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Tall Buildings

Rising to the Net Zero Challenge

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Lower Manhattan and City of London comparison

London Timeline

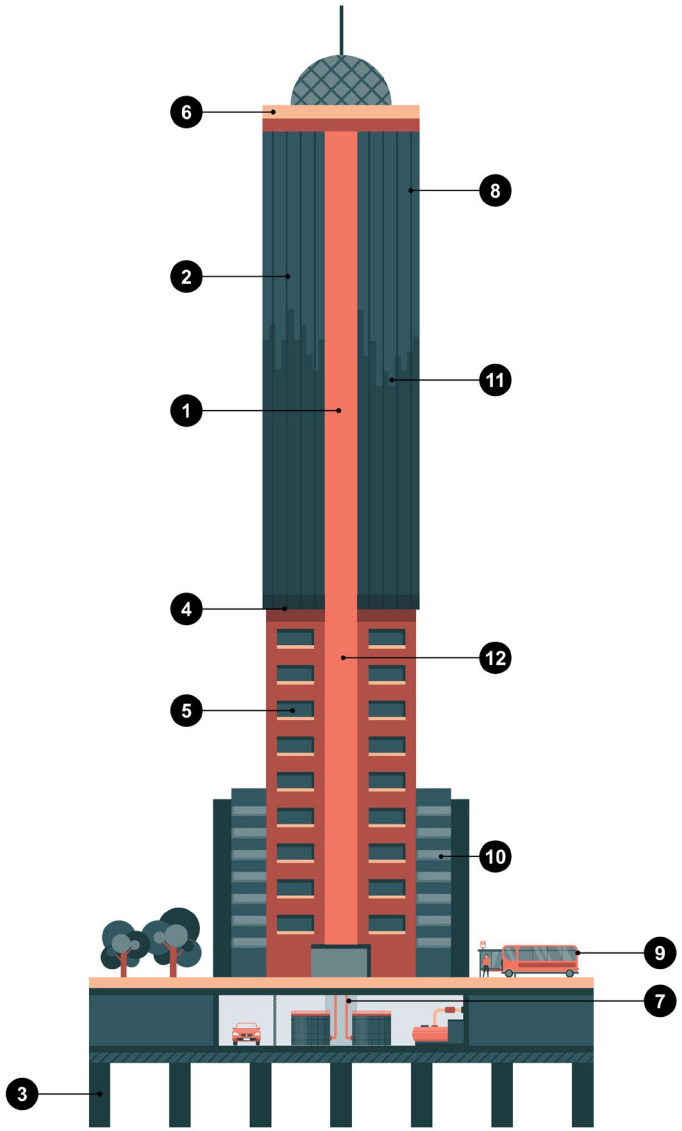
- 1980: Tower 42 (NatWest Tower)
- 2003: 30 St Marys Axe (Gherkin)
- 2011: 110 Bishopsgate (Heron Tower)
- 2014: Leadenhall Building (Cheesegrater) and 20 Fenchurch St (Walkie Talkie)
- 2018: 52-54 Lime Street (Scalpel)
- 2019: 22 Bishopsgate
- 2023: 8 Bishopsgate

NY Timeline

- 1913: Woolworth Building
- 1930: 40 Wall Street
- 1972: One Liberty Plaza
- 1986: 200 Vesey Street
- 2014: One World Trade Centre
- 2022: 130 William Street

London	New York
The City in London makes up 0.001% of the UK's area but accounts for 4% of the country's total GVA[1].	Lower Manhattan makes up less than 1% of New York's area but generates close to 10% of its GDP and jobs[2].

How we build tall



1. Vertical Transport

The invention of the passenger lift by Elisha Otis (first used in a New York department store in 1857) was instrumental in enabling the construction of tall buildings[21]. Today lifts play a major role in occupant movement, emergency escape strategies and plant replacement. As a building increases, the space required for additional lifts to higher floors reduces the floorplate efficiency, particularly on lower floors, and increases the embodied carbon investment.

2. Wind Effects

As technological advancements have allowed us to construct taller, lighter buildings, dynamic wind effects have started to govern structural design. Interventions such as additional structural damping and adjustments to building form may be used to reduce the impact. Wind tunnel testing, and CFD (Computational Fluid Dynamics) Modelling at early stages of design, enable better prediction of effects on the buildings and therefore result into more efficient design.

3. Foundations

Tall buildings typically use piled foundations, with basements generally getting deeper with increased heights above ground which helps with over-arching load balancing. Designs are influenced by factors such as soil composition, earthquake risk and local obstructions. For example, One World Trade Center's foundations are built around the existing train network[22].

4. Pressure Breaks

Hydronic systems in buildings over 100 m (328 ft) may require special interventions due to the potential pressure build up in pipework. Pressure breaks, such as break tanks or heat exchangers, can be installed roughly every 20 storeys, or high pressure rated pipework used.

5. Facade Maintenance

Tall buildings require specialist access systems, known as building maintenance units, to enable façade maintenance and cleaning. These are often installed at roof level with a crane or monorail system used to lower a cradle down the side of the building.

6. Public Spaces

Tall buildings often include public amenities such as a plaza at lower levels or a viewing gallery at upper levels. London's 20 Fenchurch Street, AKA "The Walkie-Talkie" houses the city's highest public garden along with a series of bars and restaurants, where the view becomes an integral part of the offering[23].

7. Servicing Strategy

Tall buildings are similar to small communities in terms of their scale and require a complex servicing strategy. Opportunities such as heat sharing and water re-use should be used to reduce demand, but even with these strategies 11% of GIA will typically be required for plant rooms[11].

8. Asset value and height

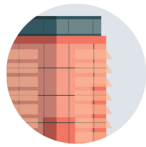
Studies have shown that for offices and residential apartments tenants are willing to pay a premium for property higher up the building. For offices, it is believed that the primary reasons for this are the enhanced views and the perceived prestige attached to higher properties[17].

9. Transport connections

Workforce densification and the (typically) urban location of tall or high density buildings, aligns with the locations of public transport nodes, allowing large volumes of workers to use public transport. Hundreds of thousands travel to The City of London[24] and Lower Manhattan daily[25], meaning the impact on emissions could be substantial [26].

10. Building form

Setbacks and podium levels became a feature of tall buildings in response to New York zoning laws designed to maintain light at street level. Today, they can be used to solve the challenge of limited roof space, relative to GIA, with the additional roof area created used to house external plant.



11. Façade design

Façade design is key to achieve an architecturally striking building that is low carbon through its lifetime. Aesthetic requirements must be balanced with thermal performance, light levels, and solar controls to minimise HVAC loads. Low embodied carbon materials should be used, and material efficiency maximised [11].

12. Fire safety measures

Tall buildings have additional fire safety requirements to ensure there is sufficient time for occupants to escape from all levels in the event of an emergency. These include more onerous requirements around the number of escape stairs, provision of fire compartmentation, sprinklers, wet risers and firefighting lifts/shafts[27].

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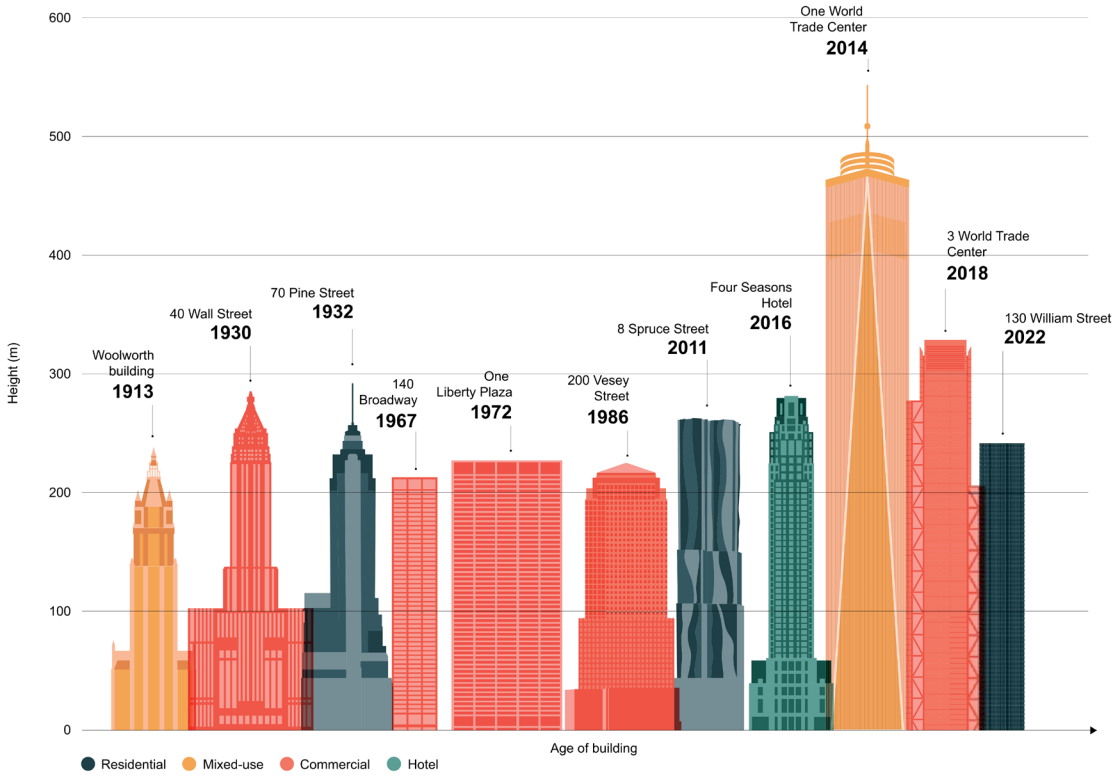
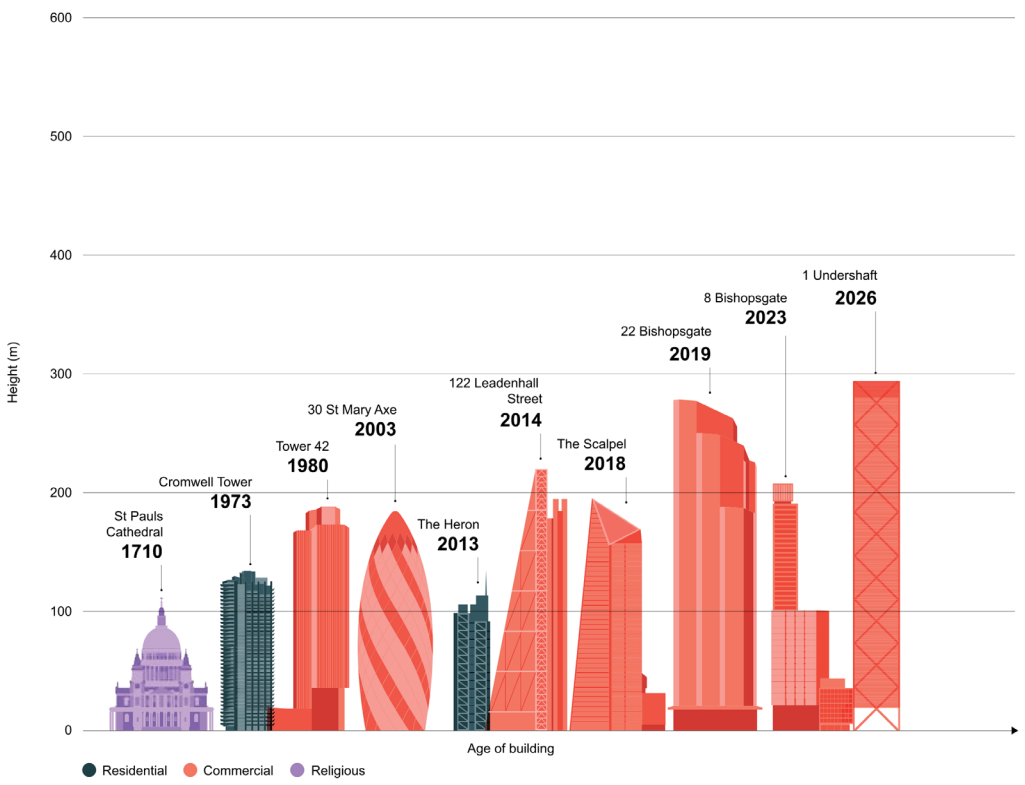
Lower Manhattan and City of London comparison





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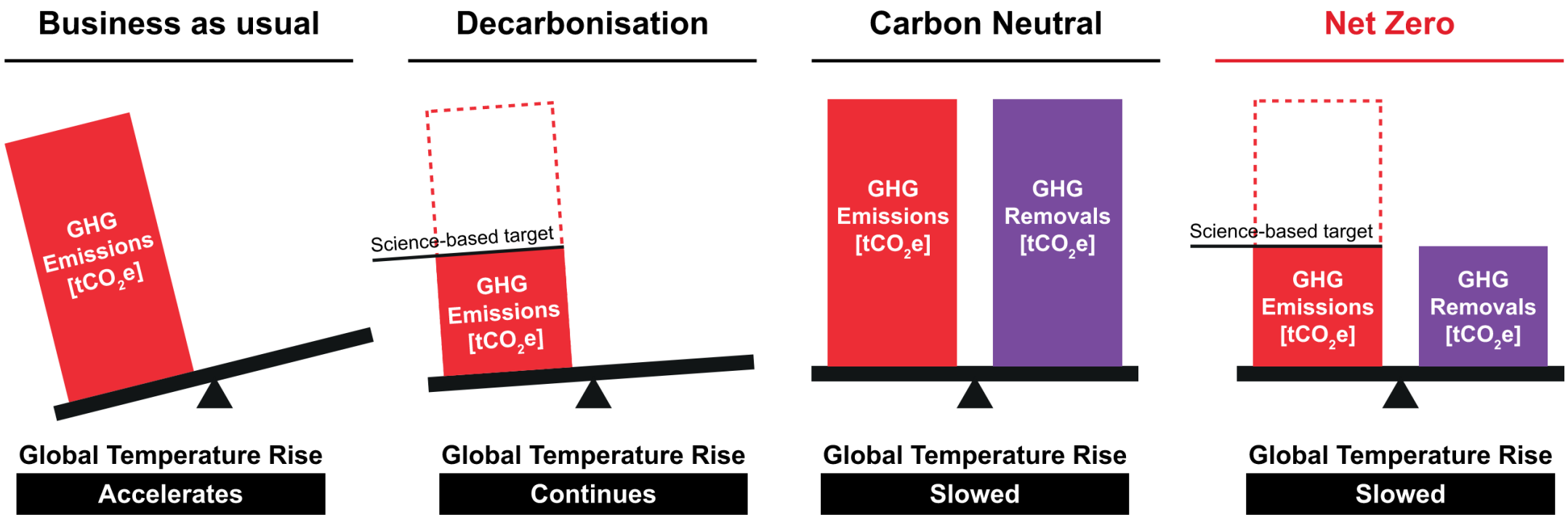
What is net zero?



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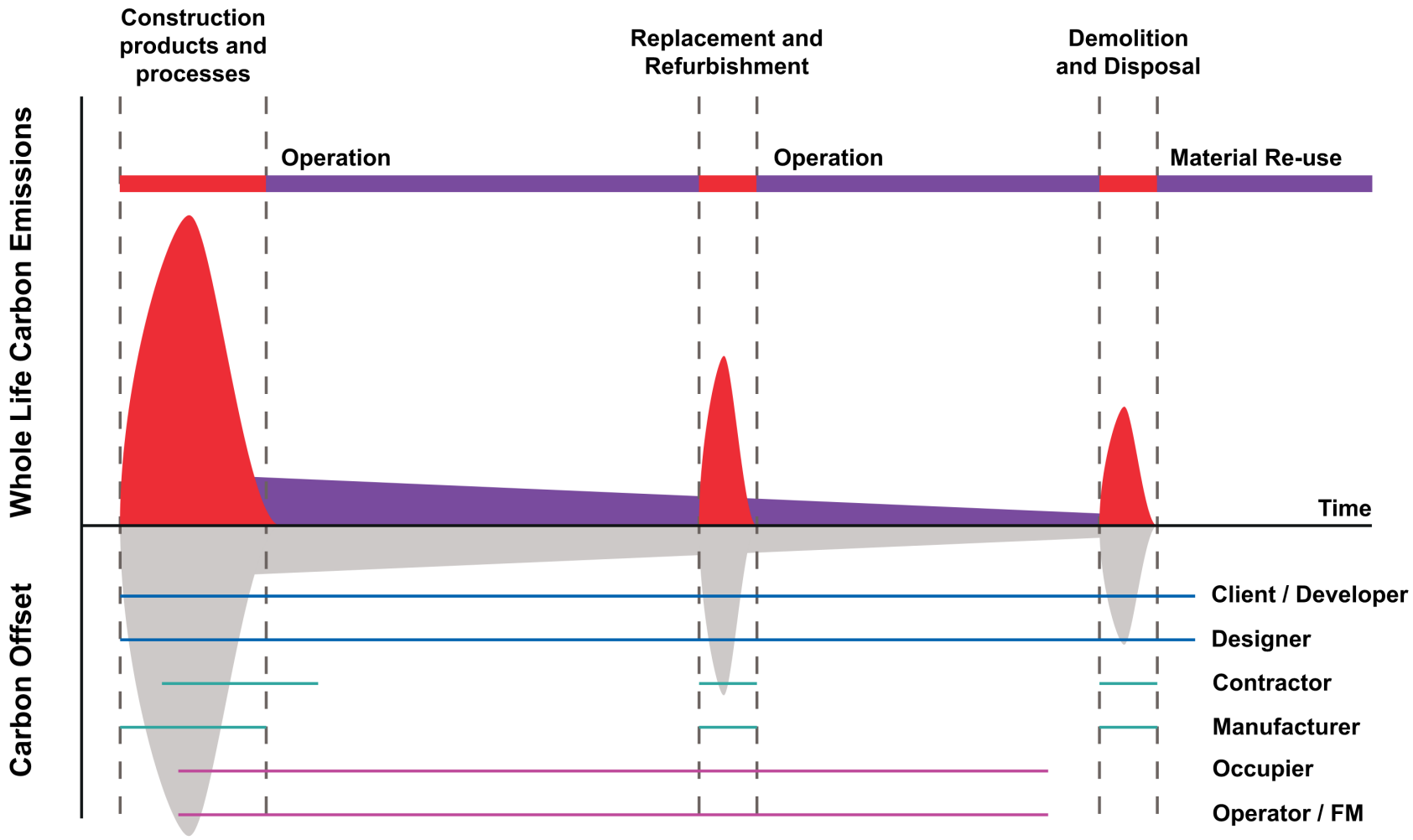
Net zero in the life of an asset



Achieving a Net Zero Carbon Building: when carbon is emitted in the life of the building, and who can make an impact.

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The challenge for tall buildings

- Scale – multiple tenants, centralised systems
- Space – for all-electric alternatives to fossil fuels
- Fabric performance
- Carbon emissions

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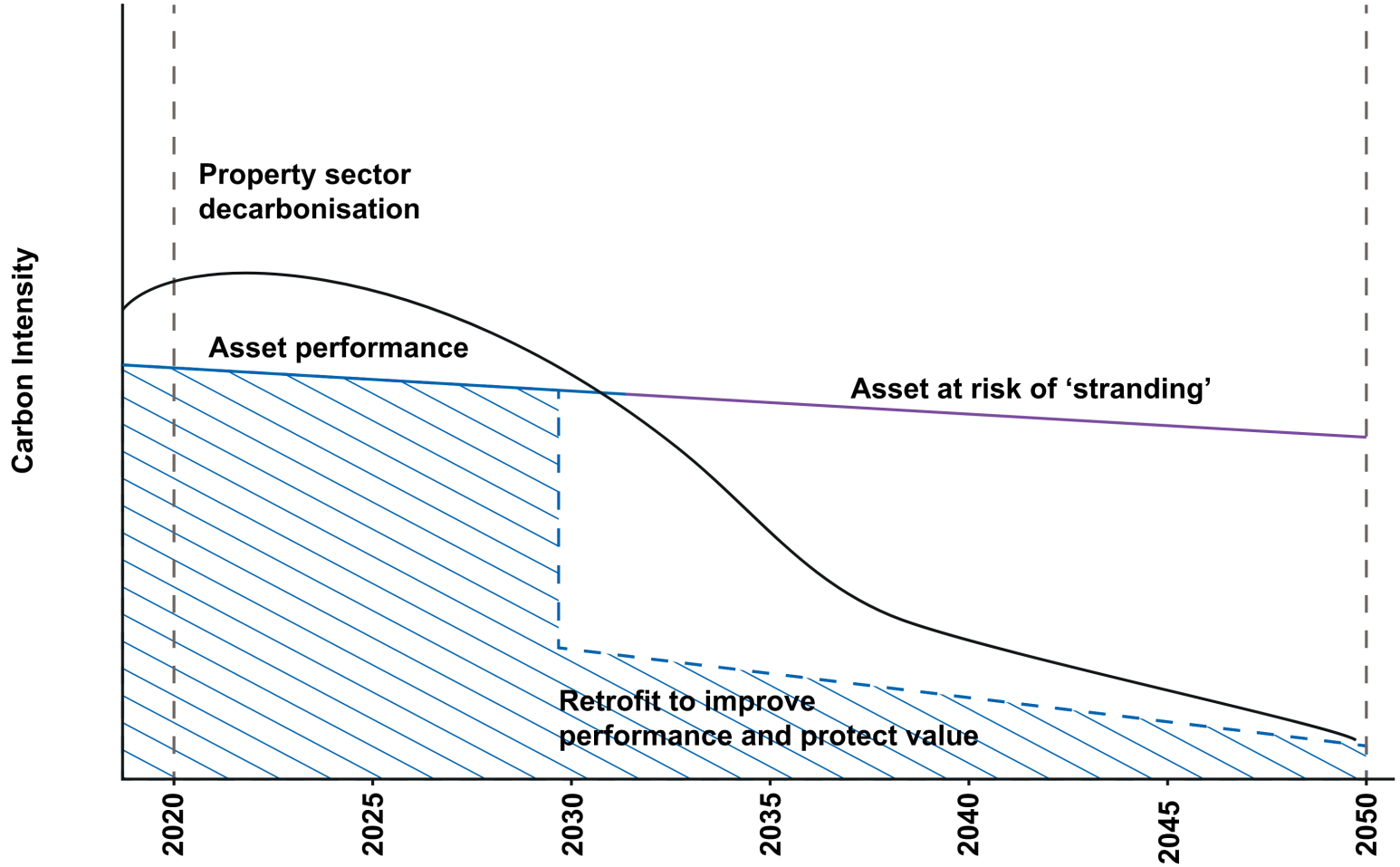
The Drivers

- Regulation
- Corporate emissions
- Voluntary ESG
- Value
- Market



Opportunity 1

Increase retrofit feasibility for existing tall buildings

- Meeting carbon reduction targets
- Flexibility and adaptability
- Good quality building stock
- A balanced approach to heritage
- Improving building databases

Opportunity 2

Take a new approach to new tall buildings

- Building something exceptional
- Gaining from shared facilities
- Adopting modern design and construction techniques
- Considering construction methodology and programme
- Balancing benefits and emissions

Opportunity 3

Create a resilient city by maximising collective influence

1. Growth
2. Transport and travel
3. Biodiversity loss
4. Water management
5. Energy Management
6. Well-being and amenity
7. Adding Social Value

Next Steps

Including:

- Lobby government for clarity on MEES regulation
- Enable collaboration between landlords and tenants for decarbonisation
- Ensure safety is paramount, especially around façade condition
- Study heritage building decarbonisation
- Enable building owners to work together to provide greater resilience

Thank you

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