



UNIVERSITY OF  
CAMBRIDGE

Department of Engineering

3<sup>rd</sup> RECBE meeting

Cambridge, UK

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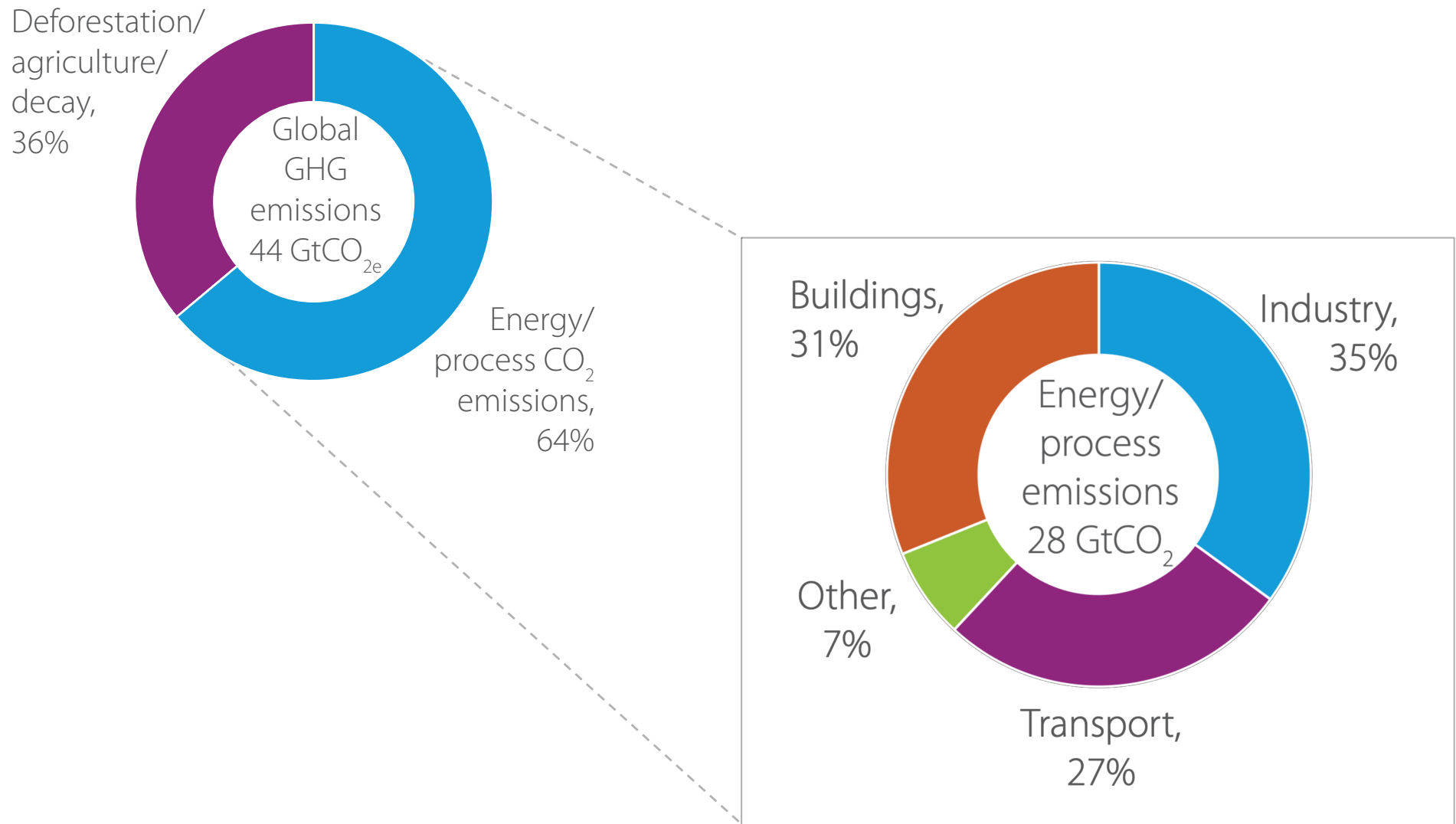
# English Housing Stock

Testing alternative strategies to reduce emissions.

Dr André Cabrera Serrenho

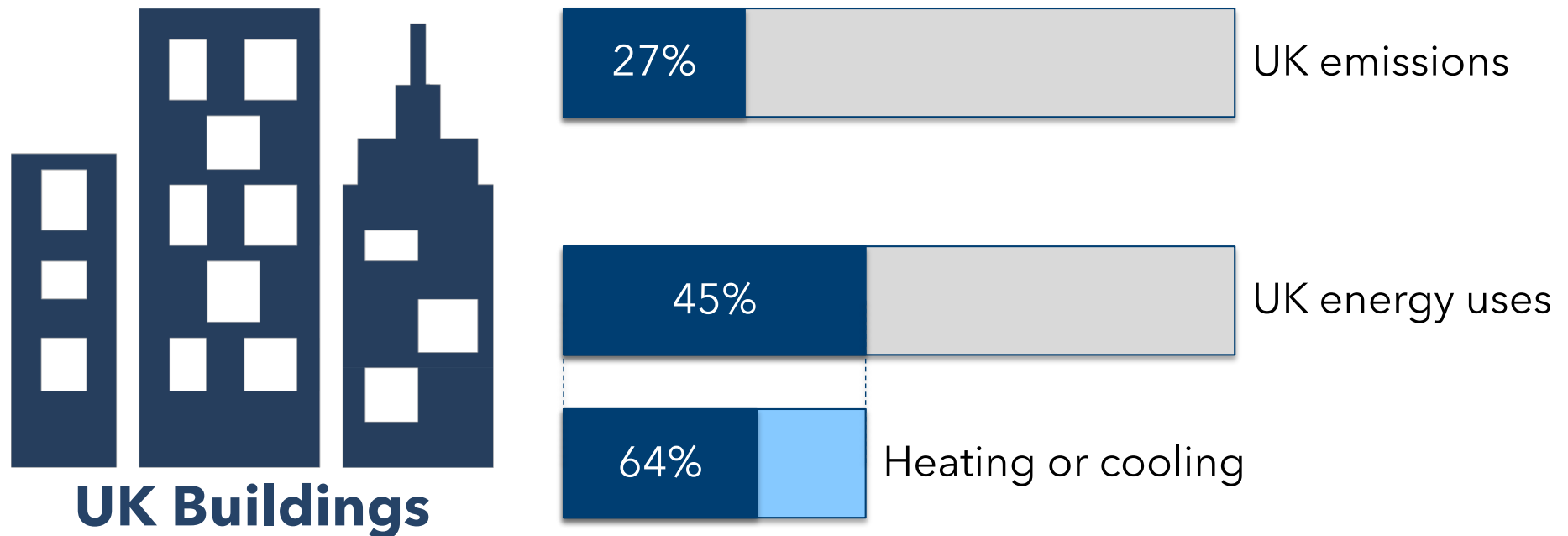
Research Associate

# Global greenhouse gas emissions



(Allwood et al., 2012)

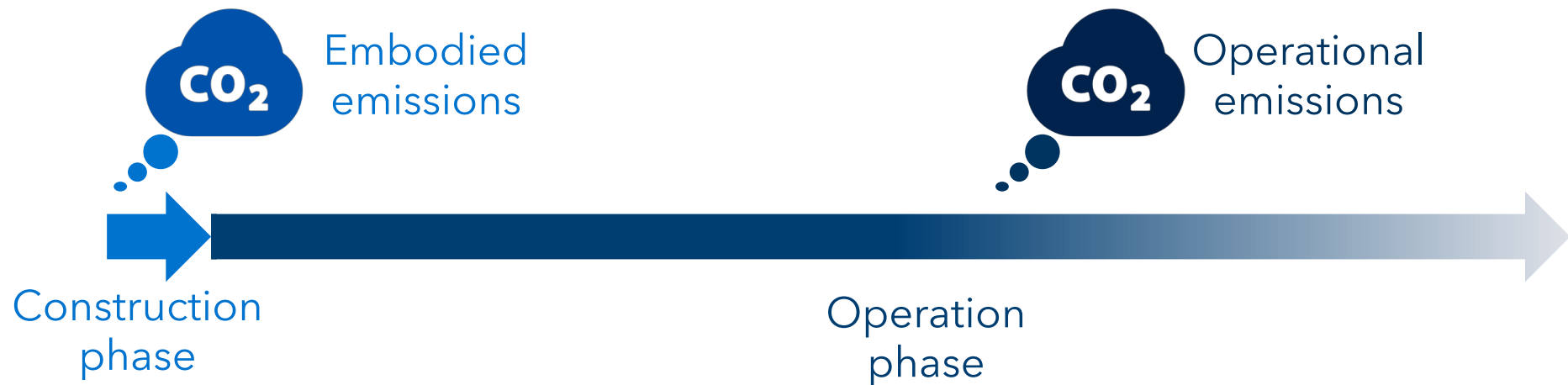
# Emissions and energy uses: UK buildings



- Current policies aim at cutting 66% of current UK emissions by 2050.
- Most progress so far has been made by the power sector.
- Buildings are expected to deliver much smaller savings: -20% from current levels by 2030.

# Emissions associated with buildings

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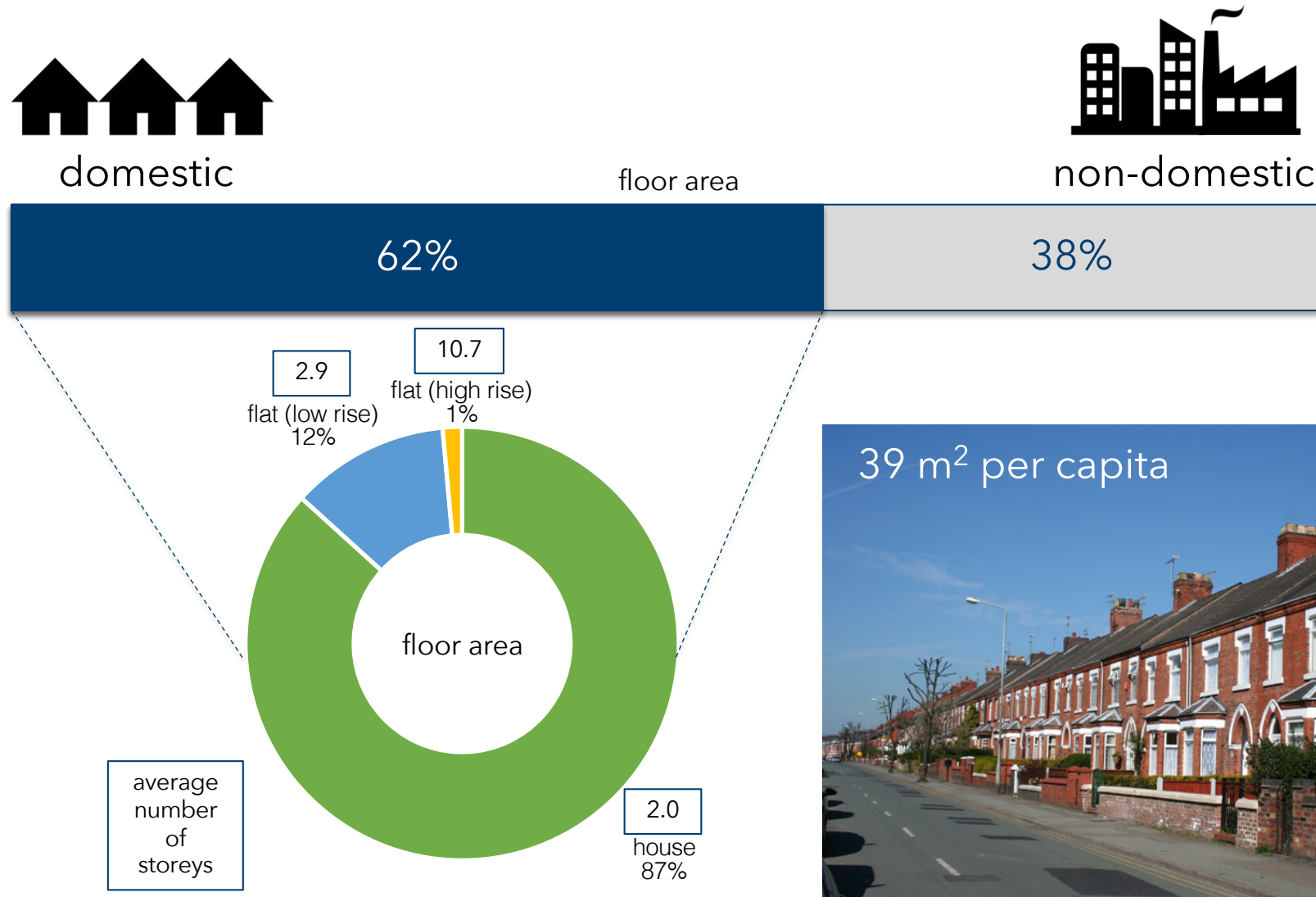


- Concrete
- Bricks
- Mortar
- Steel

- Energy uses in buildings

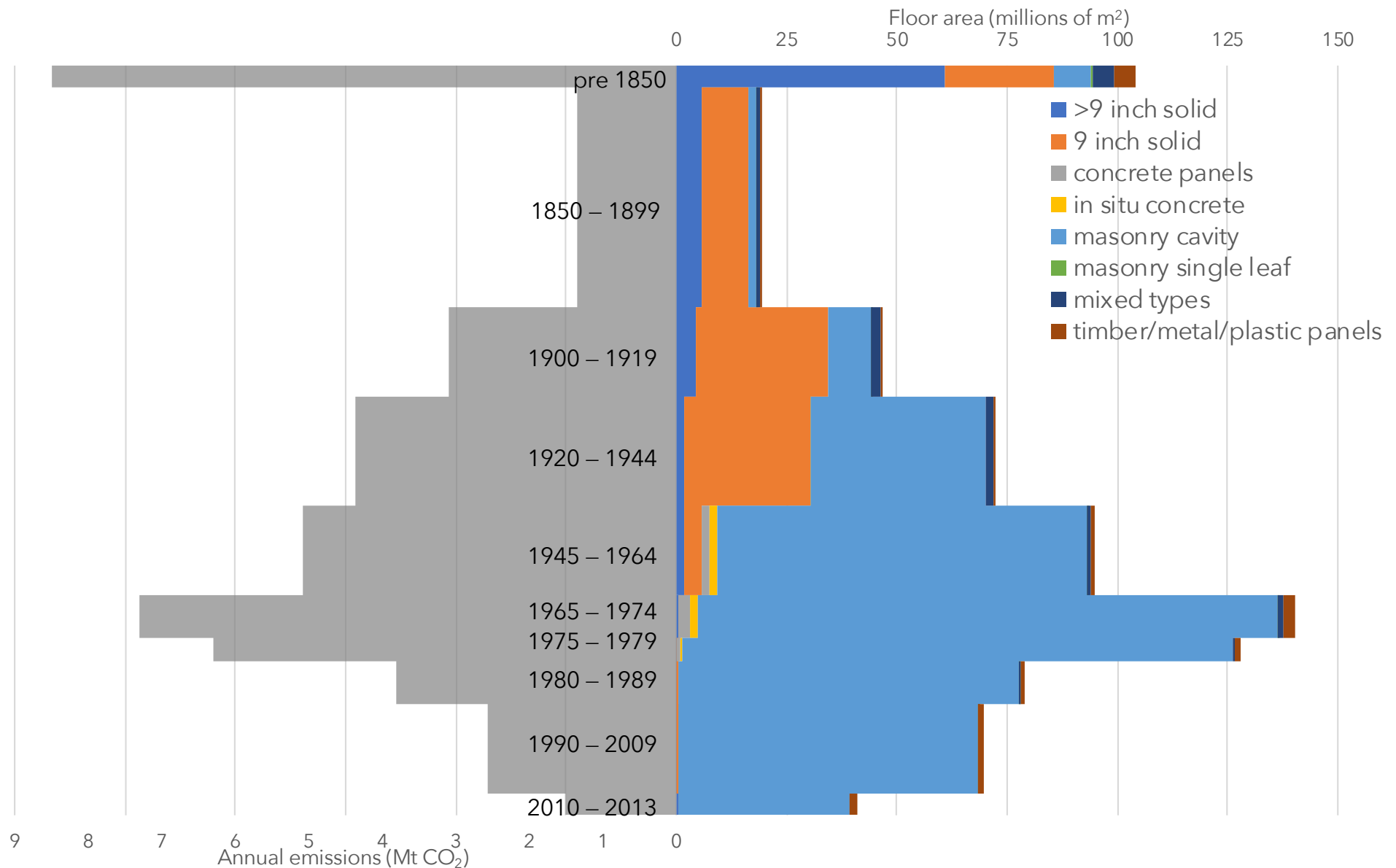


# Composition of the English building stock

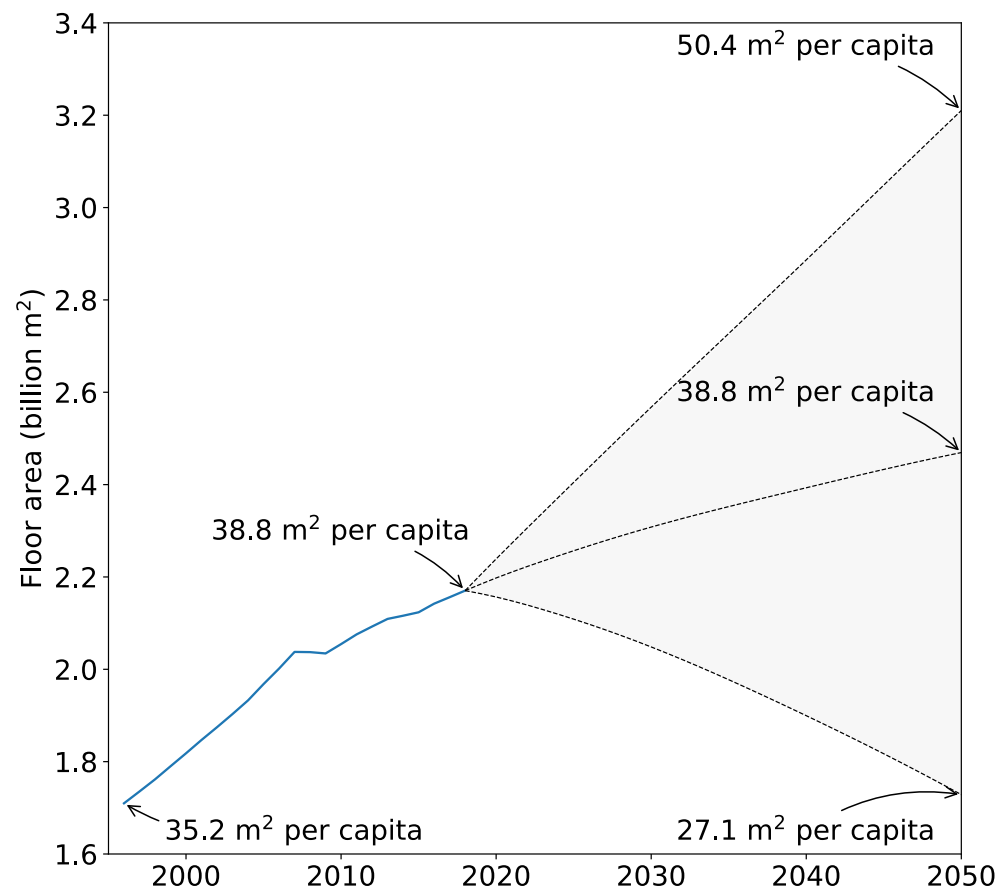
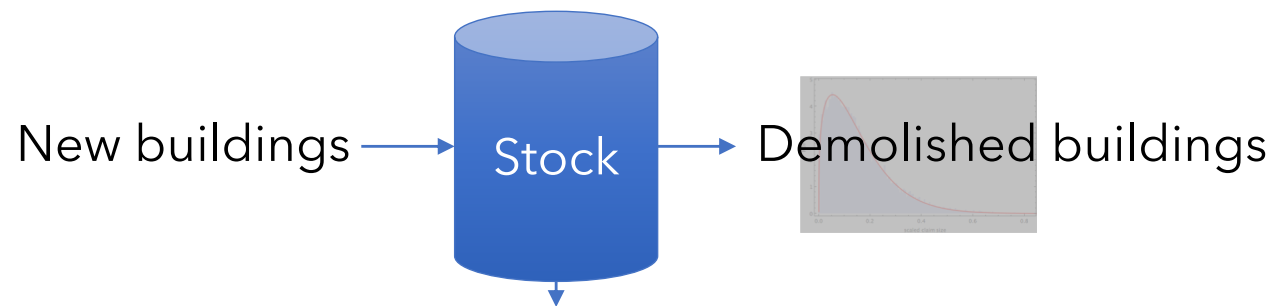


Source: English Housing Survey

# English domestic housing stock, 2013



# Modelling future building stock



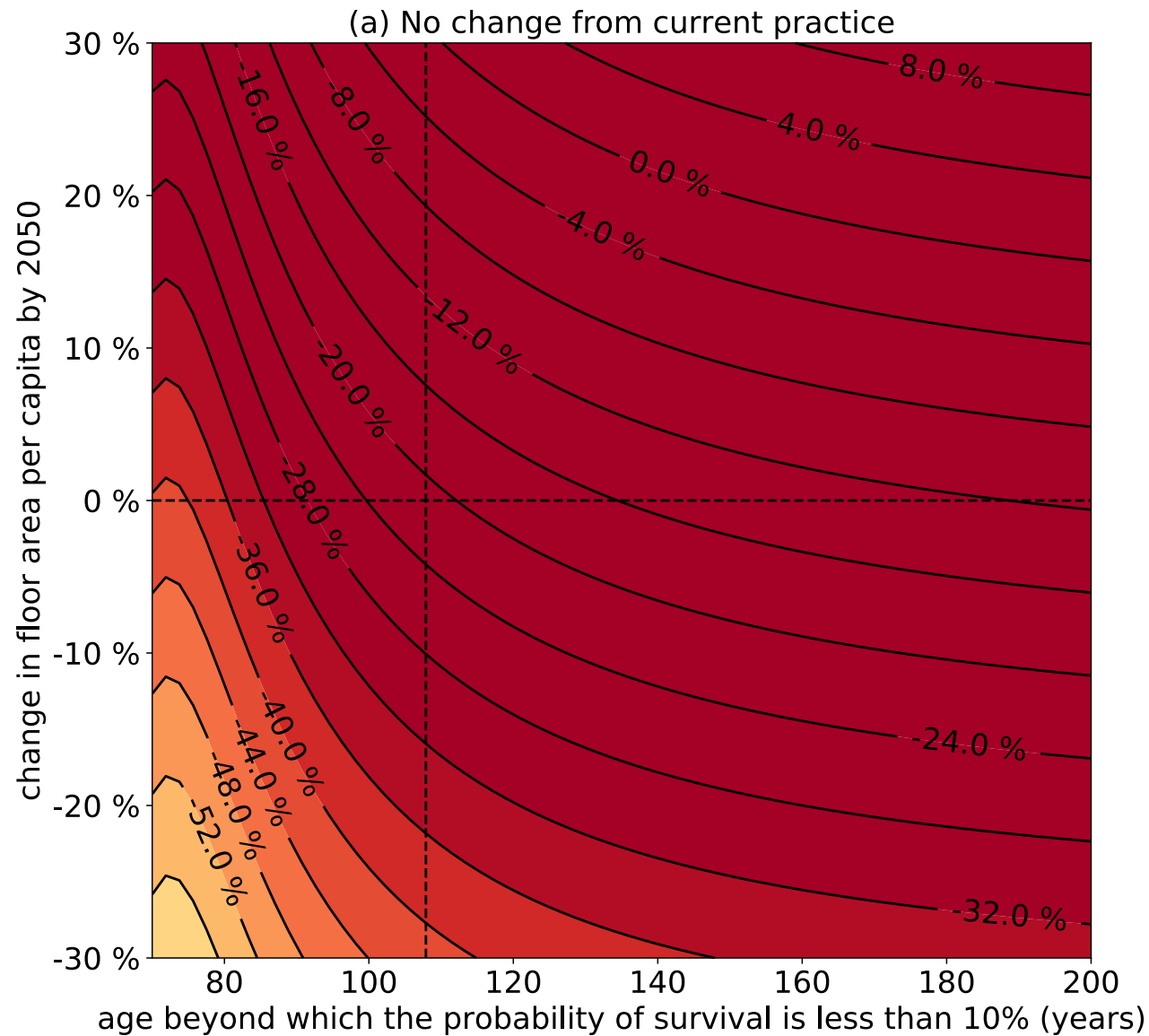
# Estimated annual new construction



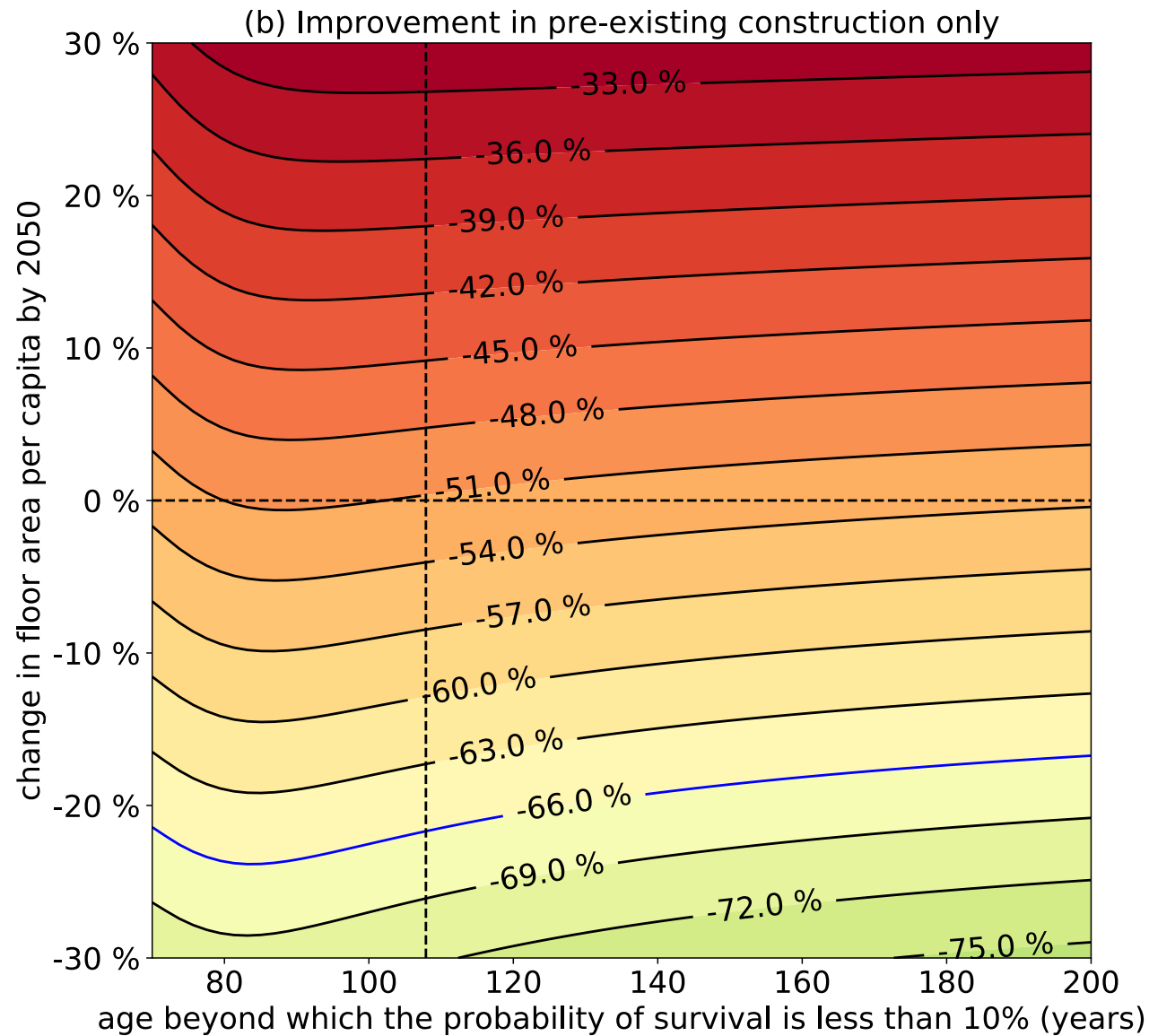
# Alternative strategies: 2050 targets

Strategies	Average operational emissions in 2050 (kg CO <sub>2</sub> / m <sup>2</sup> )	
	Post-2018 dwellings	Pre-2018 dwellings
<b>(a)</b> No change from current practice.	<b>19.1</b>	<b>54.2</b>
<b>(b)</b> Pre-2018 buildings are refurbished up to the standards of 2018 new construction by 2050.	<b>19.1</b>	<b>19.1</b>
<b>(c)</b> All post-2018 construction are zero-carbon houses by 2050, and pre-2018 buildings are kept unchanged.	<b>0.0</b>	<b>54.2</b>
<b>(d)</b> All post-2018 construction are zero-carbon houses by 2050, and pre-2018 buildings are refurbished up to the standards of 2018 new construction by 2050.	<b>0.0</b>	<b>19.1</b>

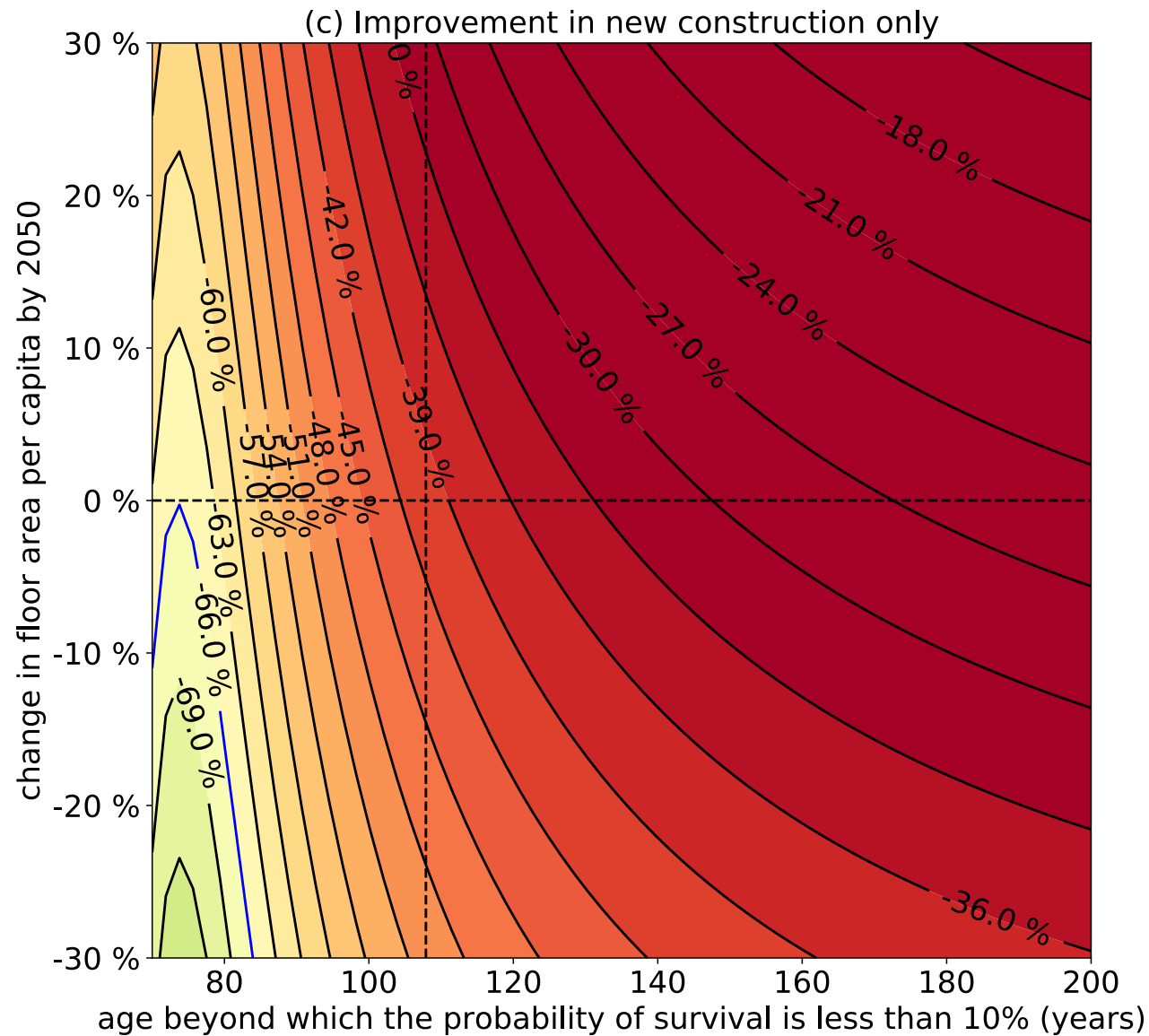
# Emissions savings by 2050



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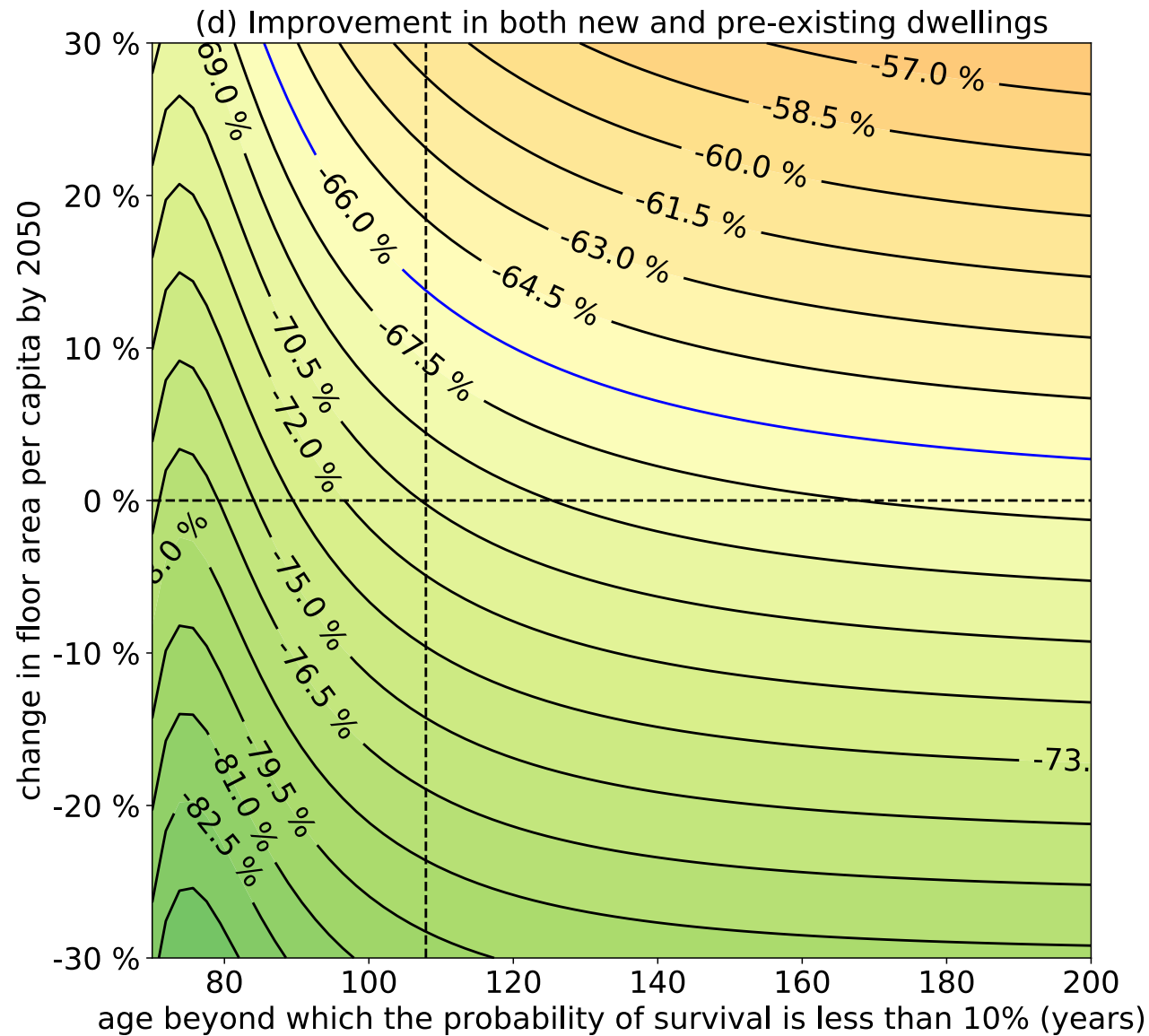


# Emissions savings by 2050

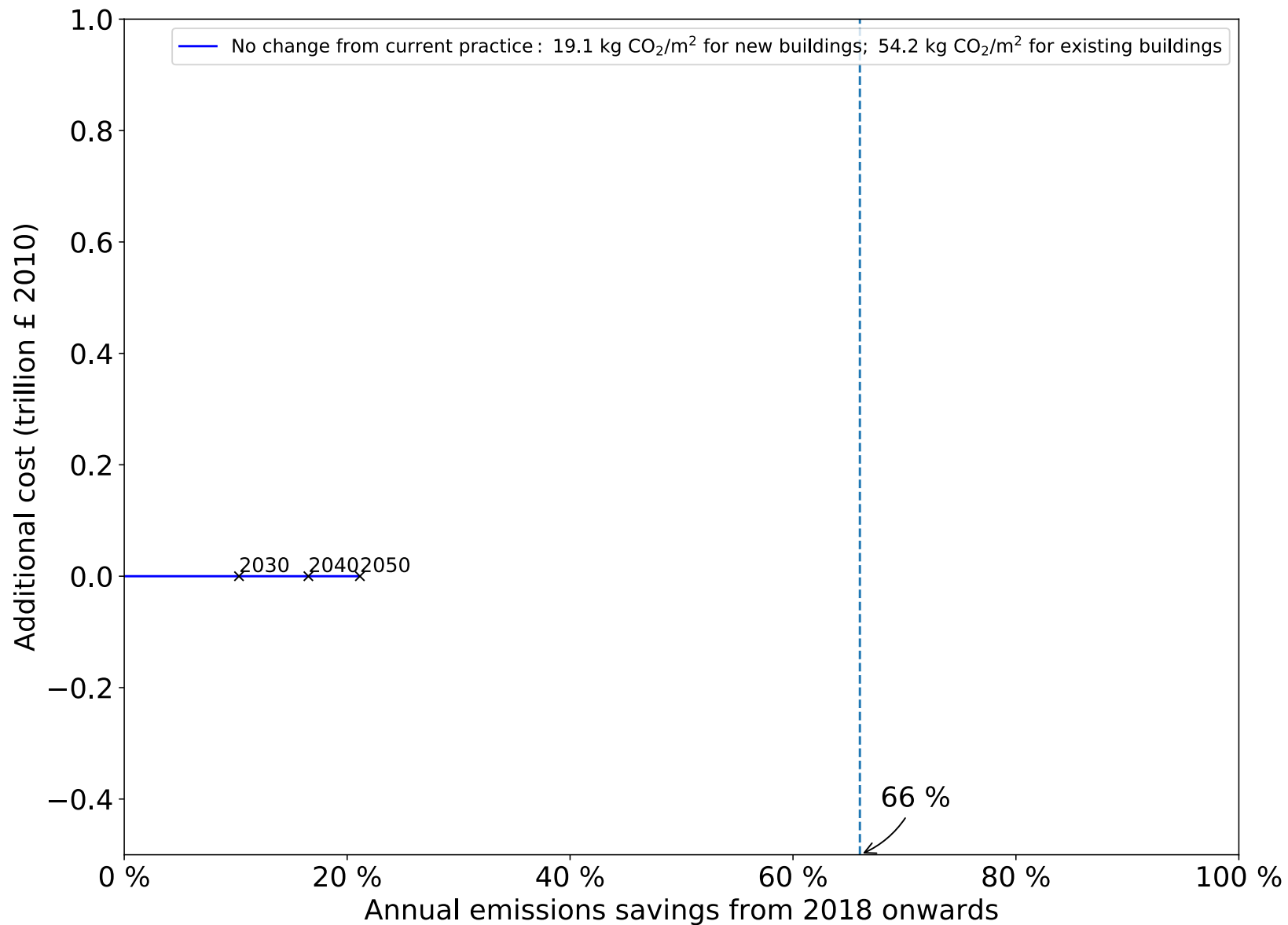




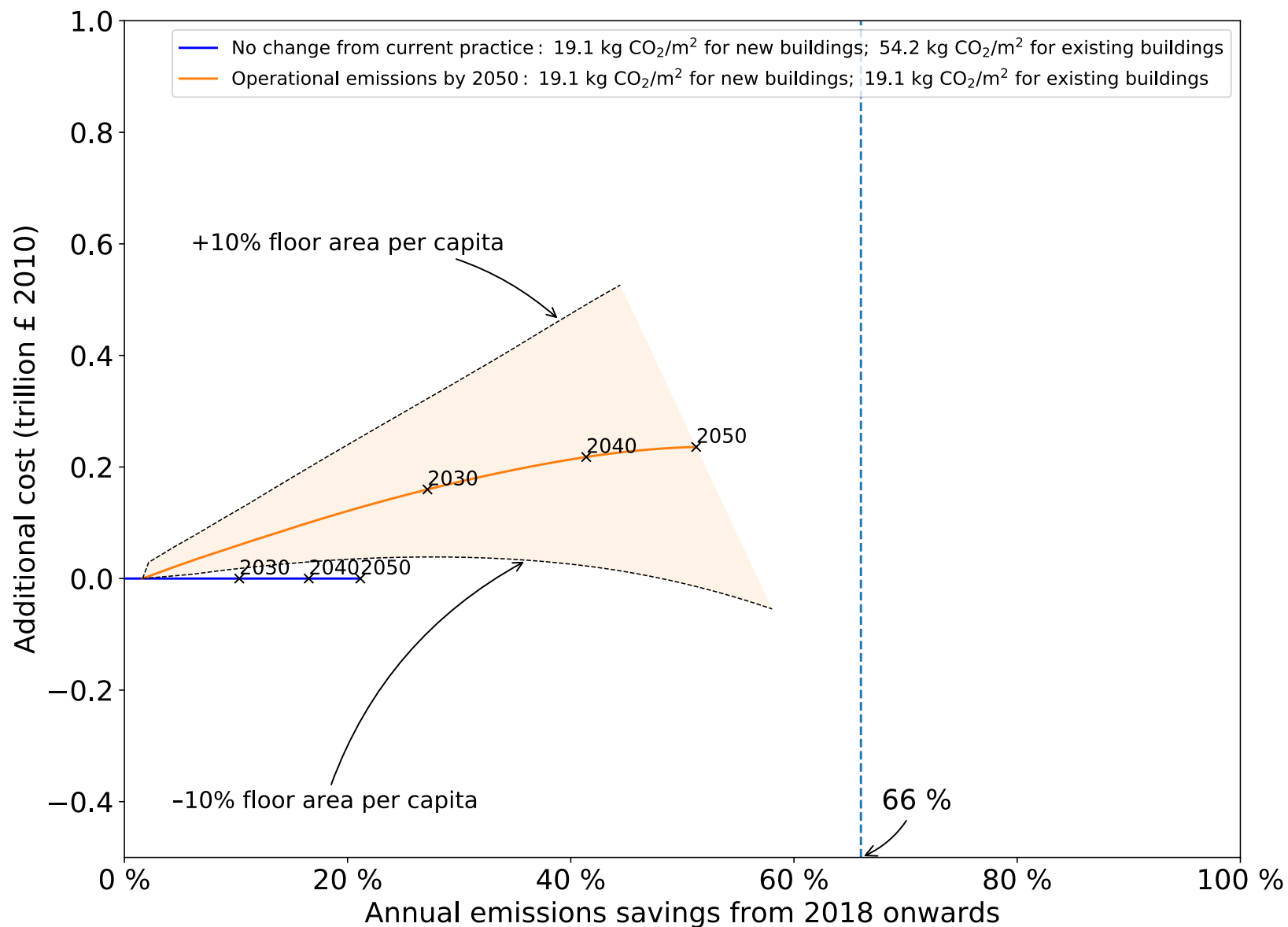
# Emissions savings by 2050



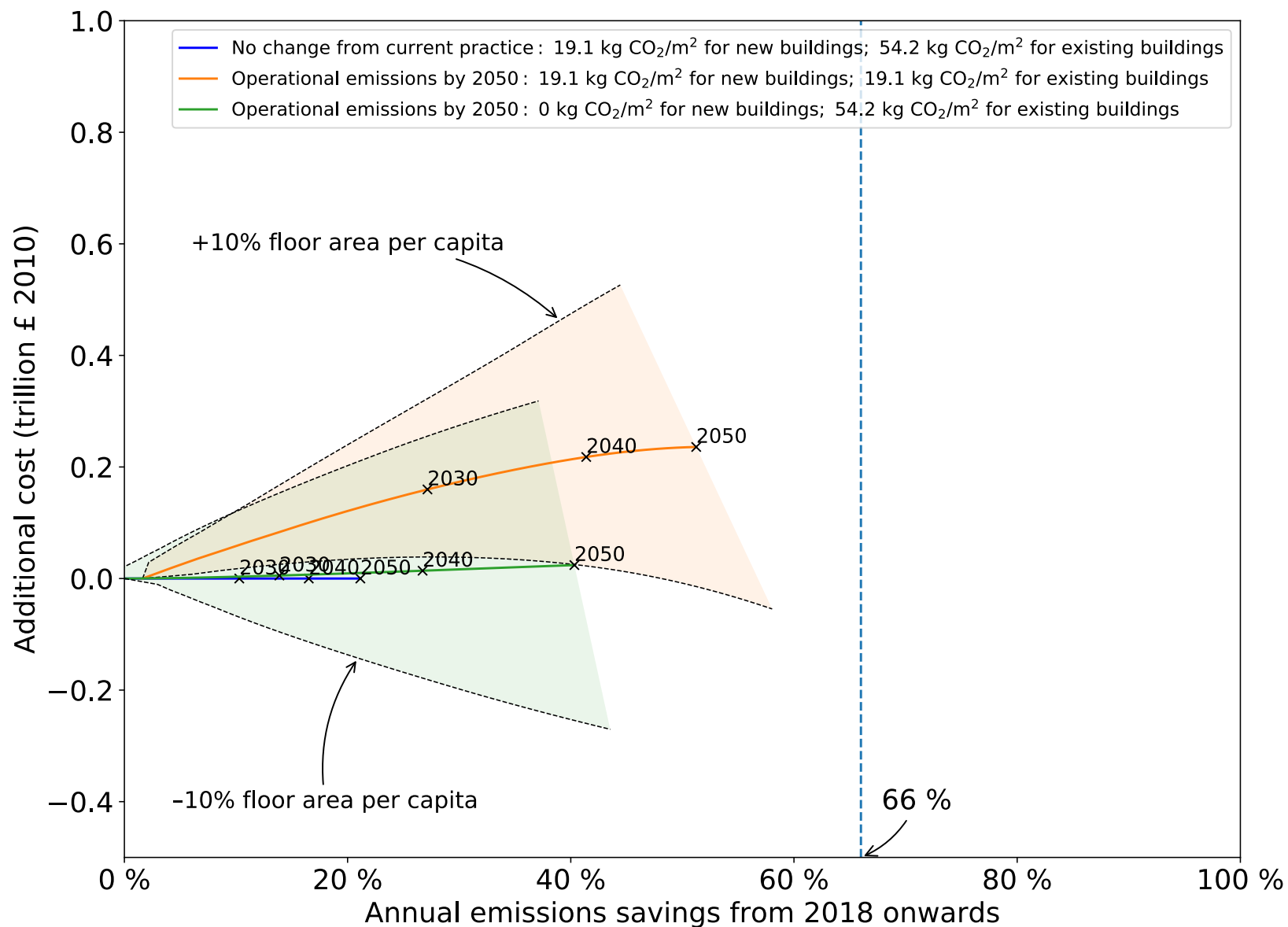
# Costs and emissions for each strategy



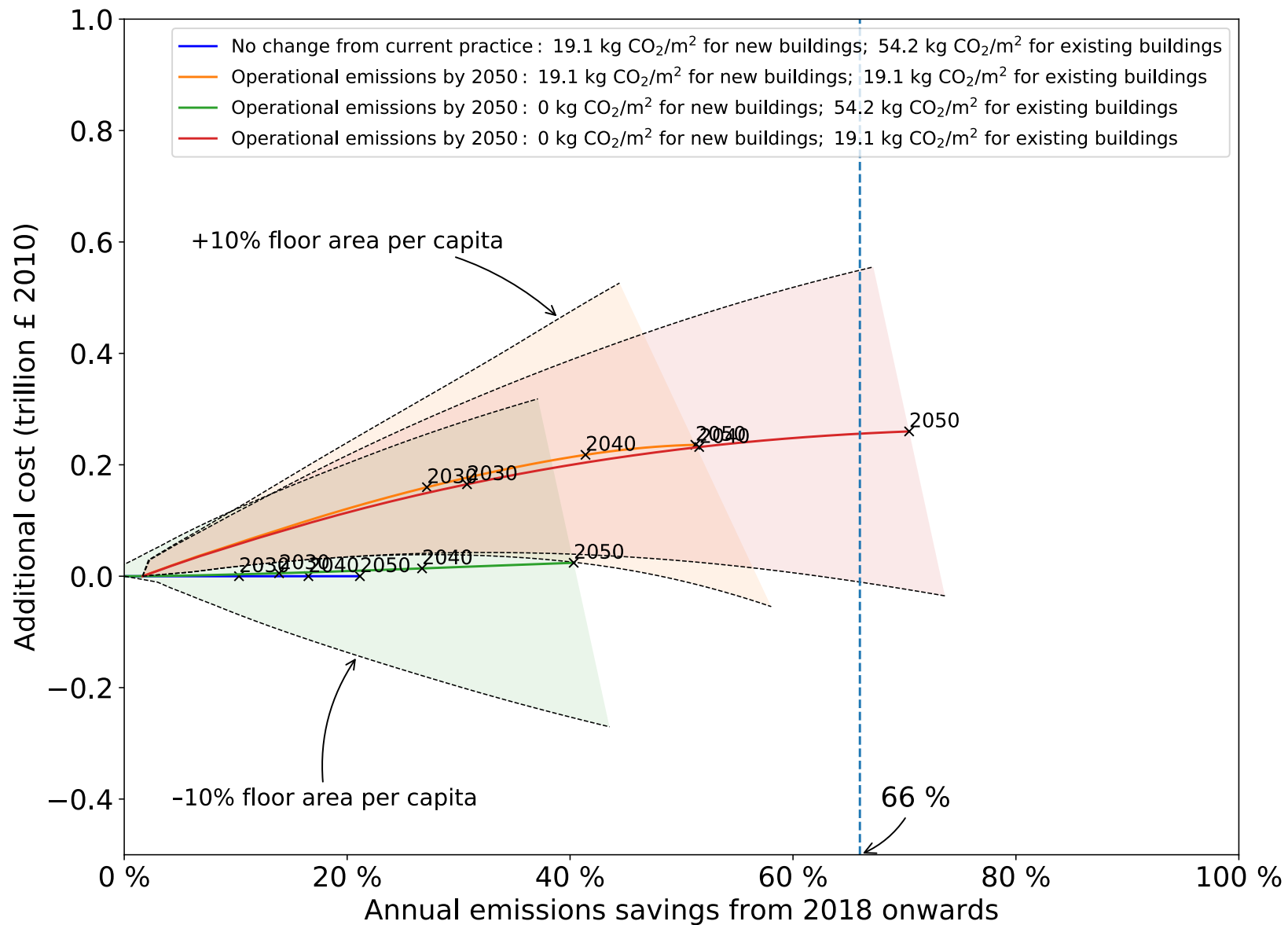
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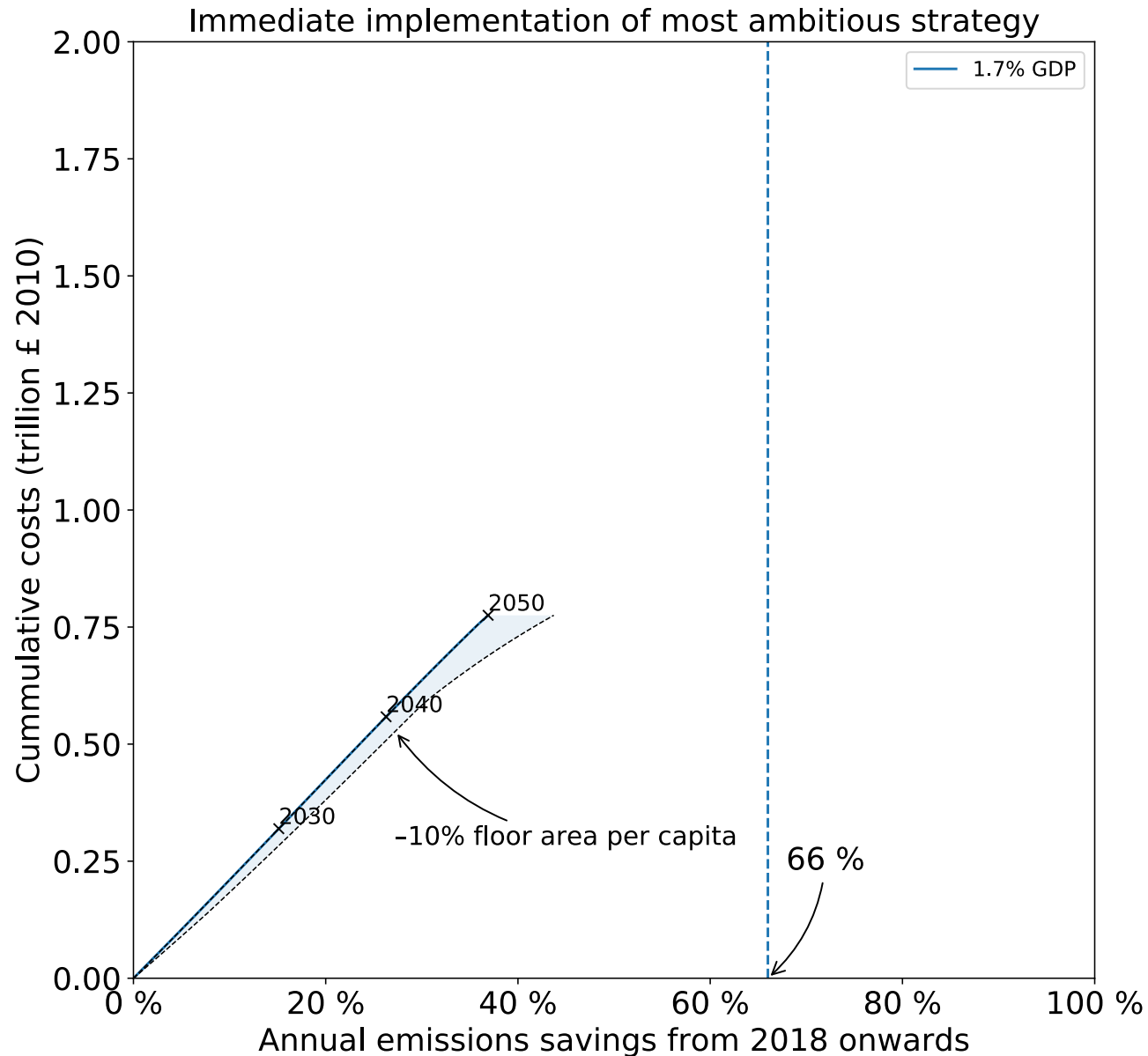
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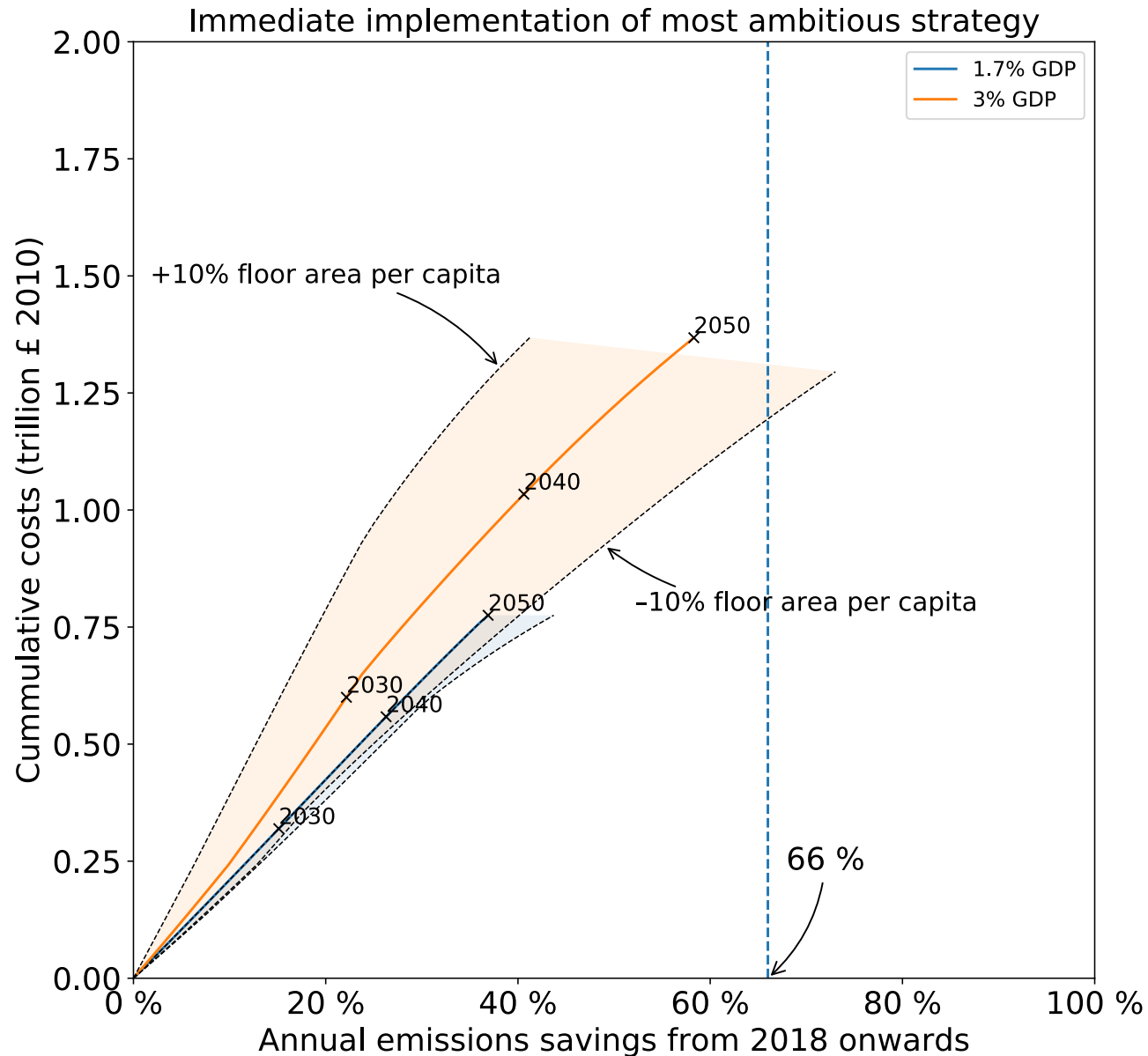
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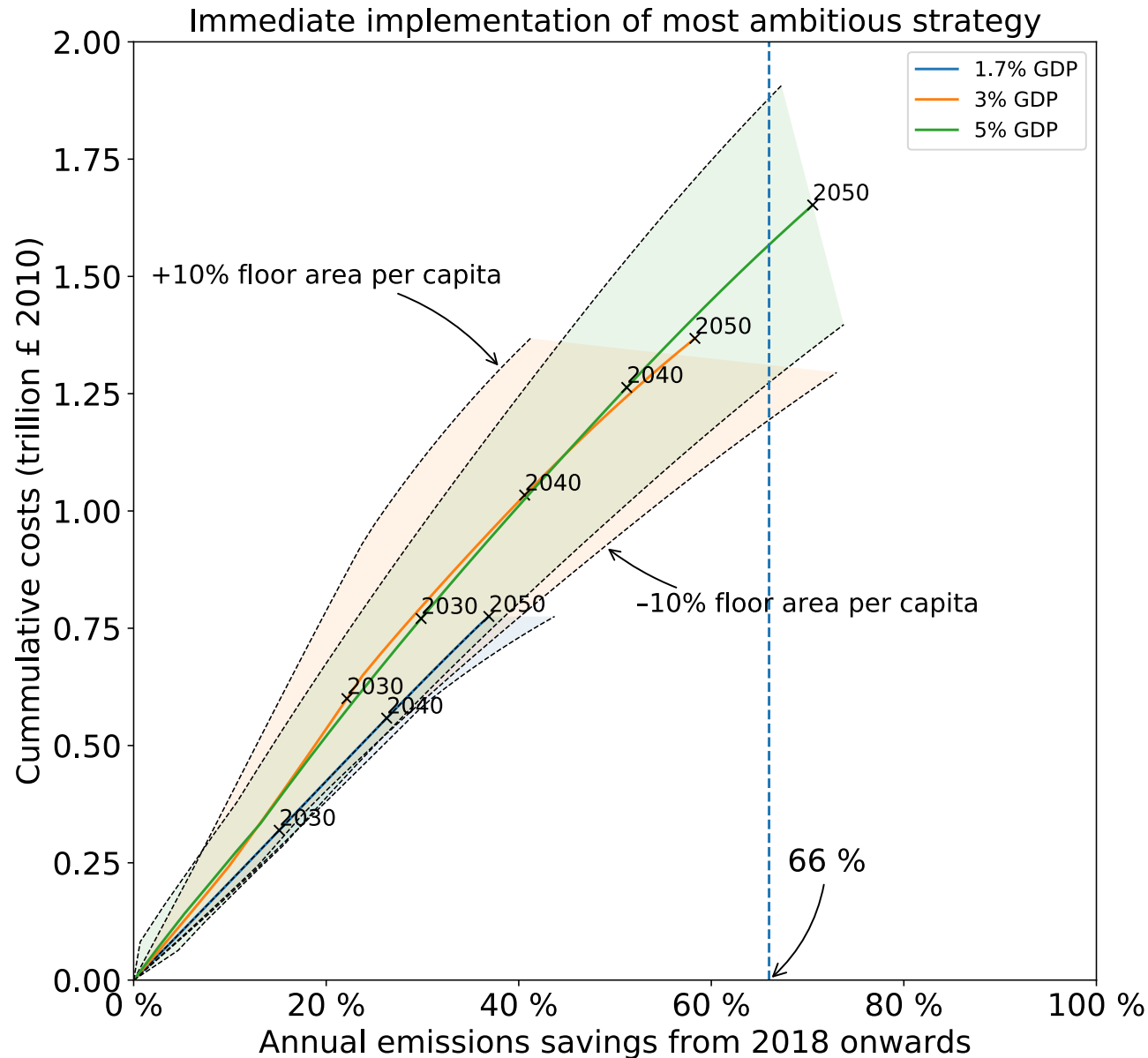
# Emissions and expenditure



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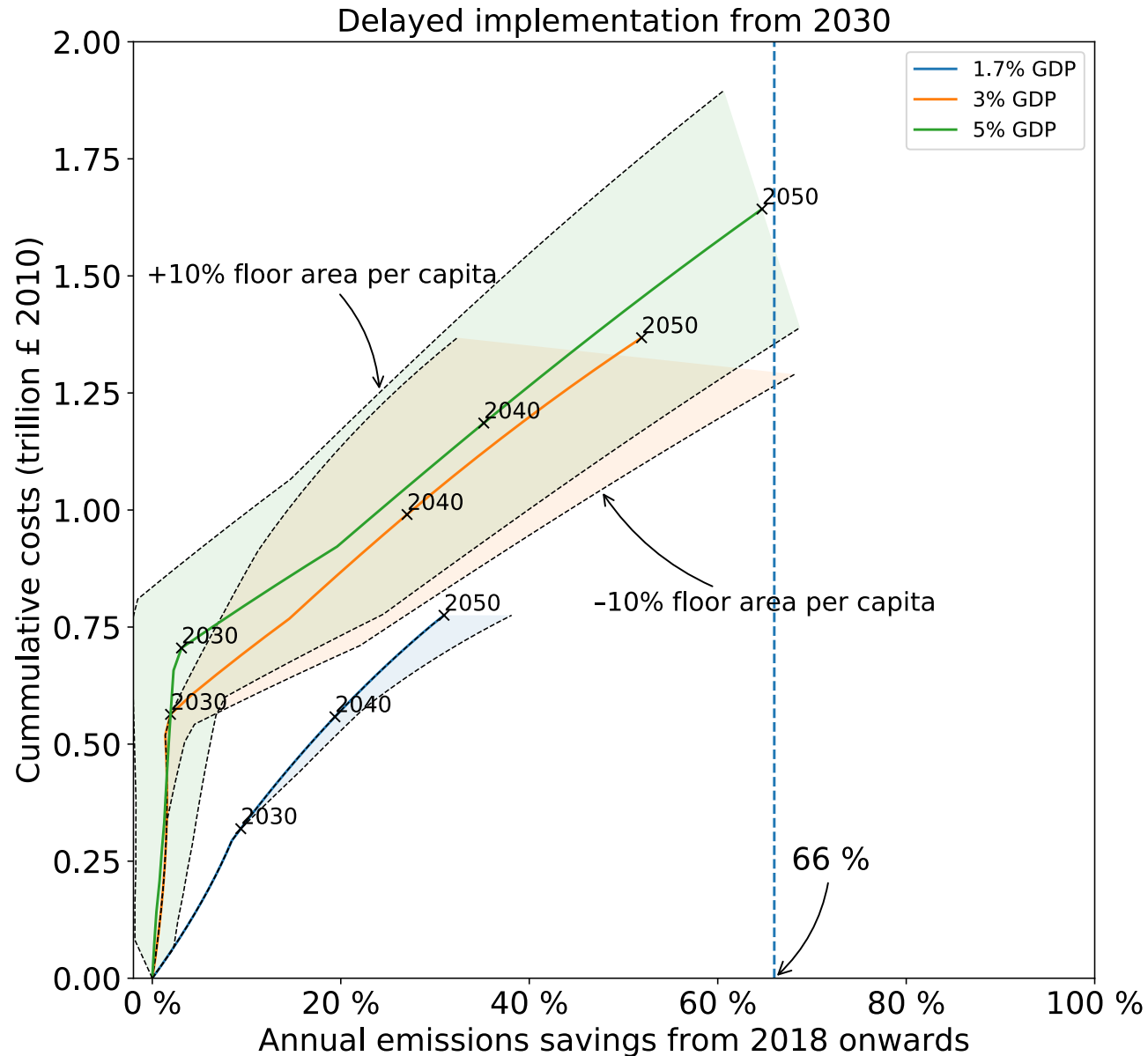


# Emissions and expenditure

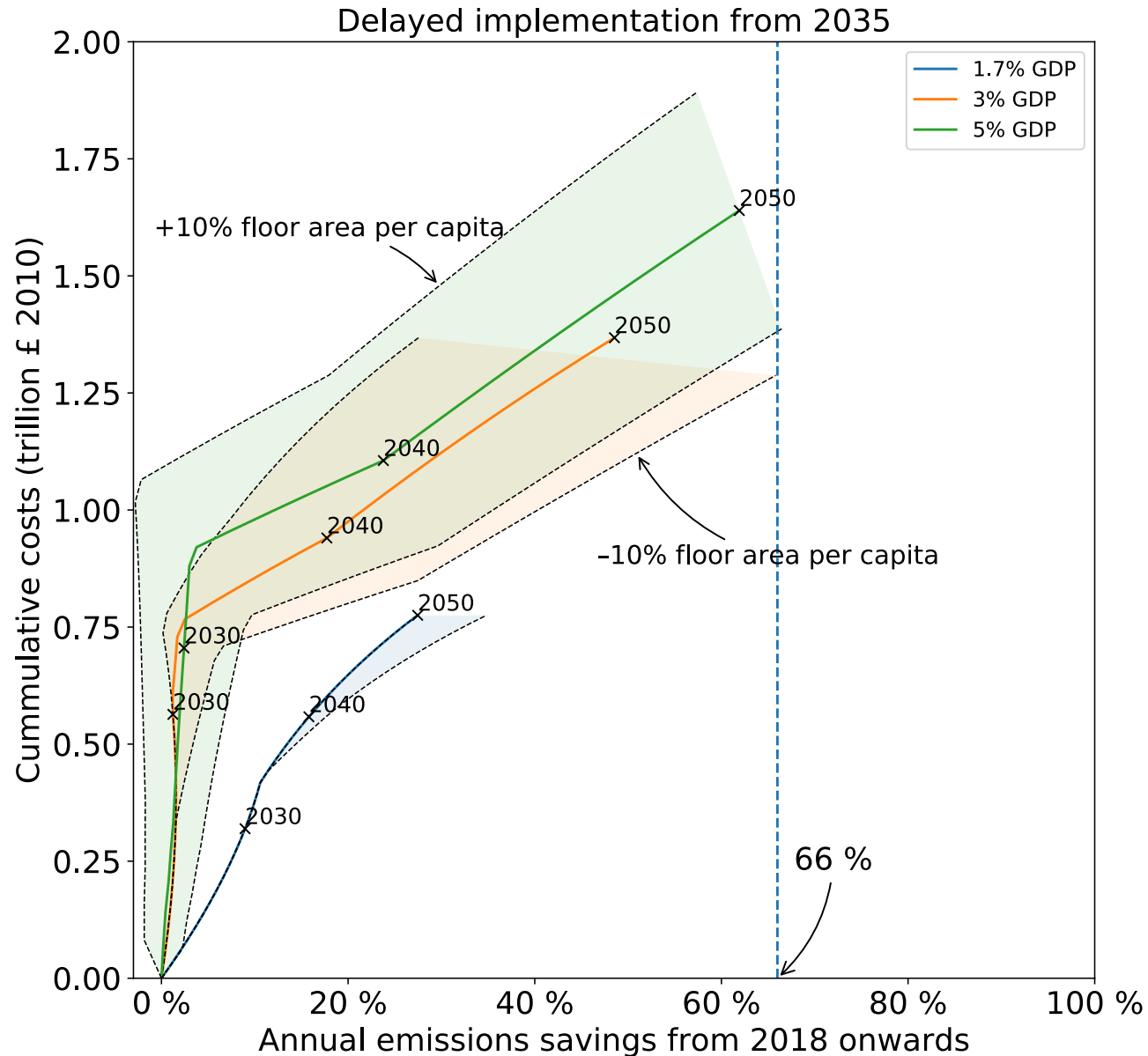




# Emissions and expenditure



# Emissions and expenditure



# Conclusions

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- **Deploying zero-carbon buildings** at scale by 2050 **is not enough** to reduce building emissions by the amount required nationally (-66% from current levels by 2050).
- Only the deployment of **zero-carbon buildings and extreme levels of retrofitting** would allow **meeting targets**.
- However, **the costs** of such ambitious changes are **likely to be unreasonable**, unless there is a **reduction in housing demand**.