

Tradeoffs and synergy between material cycles and greenhouse gas emissions?

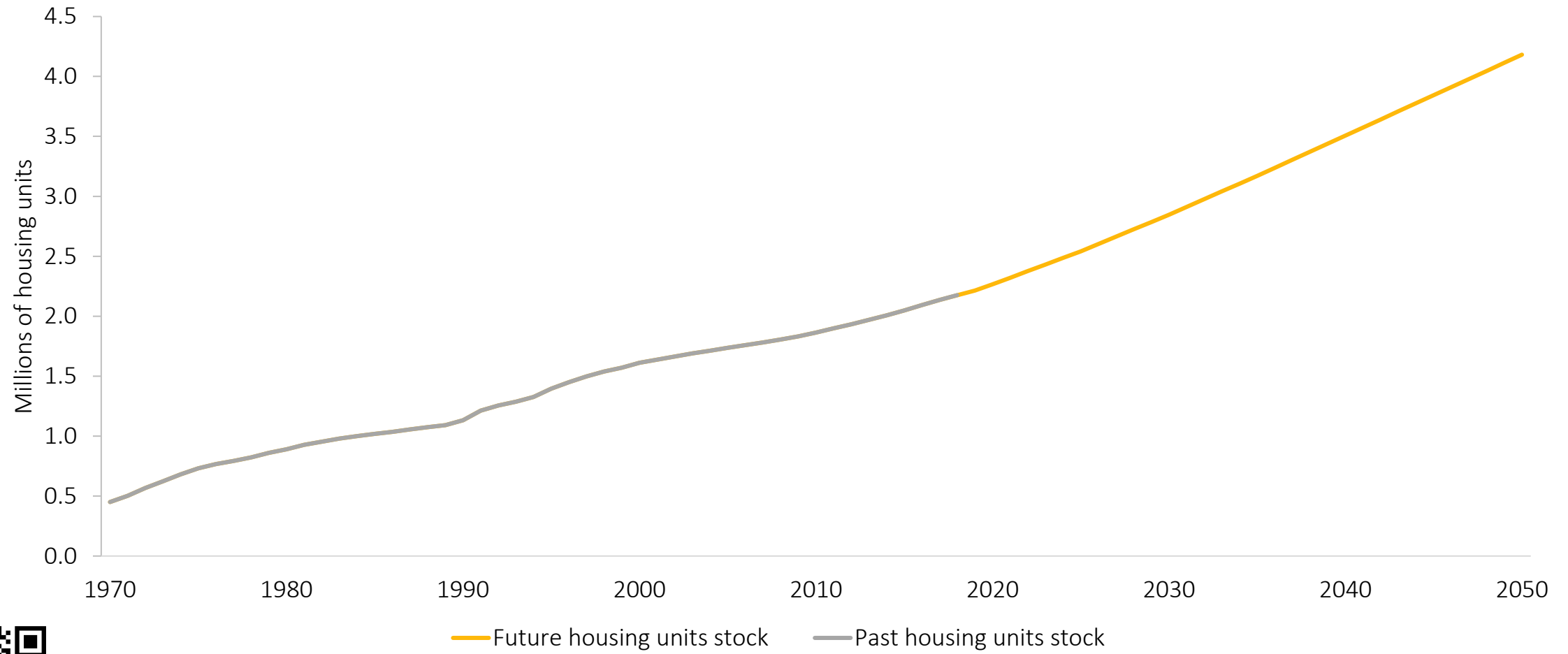
Opportunities in Israel's rapidly growing housing stock

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Israel's Housing stock is expected to double between 2019 and 2050



Igdalov, Fishman, and Blass. 2024.

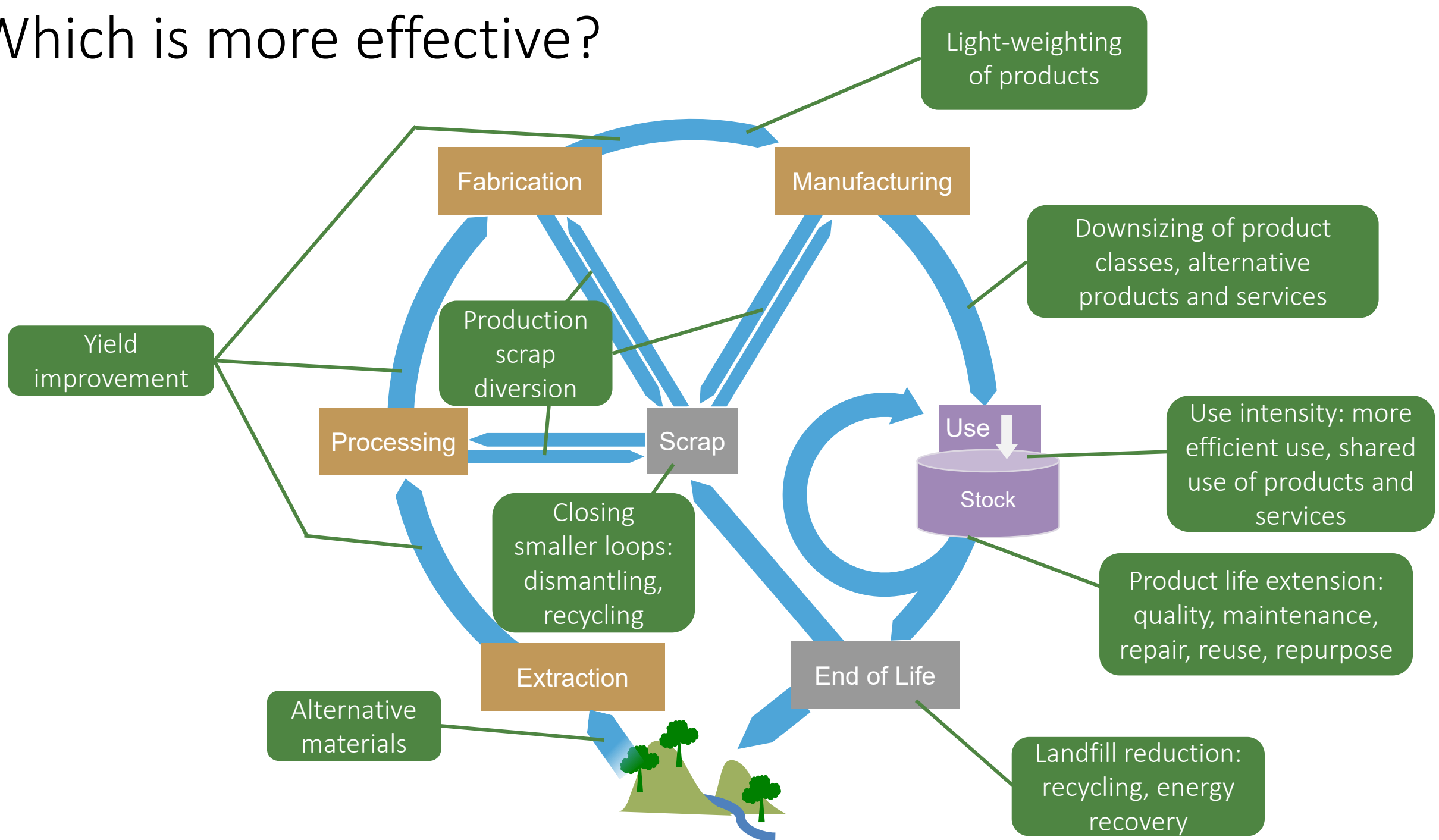
[doi:10.1111/jiec.13576](https://doi.org/10.1111/jiec.13576)

Israel's Housing stock is expected to double between 2019 and 2050

- What is the **future material demand** to satisfy Israel's growing buildings sector until 2050?
- How much future **demolition ~~wastes~~ secondary resources**?
- How can new **technology, policies, and materials** make an impact?
- How can we reduce **the GHG emissions** of this sector?



Which is more effective?



The circular economy of Israel's future building stock

Recycling (mainly of steel) reduces the biggest amount of GHG emissions

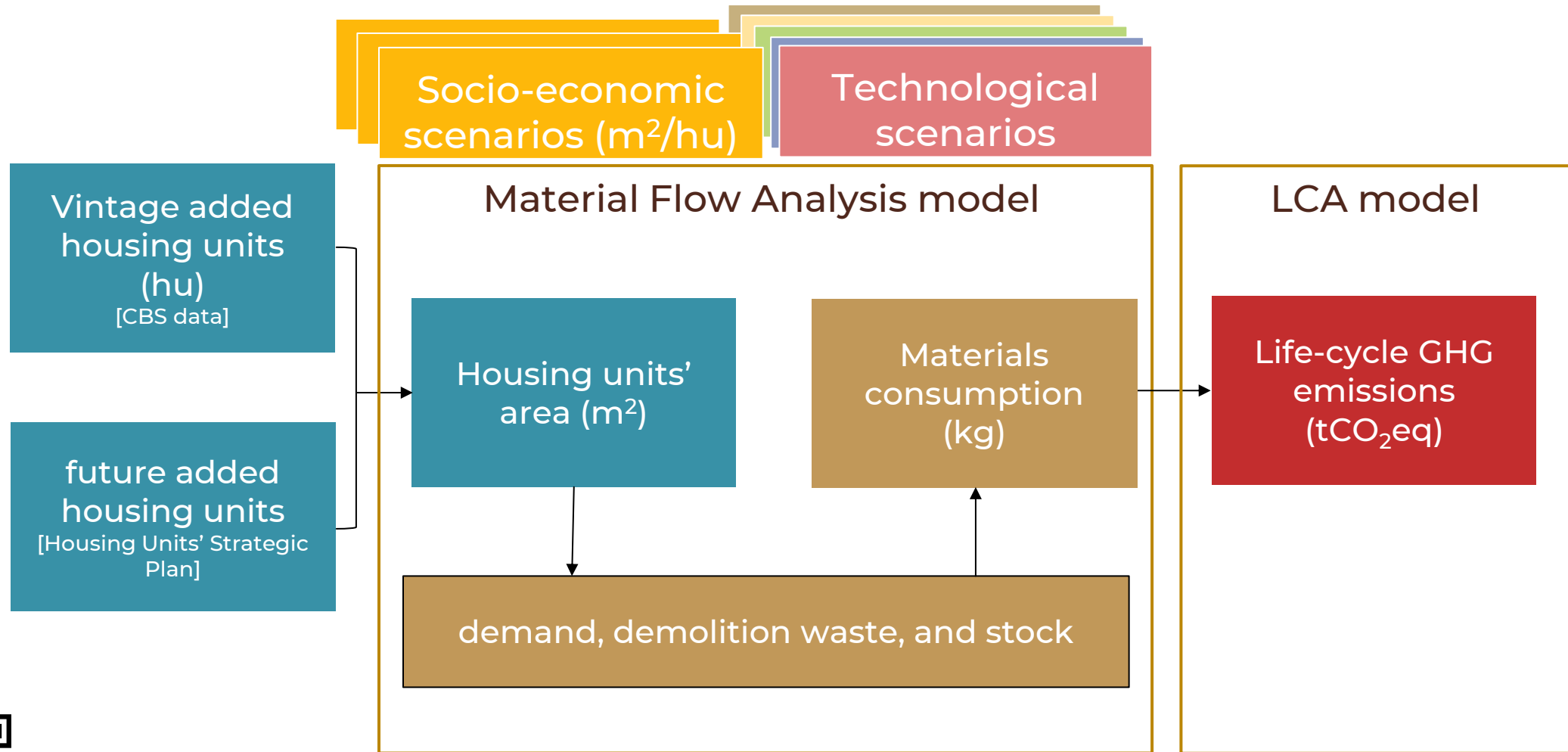
Lifetime extension reduces the highest amount of waste

Wood-based materials (CLT) can significantly reduce steel and concrete consumption

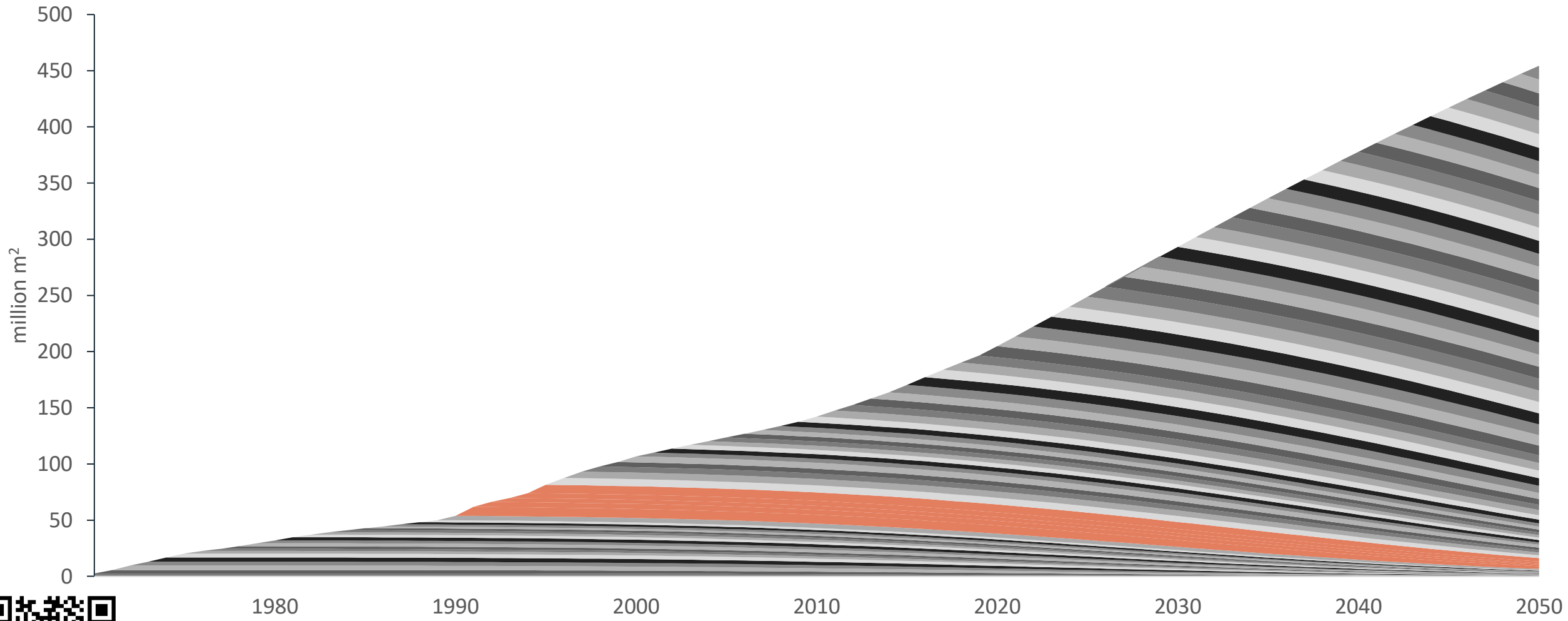
Lifestyle change (smaller floor area) can achieve higher reductions than technological strategies



Model framework



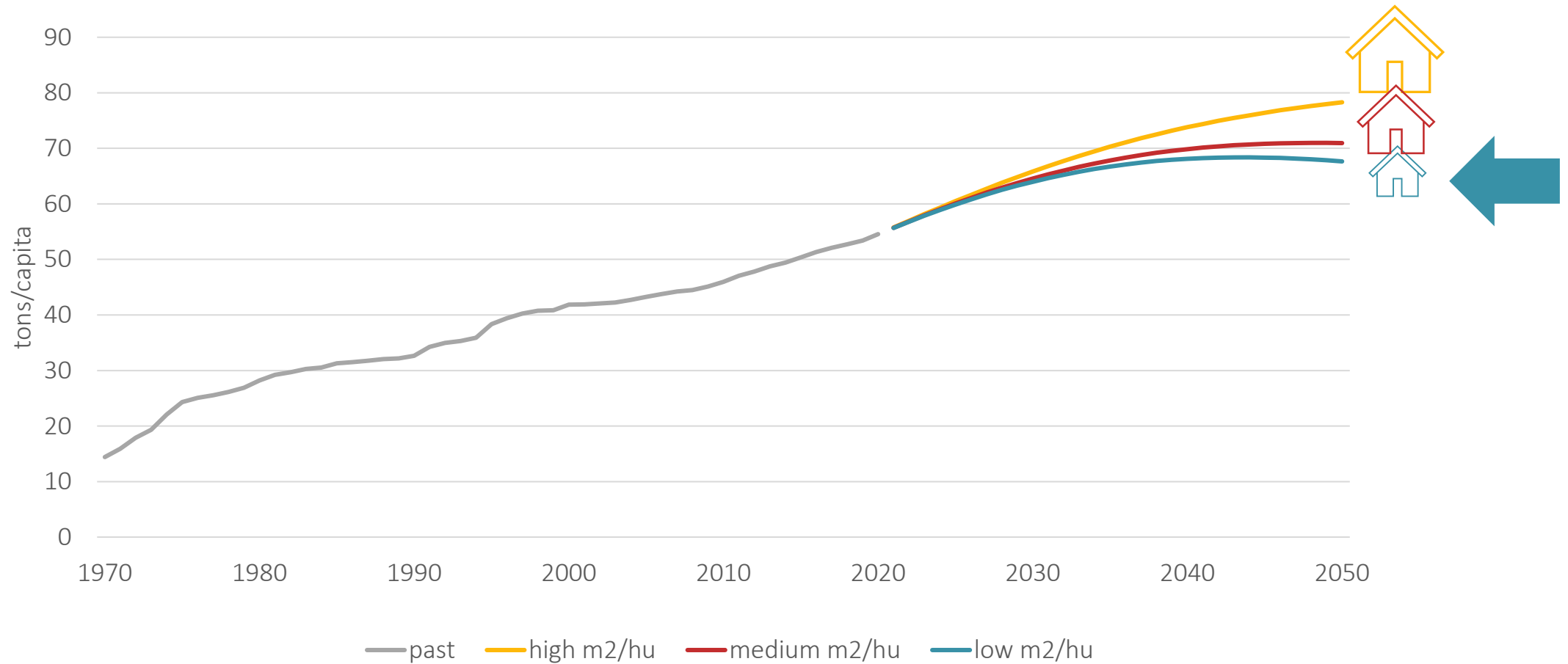
Dynamic Material Flow model



Igdalov, Fishman, and Blass. 2024.

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The amount of material per capita increases over time, but can be stabilized



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Scenario descriptions (2050 target)

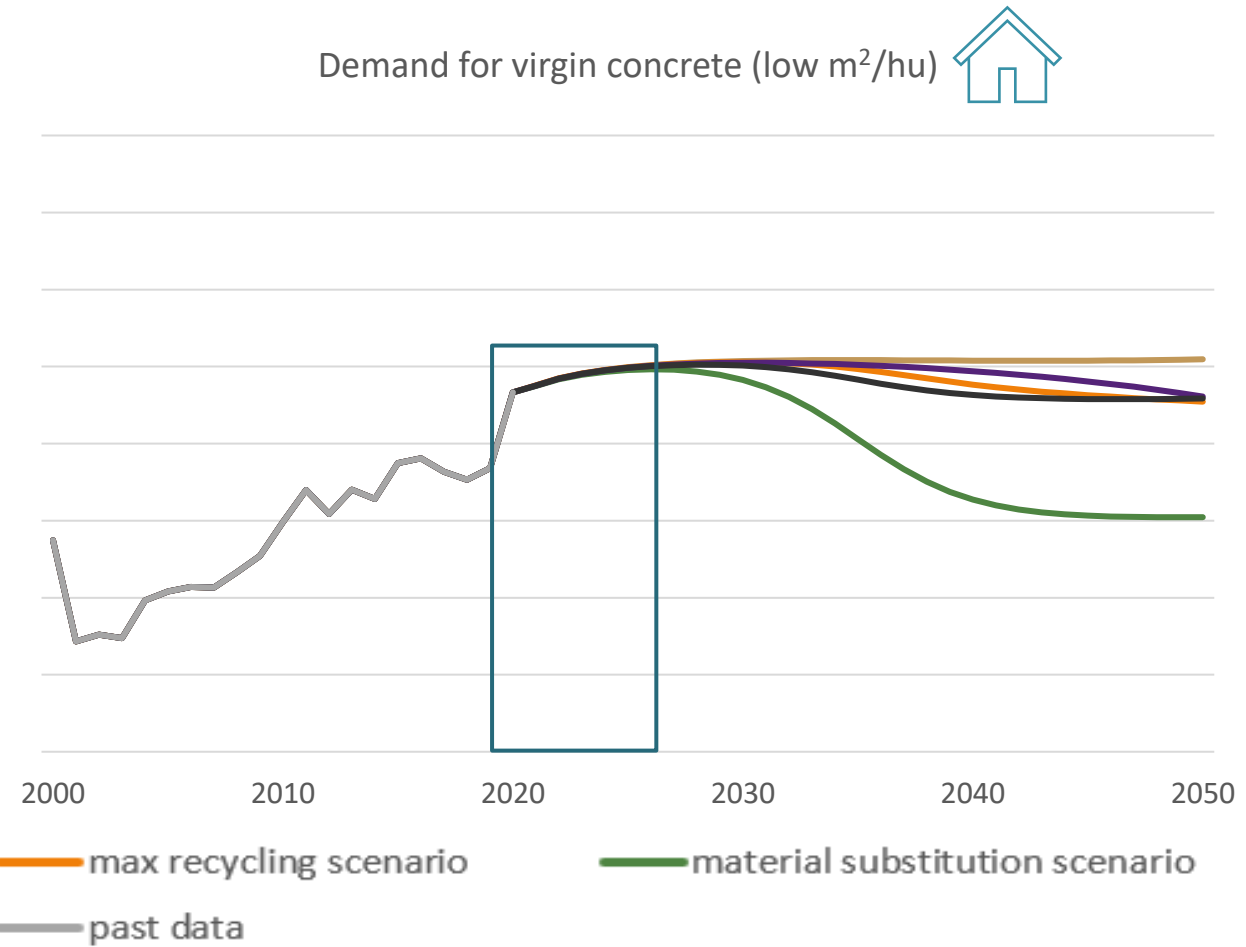
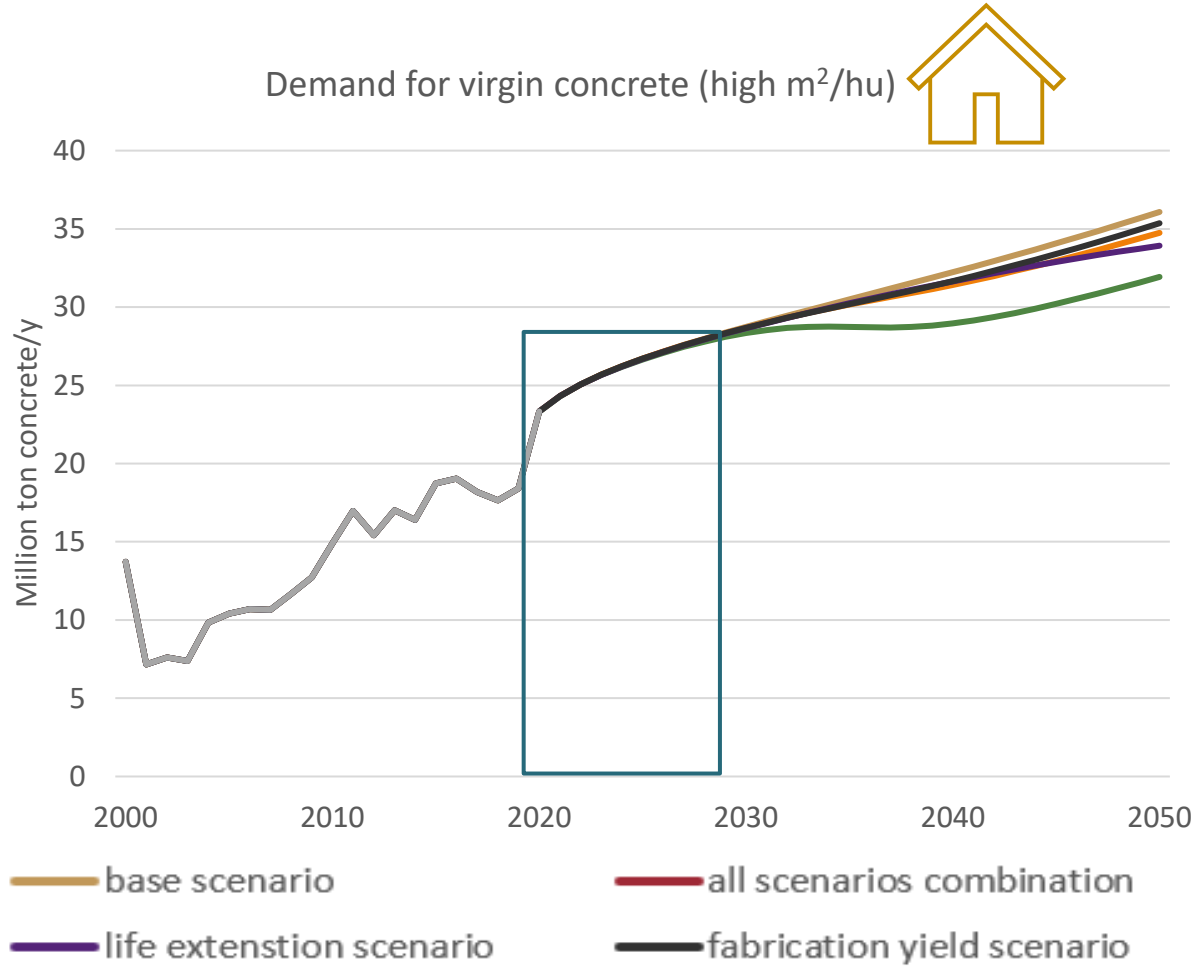
18 combinations in total



Baseline	Size of housing units (m ² /hu)	105 m ²	129 m ²	183 m ²
Lifetime extension	Buildings' lifetime	HU size & 100	HU size & 75	HU size & 75
Fabrication yield	Materials reduction	HU size & 10%	HU size & 5%	HU size & 2%
Max Recycling	Share of recycled material	HU size & Concrete: 50%* Steel: 90%	HU size & Concrete: 30%* Steel: 50%	HU size & Concrete: 10%* Steel: 10%
Material substitution	Share of CLT buildings	HU size & 80%	HU size & 50%	HU size & 20%
Combination	Combination of all the scenarios	All of the above	All of the above	All of the above



How do we reduce virgin materials consumption the most? **Material substitution**



Canada



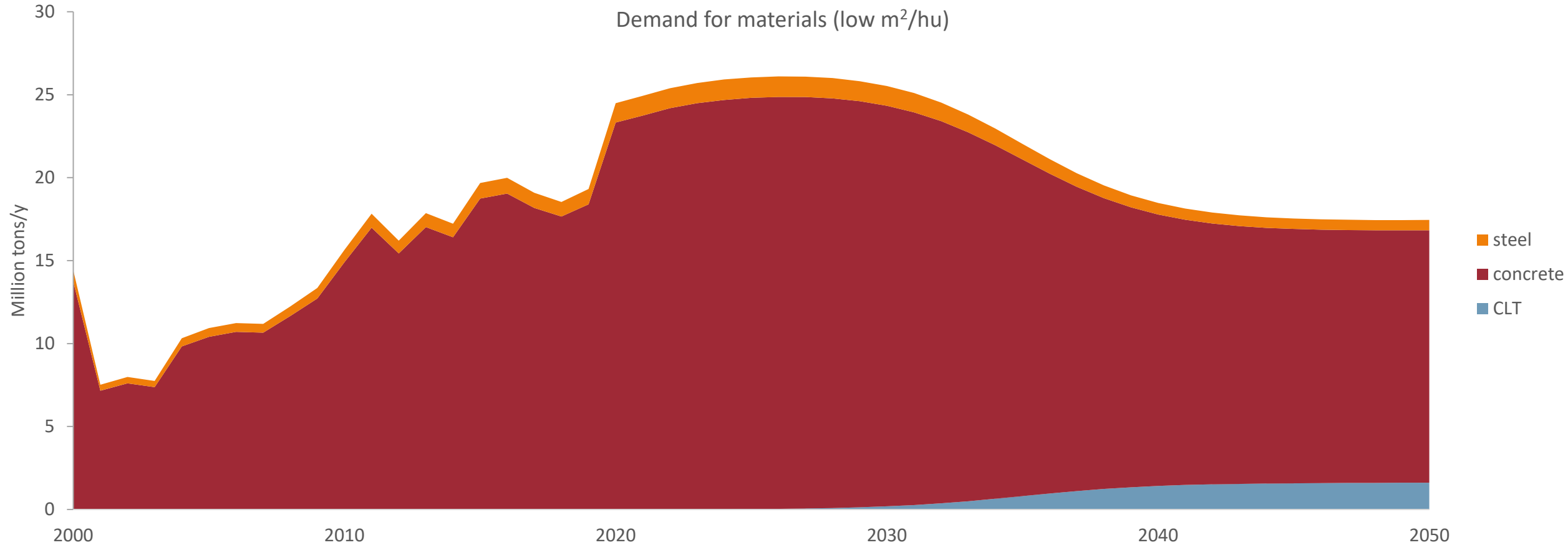
United States



Norway



The concrete decrease is much bigger than the CLT increase

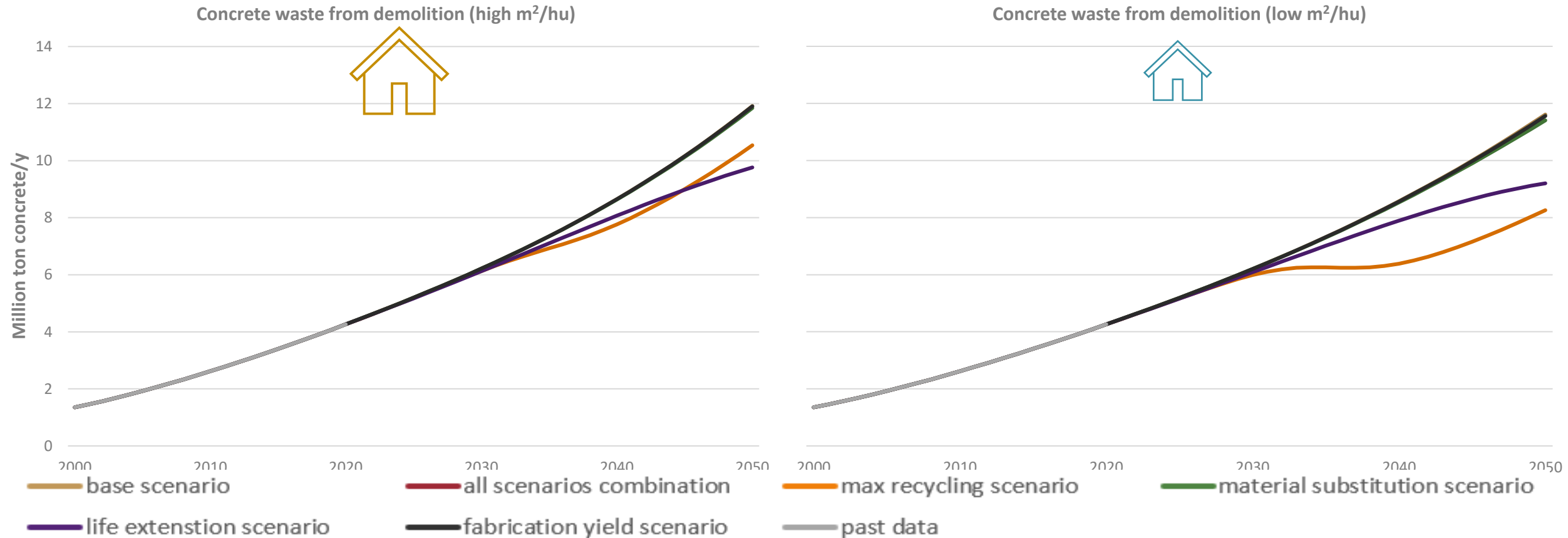


Igdalov, Fishman, and Blass. 2024.

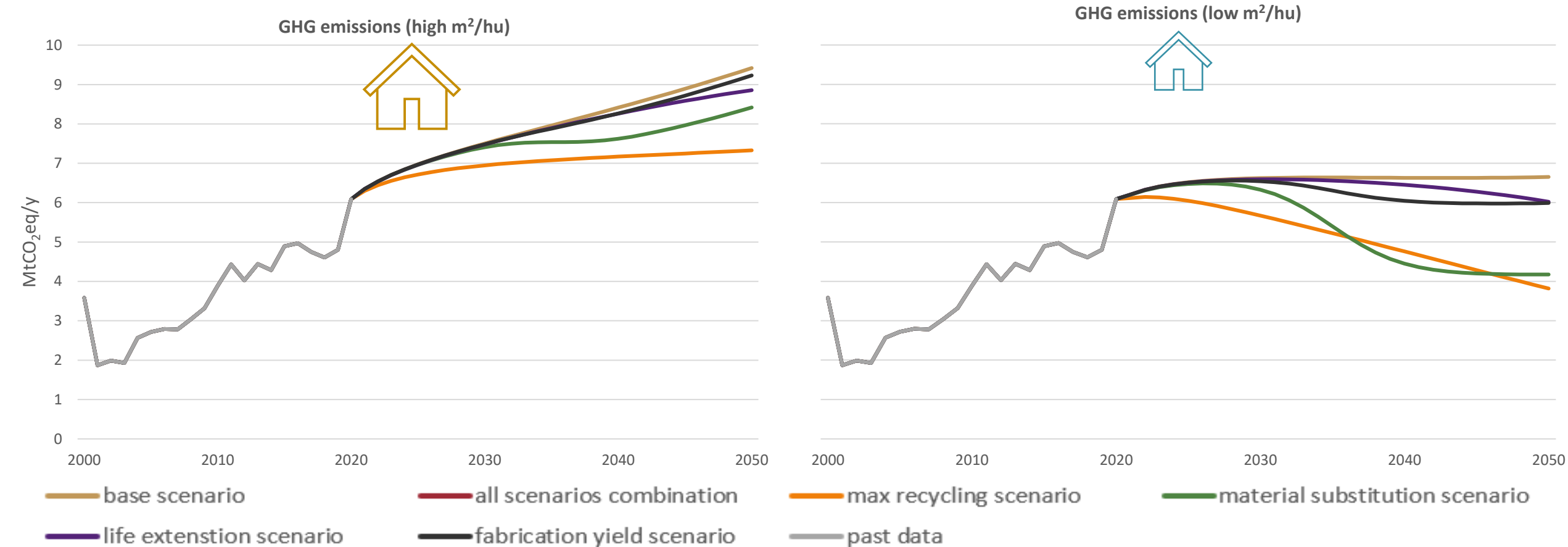
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How do we reduce landfilled demolition waste the most?

lifetime extension more effective than recycling



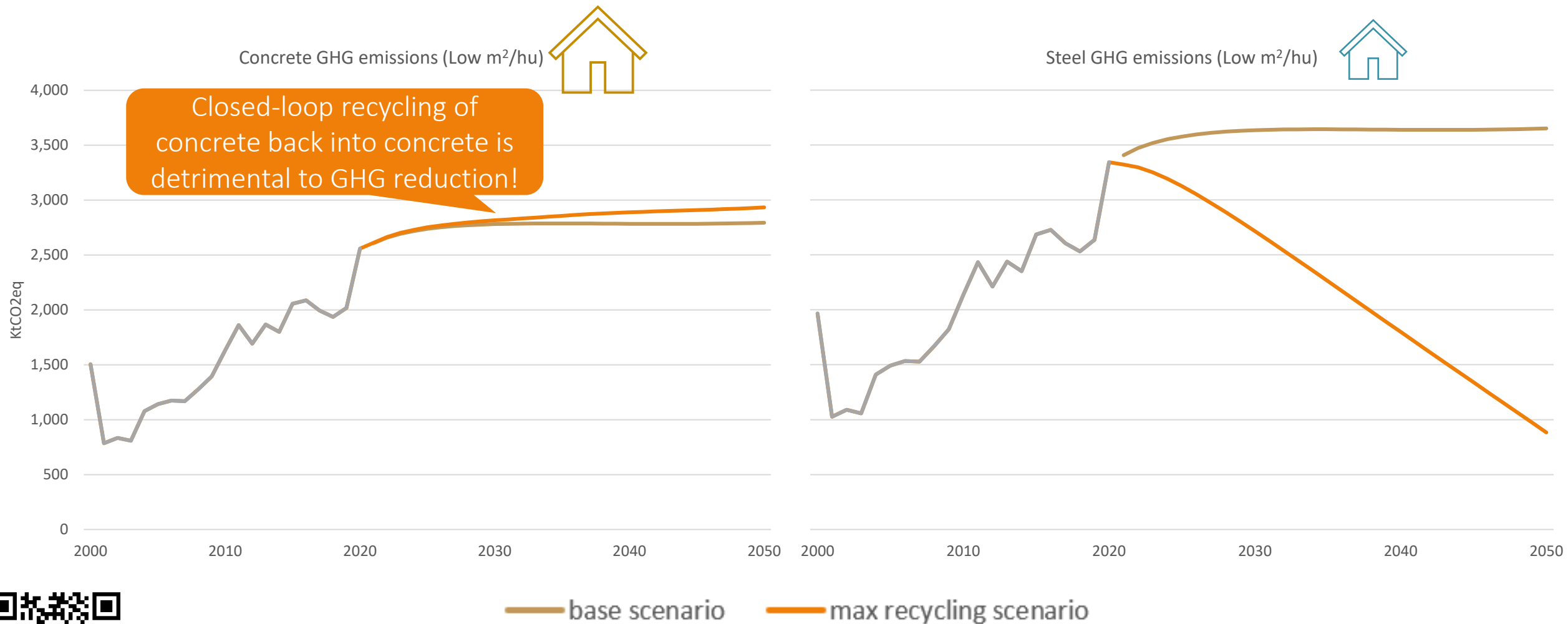
How do we reduce GHG emissions the most? Recycling



Igdalov, Fishman, and Blass. 2024.

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The whole reduction of GHG comes from steel recycling



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Lifestyle change (smaller floor area) can achieve higher reductions than technological strategies

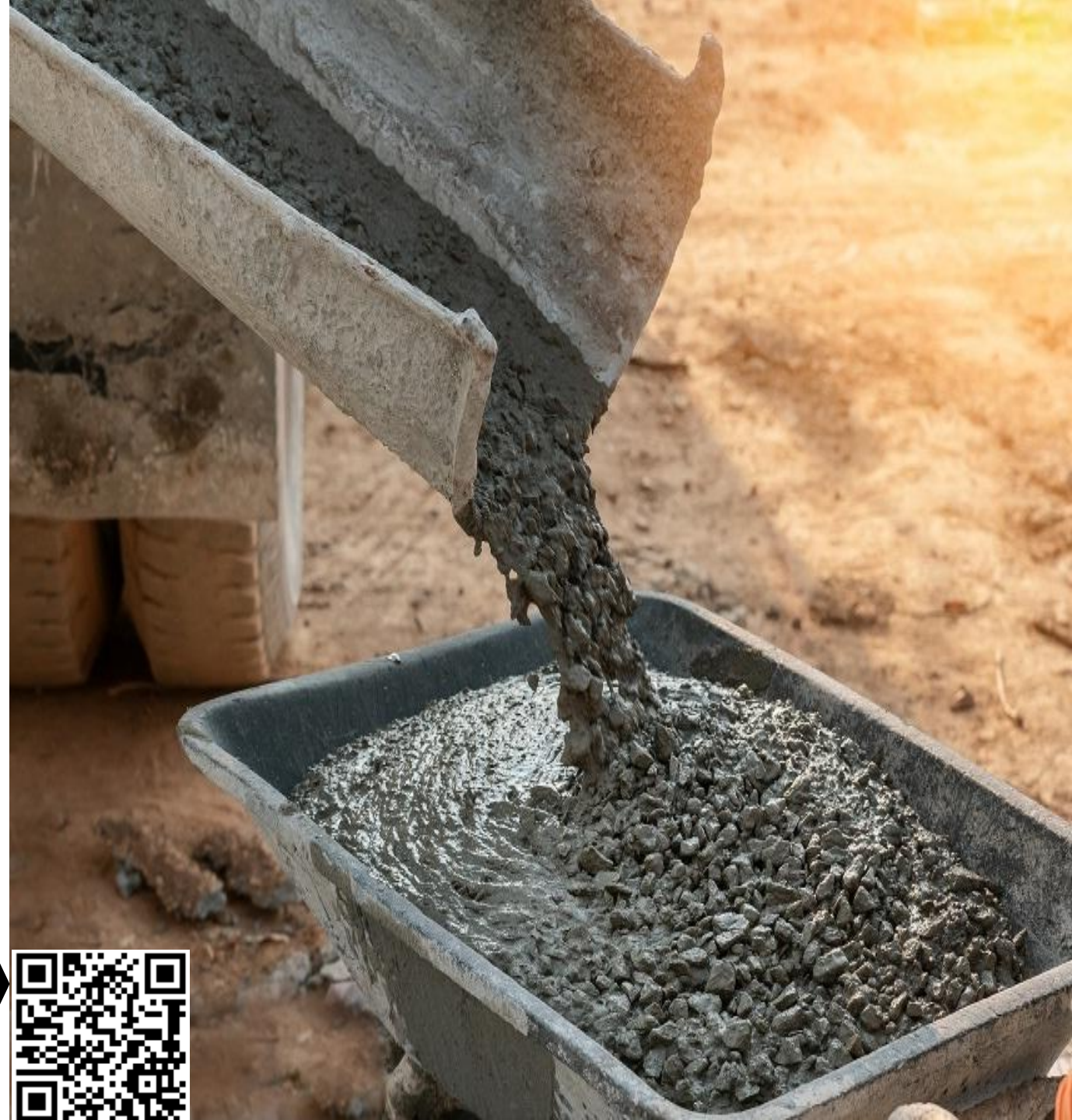
Impacts can be significantly reduced with long-term planning

Short window of opportunity to act



Future research

- Barriers to implementation of the scenarios?
- Municipality-level studies
- More construction materials
- Renovations
- Additional environmental impacts
- Additional sectors (commercial, infrastructure, ...)
- More accurate material efficiency data



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