ROAD MAPS FOR FOOD STORAGE IN DOMESTIC HOMES

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ENOUGH
EUROPEAN FOOD CHAIN SUPPLY TO REDUCE GHG EMISSIONS BY 2050

Refrigeration represents a major share of domestic kitchen energy use. This study reviewed 54 technologies and strategies, identifying those with the highest potential, their carbon savings, and payback times. Mathematical modelling assessed global impacts of applying these solutions from 2020–2025, considering grid carbon intensity changes and global warming.

Modelling of impacts from 2020 through to 2050

Selected Mature Kitchen Systems and Technologies:

- Air source heat pumps (ASHP) for space heating (when not already installed)
- Resistive and induction cooking, replacing gas cooking (73 – 84% more efficient)
- Efficient cookers, kettles, and microwaves (10% less energy usage)
- Efficient refrigeration, dishwashing (10% less energy usage each)
- Combined deployment of all the above technologies

A representative domestic kitchen model was developed, assessing six locations: the UK, France, Lithuania, Norway, Italy, and Poland. Three scenarios were considered:

- **Impact of climate change:** Using the IPCC's RCP 4.5 scenario, changes in temperature and humidity between 2020 and 2050 were modelled, assuming no modifications to the baseline kitchen.
- **Impact of grid carbon intensity (CI):** The impact of projected national changes in electrical CI was assessed for 2020, 2030, 2040, and 2050. For Norway and Italy, projections were only available for 2020, and for Poland up to 2040.
- **Impact of applying technologies:** Scenarios considered the introduction of measures such as air source heat pumps (ASHP), resistive or induction cooking, and more efficient appliances (cookers, kettles, microwaves, refrigerators, and dishwashers), individually and in combination.

Predicted impact on CO2e emissions reduction

All scenarios were simulated with the following findings:

Carbon emission savings:

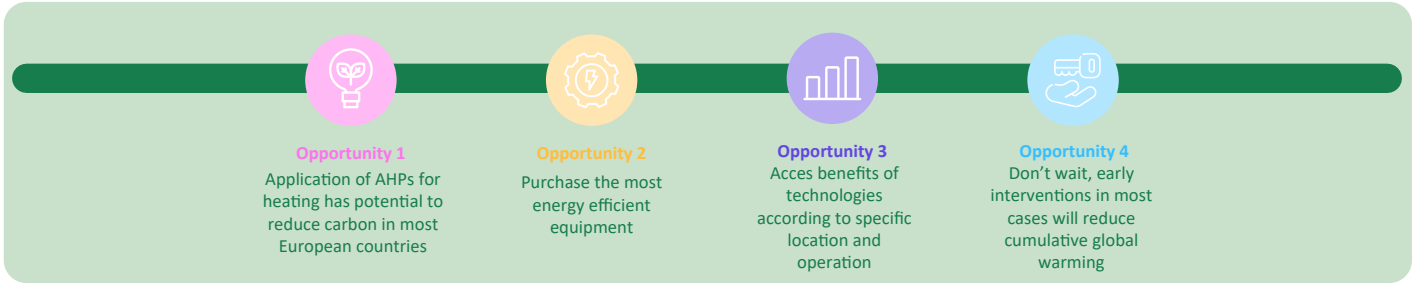
- **Impact of climate change:** With no interventions, grid decarbonisation alone brings kitchens in the UK, Norway, and France close to net zero emissions by 2050. In Lithuania, Italy, and Poland, additional technological upgrades are required to achieve substantial reductions.
- **Impact of grid CI:** Changes in the carbon intensity of national electricity grids strongly influence outcomes. In countries such as Poland and Lithuania, reductions remain limited as long as grid carbon intensity stays high.
- **Impact of applying technologies:** Immediate application of mature energy-efficient technologies (e.g., air source heat pumps, induction cooking, and more efficient appliances) achieves 11–81% emission savings, with the greatest impact in countries with cleaner or rapidly decarbonising grids.

Energy Savings :

- Upgrading to efficient appliances and electrifying cooking/heating substantially reduces total kitchen energy consumption, with reductions of 13-51% compared to baseline kitchens.
- Heating requirements fall in warmer climates by 2050; slight increase in refrigerator energy use due to higher ambient temperature is counterbalanced by reduced heating nee

Roadmap

From the work, this roadmap recommends 6 major opportunities to reduce carbon in cold stores.



A significant part of emissions reduction in domestic kitchens will result from the decarbonisation of the electricity grid. However, rapid adoption of-available technologies is essential to accelerate carbon savings and reduce cumulative emissions over time. Early action will maximise the overall climate benefit by 2050.

Find out more about this work: https://enough-emissions.eu/publications/

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