

# Energy and emissions in localised food systems: a case study of bread in the UK

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Conference on

**Localising Food Systems**

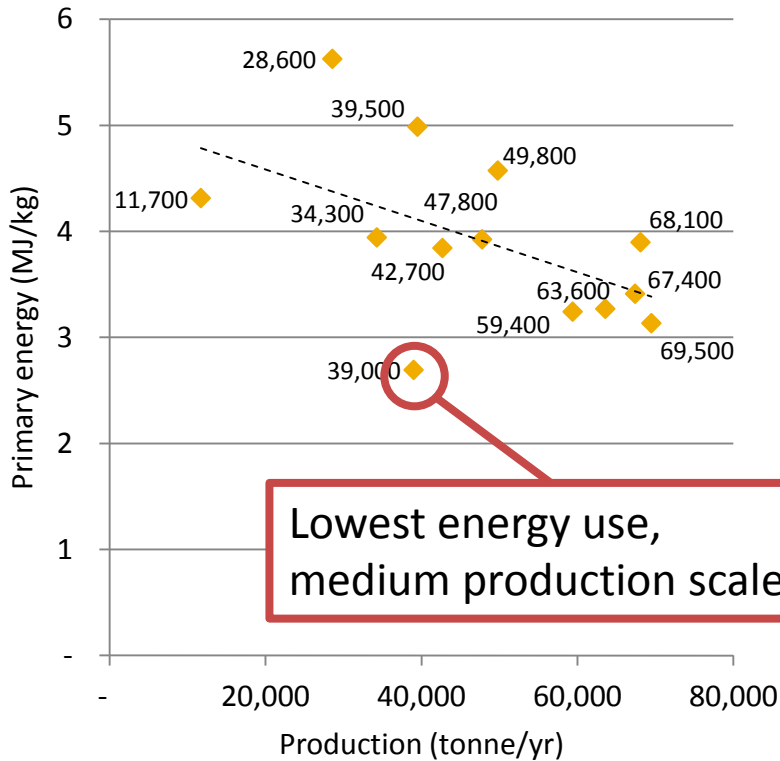
*The food-energy-water nexus issues of re-distributed manufacturing*

7<sup>th</sup> of December 2016, Oxford

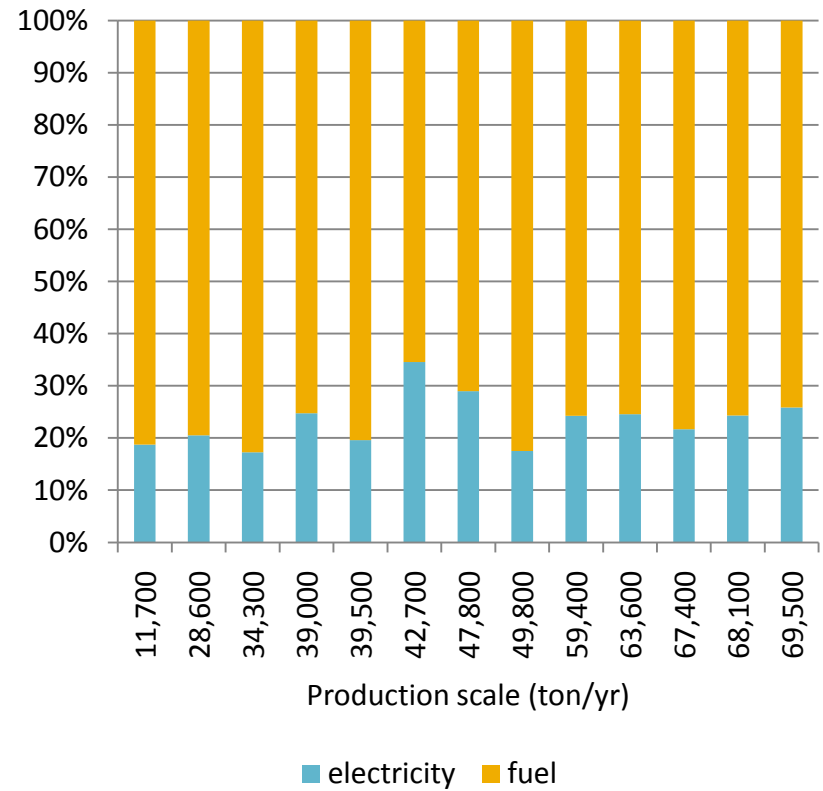


# 13 large scale bakery sites in UK

## Primary energy (MJ/kg) bread

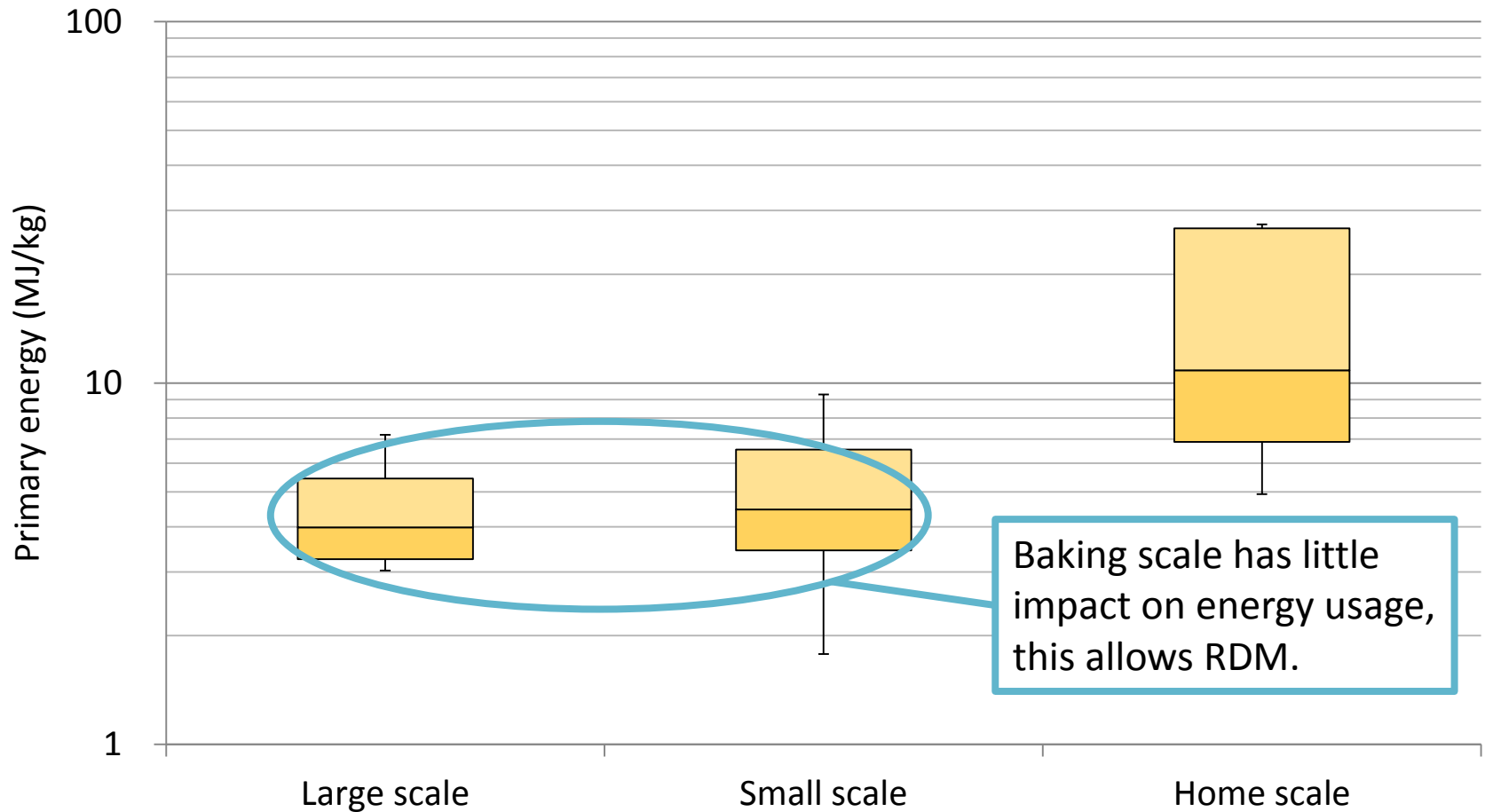


## Electricity and fuel shares in final end-use (%)



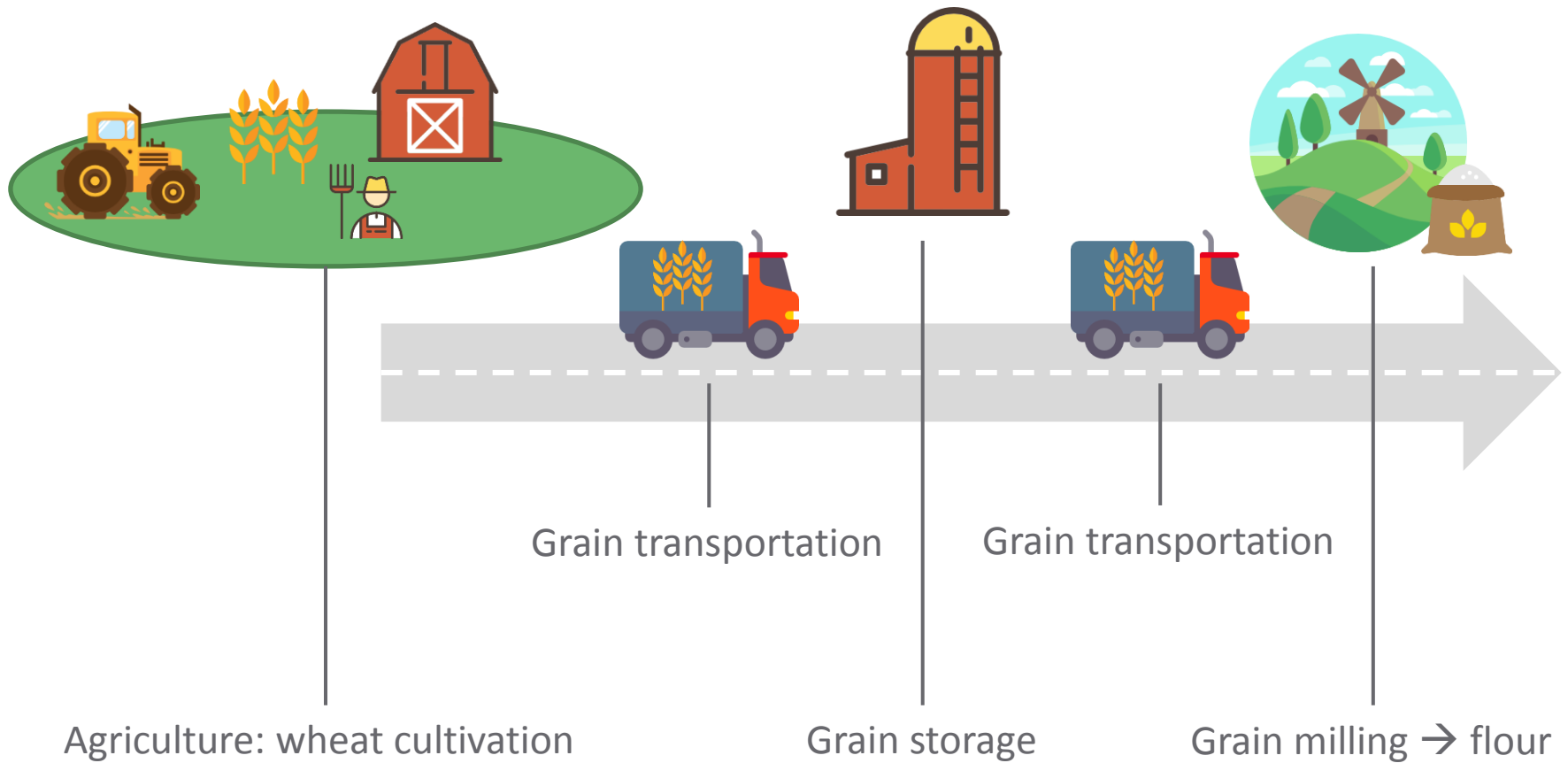
Source: Carbon Trust (2010)

# Energy in baking bread (MJ/kg)

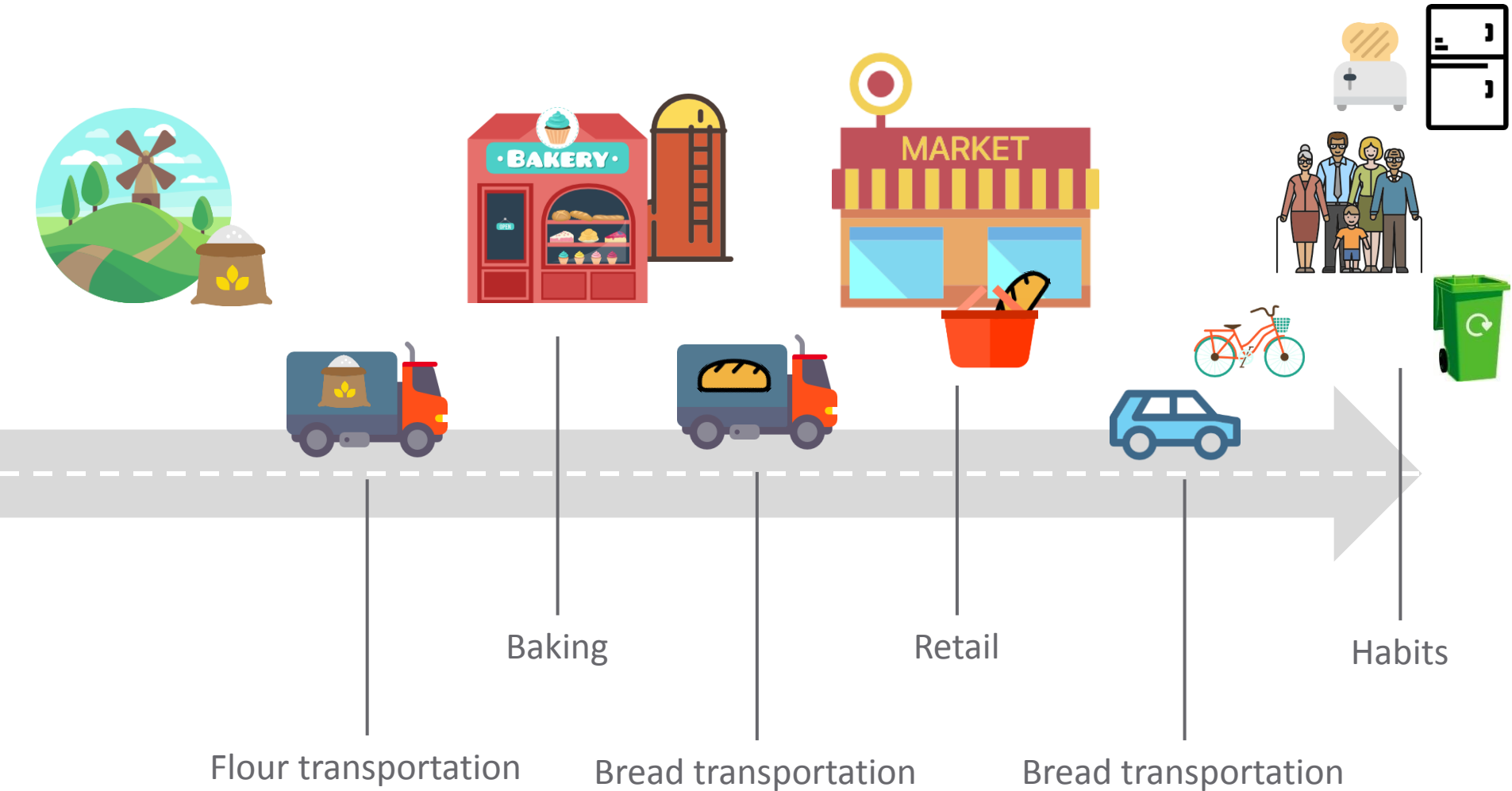


*Based on various values (measurements and modelled data) found in literature*

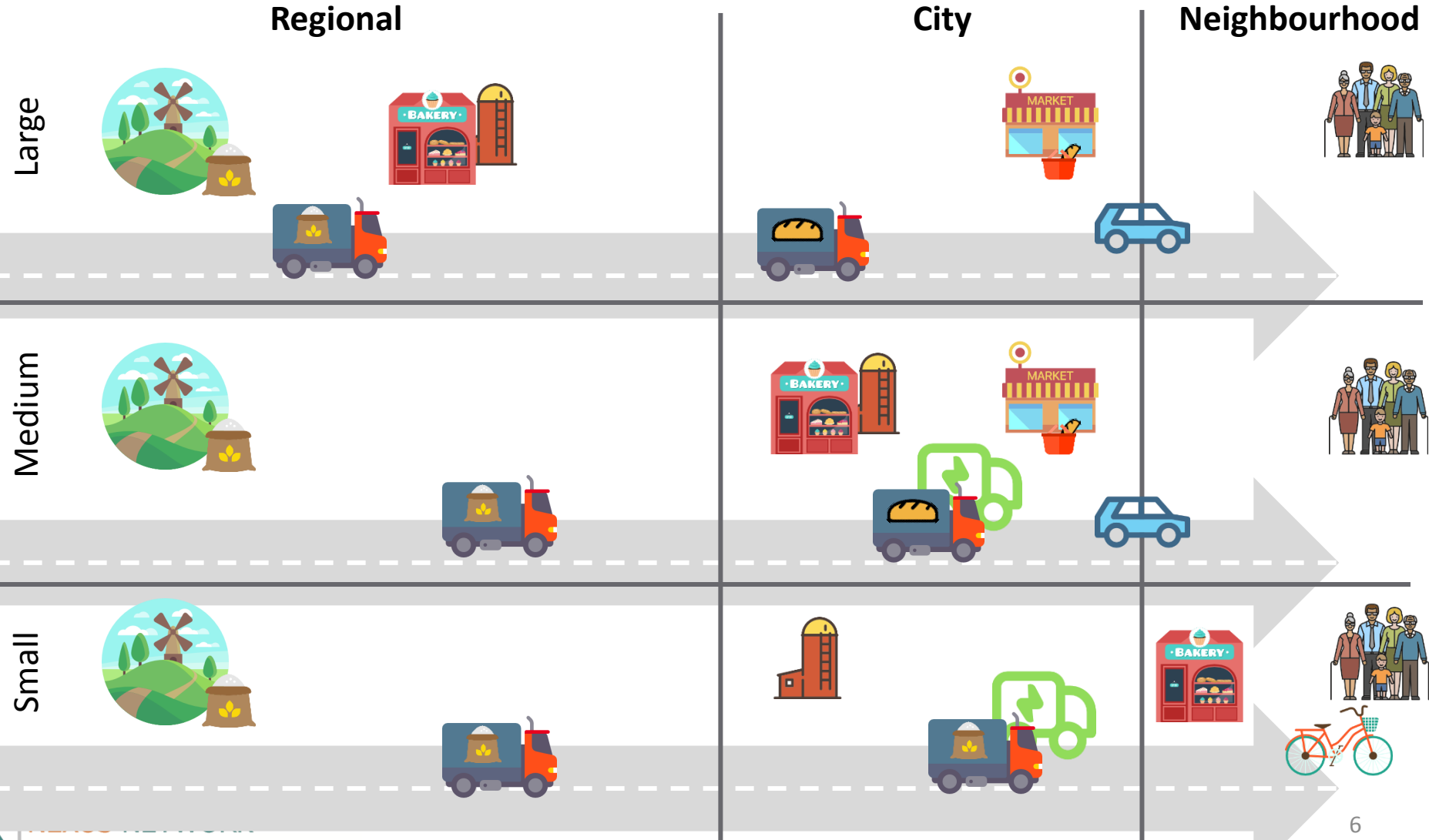
# Processes in the bread supply chain assumed to remain **unchanged**



# Processes in the bread supply chain with potential to be **changed**



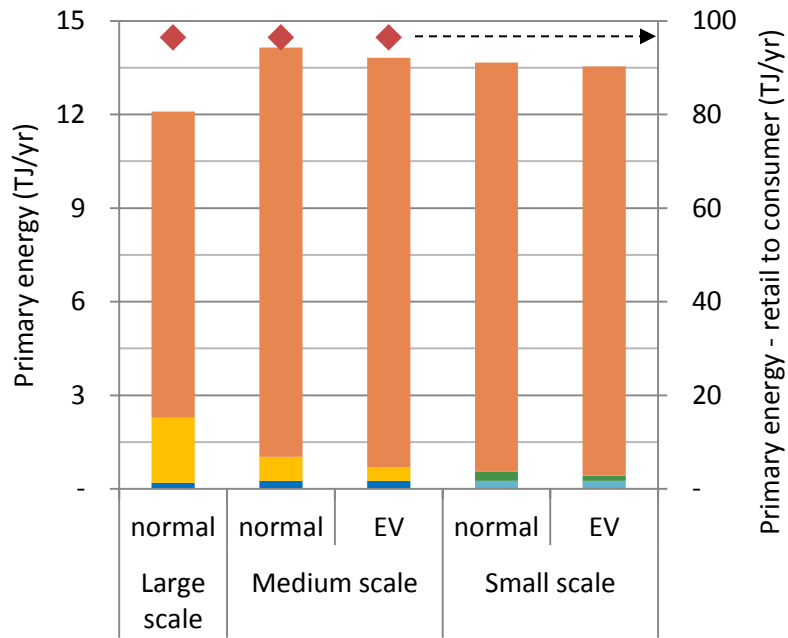
# Modelling three configurations



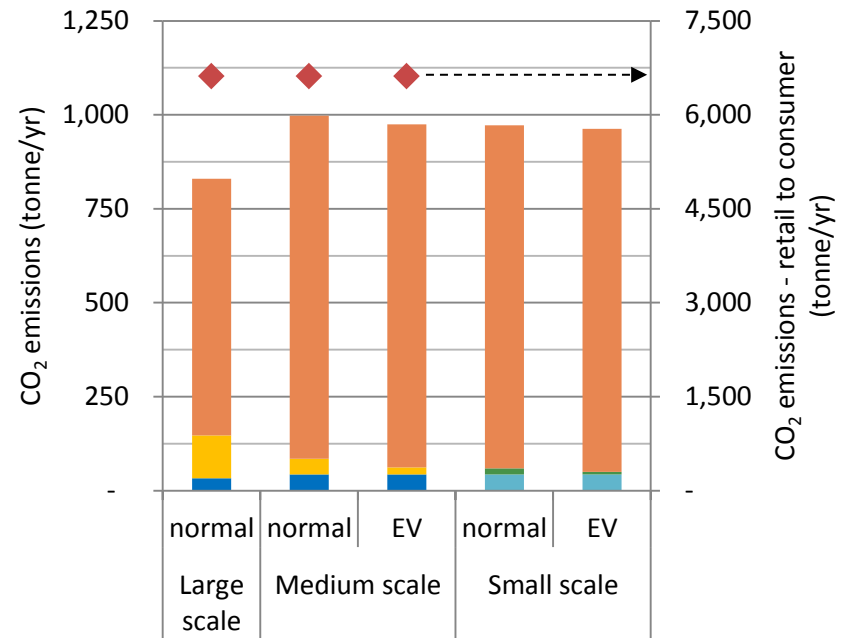
# Results for the three configurations






*Based on population of Oxford: 158,000 people*

## Primary energy (TJ/yr)



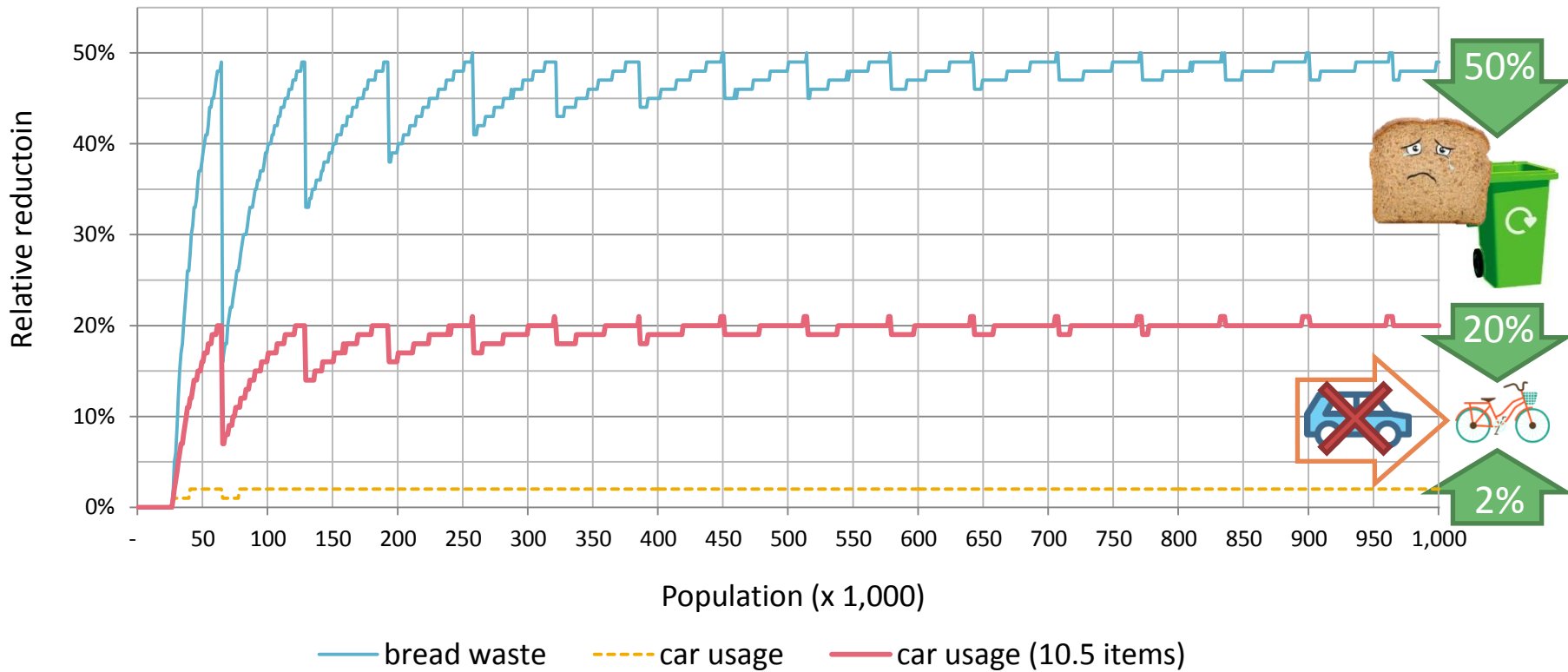
## CO<sub>2</sub> emissions (tonne/yr)



-  Bread baking
-  Bakery to retail
-  Flour distribution centre to bakeries
-  Mill to flour distribution centre
-  Mill to bakery
-  Retail to consumer

# Potential for reduction in waste and car usage with small scale bakeries

Relative reduction at which small scale configuration consumes less primary energy compared with large scale configuration (~ break-even point)





# Conclusions

- Production scale has little influence on energy consumption in bread baking
- Small localised bakeries could change consumer habits, thus offering environmental benefits over large-scale production
  - However, this is not in the interest of bakeries:
    - more waste = more bread being sold → more profit
- Future research:
  - Economics / Business models
  - Wider circular economy benefits
  - Bread/food as a service? CO<sub>2</sub> pricing?