



**Material stock and
circularity prospects of
buildings**

Singapore

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Buildings and construction sector

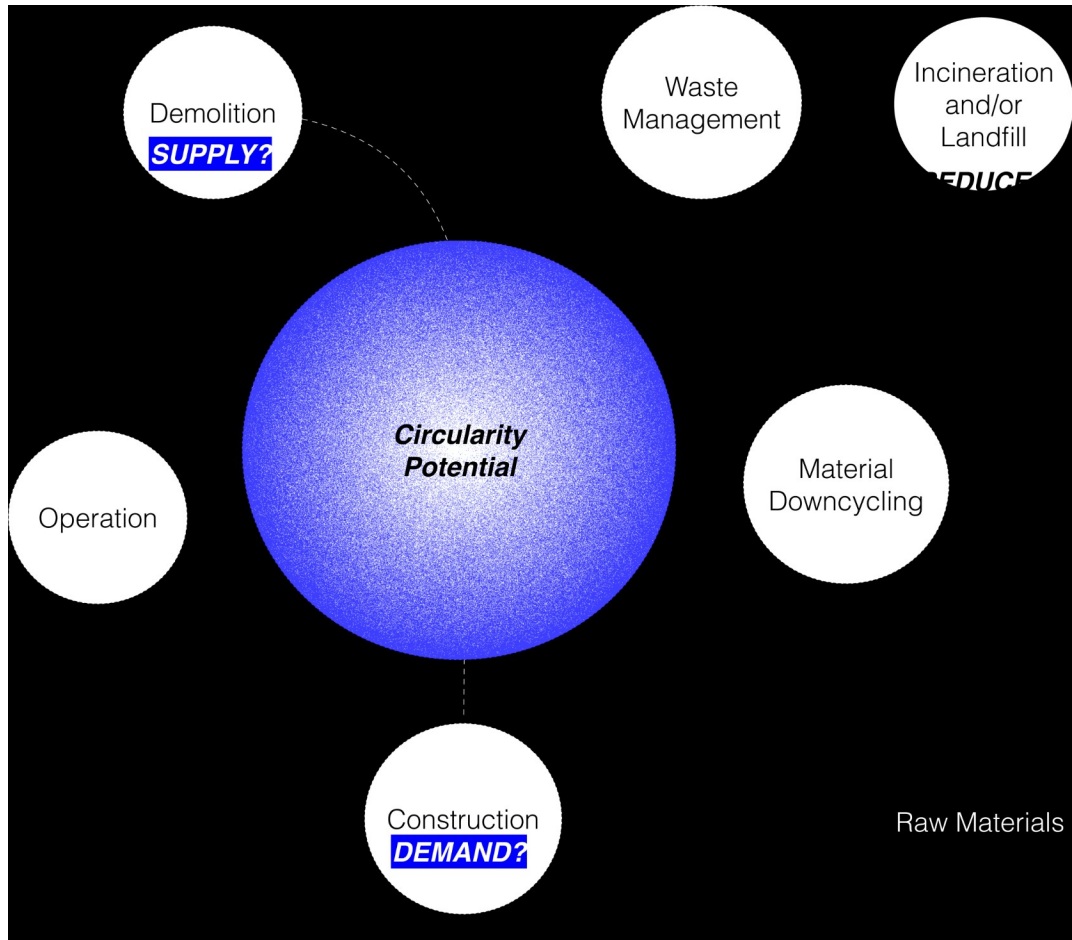
39% of Carbon Emissions Worldwide:

Operational Carbon (28%)
Embodied Carbon (11%)

Net-zero building stock in 2050:

Operational Carbon (- 50%)
Embodied Carbon (-60%)

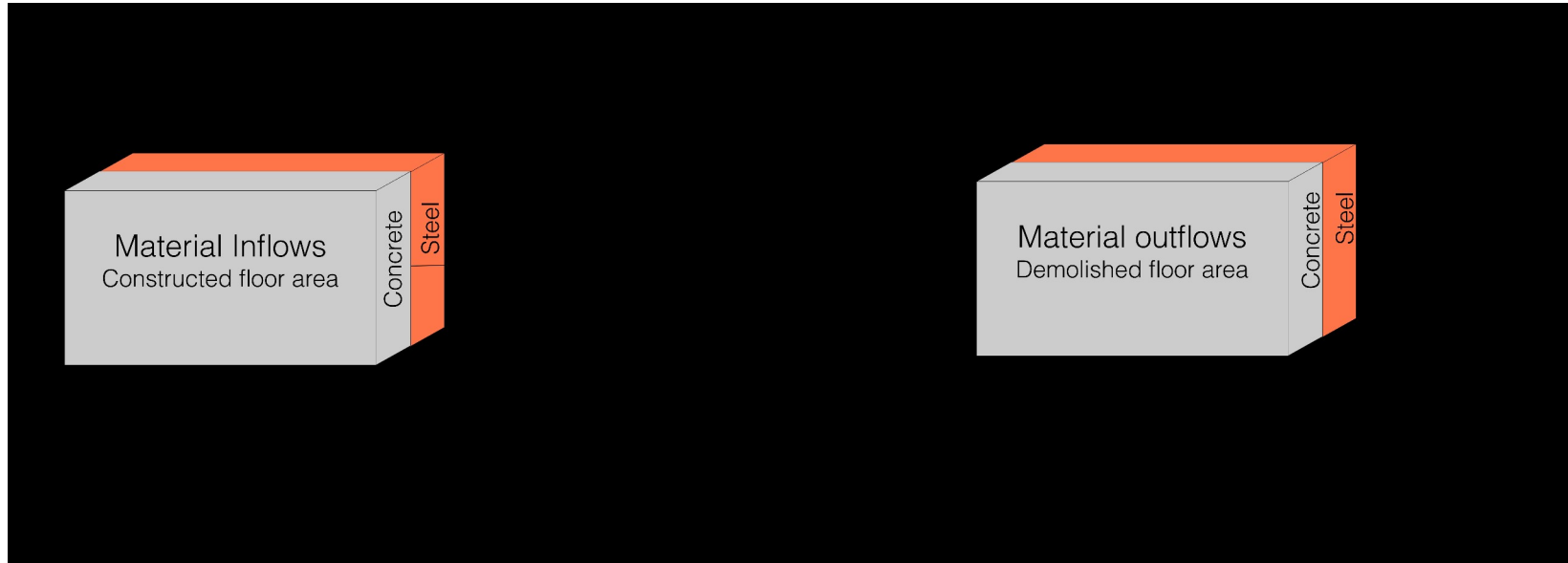
By 2030 (*International Energy Agency, 2020*)



Tackling Embodied Carbon

Increase intake of **secondary raw materials** (Upcycling).

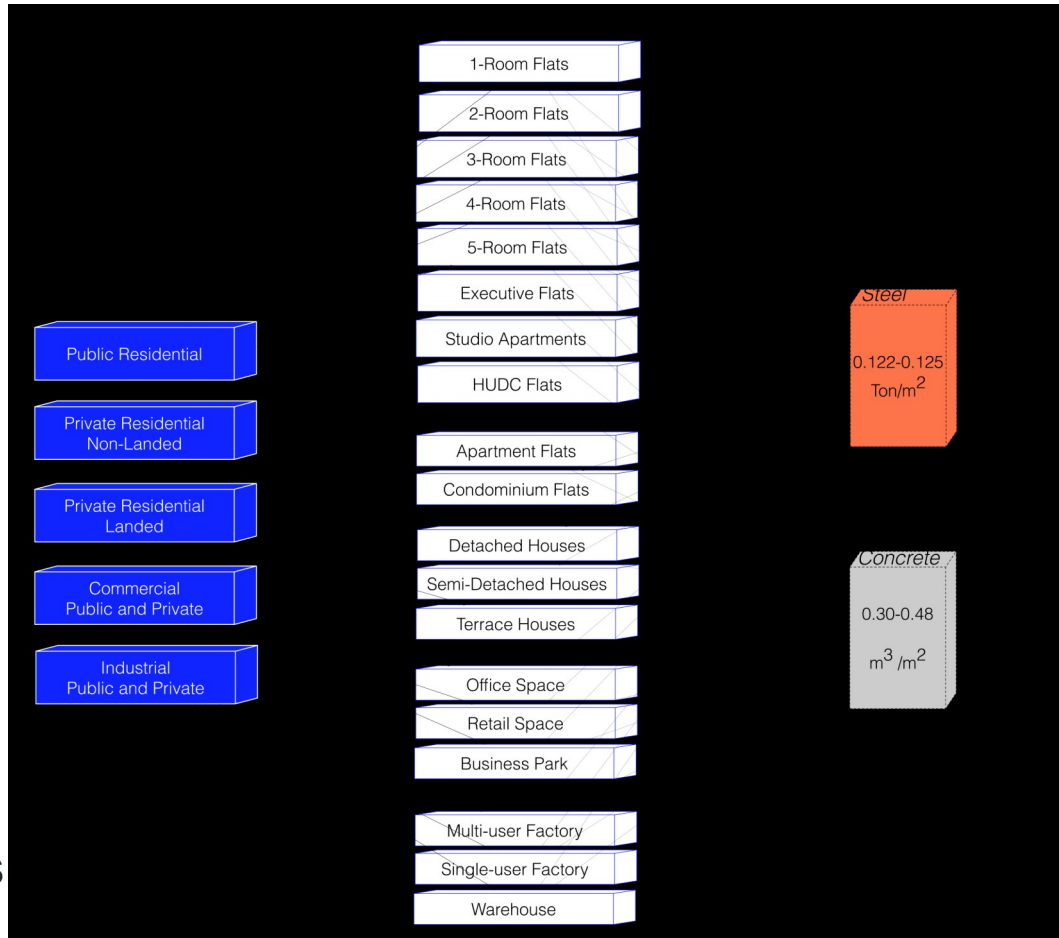
Requires quantitative insights on resource use to convey **scale** and inform strategies.



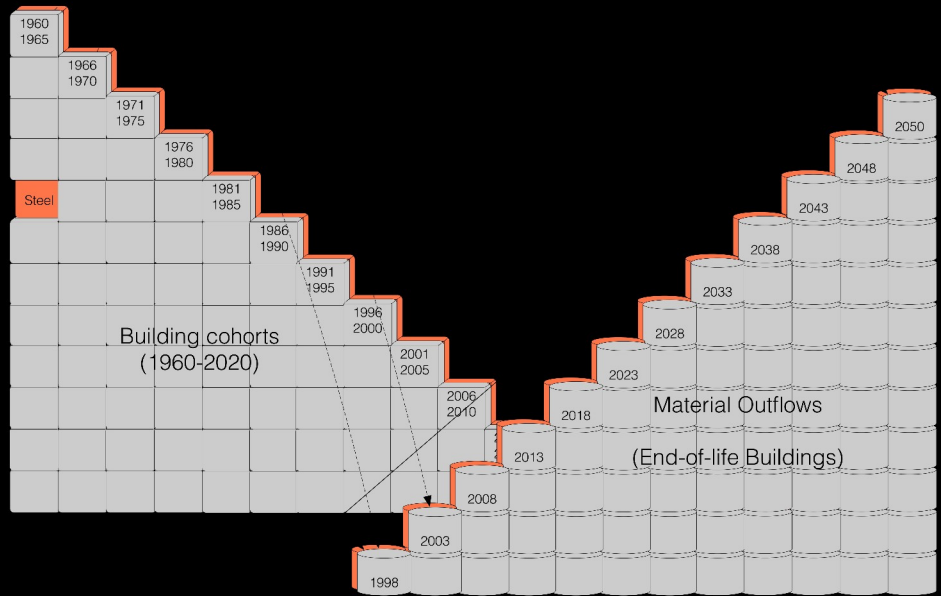
Retrospective Bottom-up Material Flow Analysis.

Quantitative data on stocks and flows of concrete and steel rebar in all Singapore buildings (2010-2020).

Stock dynamics.



7 Typologies 19 Archetypes



Short-based building annihilation model

of the opportunity for building
material recovery over the next 10

ing estimated average building
life of 33 years.

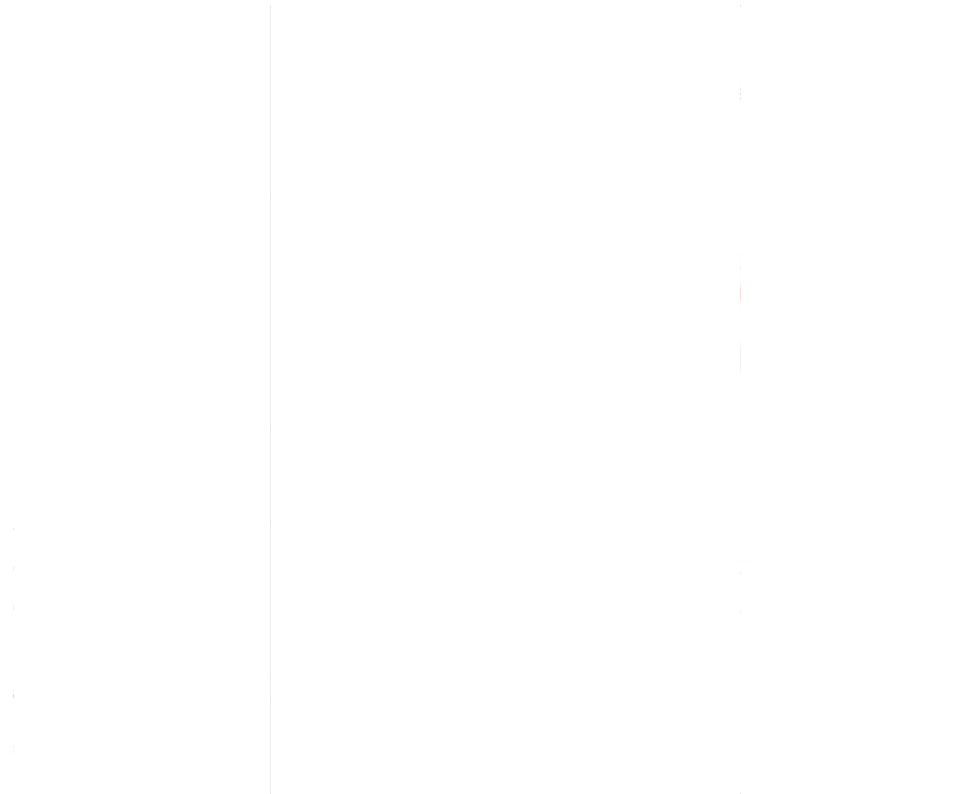


Stock & Flows

Stock Growth:	Avg. 3% YoY
Average Lifespan:	~33 years
Most material usage:	Public Residential
Most C&D waste:	Industrial

Embodied Carbon

Public Residential buildings:	93.04 MtCO₂e
Private Residential buildings:	64.67 MtCO₂e
Private Industrial buildings:	45.42 MtCO₂e



Sankey Chart

Stock and flows of concrete and steel in buildings (Million Tonnes). Stock and flows as in 2020's amounts. Circular flows are based on reported rate of recycling.



Circularity Potential

37%

Ongoing stock growth in the future.
Opportunity to step up secondary resource
utilization and reduce material imports.

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Panel 2: Science of Decarbonising Cities

Project:

Material stock and circularity prospects of buildings in Singapore

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