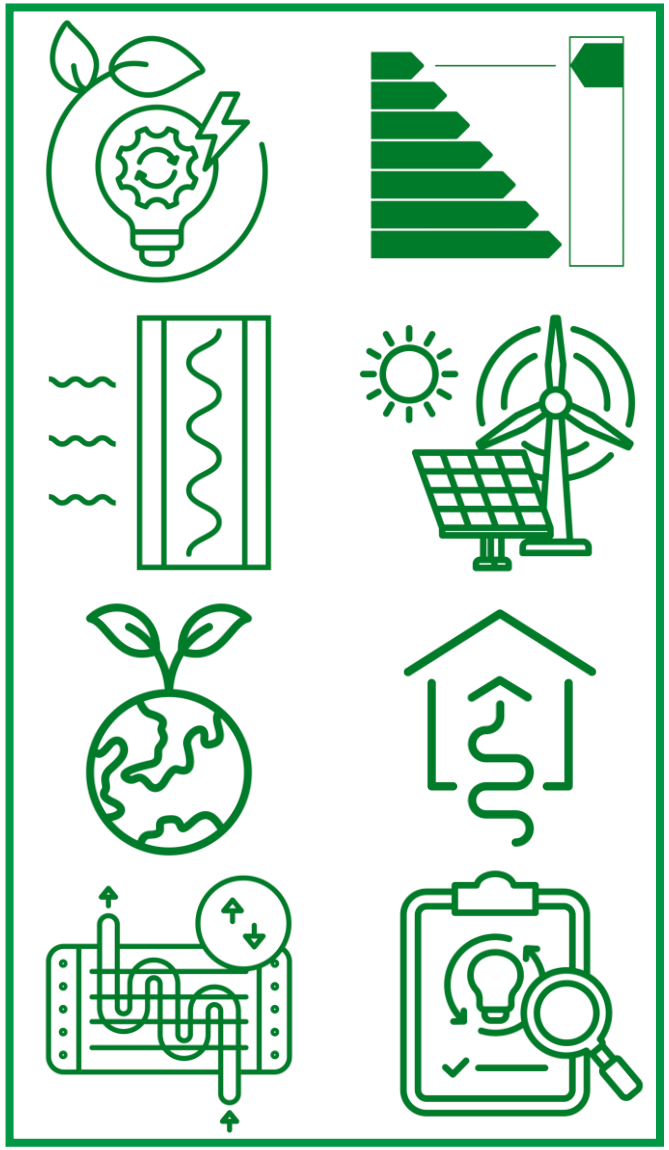
Technologies/ strategies	30
Model	ice-e model Chilled and frozen store
Scenarios	Retrofit 1. Vestibule 2. More efficient condenser and fans 3. Maintenance 4. Renewable energy (solar) New store 1. High efficiency compressor 2. Refrigerants (ammonia)
Carbon savings (now)	Retrofit (combined): Chilled 49% Frozen 59% +New (combined): Chilled 60% Frozen 72%



Road maps – opportunities for carbon reduction

- Many options available:
  - Electrification (move from fossil fuels)
  - Purchasing efficient equipment
  - Minimising heat gains

    - e.g. infiltration, better insulation, operational efficiency, alternative practices/technologies
  - Use of RES
  - Moving to natural refrigerants
  - Use of heat pumps (low, plus high temperature)
  - Heat reclaim/exchange
  - Auditing, maintenance (+skills)



Conclusions

- Road maps:
  - Decarbonisation of grid electricity has major impact on reducing carbon emissions
  - Electrification of systems is therefore important part of decarbonisation
  - Application of technologies/strategies enable earlier carbon reductions and less overall carbon emitted
  - Number of relatively simple and low-cost options available in all sectors examined
  - Options available to retrofit or for new systems
  - Possible to get very close to net zero in 2050 if apply best technologies
  - Location has impact on selection of equipment and overall benefits
- Demos:
    - Significant opportunities to optimise systems (often >30% savings)
    - Often cost-effective options to apply new technologies
    - Very important to show industry examples and prove benefits of technologies
    - Support required to enable uptake of best technologies

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THANK YOU!

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