



Keppel Bay Tower

Transforming an Existing Building
to a Zero Energy Building

About Us



The Keppel Group

One Integrated Business Providing Sustainable Urbanisation Solutions

Strengths & Differentiators

- 1 Engineering track record
- 2 Project management
- 3 Efficiency in capital allocation
- 4 Focus on sustainability
- 5 End-to-end business model

Focus Areas

ENERGY & ENVIRONMENT



Keppel O&M •
Keppel Infrastructure •
Keppel Renewable Energy

URBAN DEVELOPMENT



Keppel Land • Keppel Urban
Solutions • Sino-Singapore
Tianjin Eco-City

CONNECTIVITY



Keppel Data Centres • M1



ASSET MANAGEMENT

Keppel Capital • Ecosystem of private funds and listed REITs & Trust

Keppel Land

Provides innovative and multi-faceted urban space solutions for
Quality homes, offices, malls and large-scale integrated developments



Key markets:

- China
- Singapore
- Vietnam

Scaling up in:

- India
- Indonesia

What Defines Us

Sustainability-focused • Innovation • Quality-driven • Community Champion



Vision

A leader in redefining urban spaces for a sustainable future

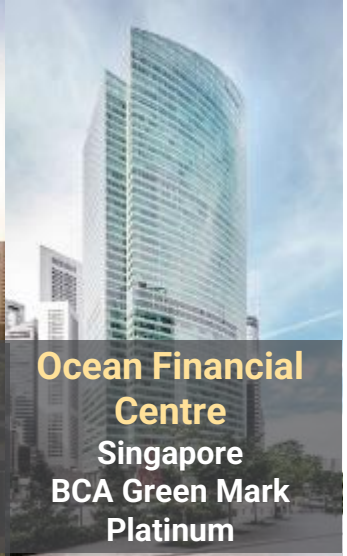



Mission

We deliver innovative solutions that enrich people and communities

We Create

Some of the best and most sustainable commercial assets in Asia





Sustainability
Our Motivation



Climate change is an

Existential challenge

We support efforts to accelerate climate action

UN Sustainable Development Goals

Supporting six relevant sustainable development goals



Healthy Buildings

100%

All new commercial developments certified to support health & well-being



Innovation

2%

Of profit invested in innovations to support sustainable development.



Green Buildings

100%

All new developments certified to BCA Green Mark Gold/Gold^{Plus}, or its equivalent.



Energy/Water Efficiency

100%

Reduction in absolute energy usage by 2030.

20%

Reduction in water usage per square meter from 2020's levels by 2030.



CO₂ Emission

Halve

Absolute Scope 1 & 2 emissions from 2020's levels by 2025, and achieve net zero by 2030



Partnership

Continue collaborating with partners and stakeholders in communities where we operate.

Targets

Achieved S\$68 million in Annual Cost Savings



89
Green Mark Awards
*1 Platinum ZE
1 Platinum SLE
16 Platinum*



1st
Diversified – Office/Residential – Core
Category
*3rd time in 4 years
Highest GRESB 5 Star Rating*



115,000
Tonnes/Year Emission Savings
Equivalent to 580,000 trees



S\$500 mil
Of Loans tied to Green Initiatives
*S\$230 mil Sustainability-Linked Loan
S\$270 mil of Green Loan*



280 mil
kWh/Year Energy Savings
Equivalent to powering 58,000 five-room units



2.7 mil
m³/Year Water Savings
Equivalent to filling 1,100 Olympic sized swimming pools



Case Study

Keppel Bay Tower

First Commercial Green Mark
Platinum Zero Energy Building

Keppel Bay Tower

First GM Platinum Zero Energy Commercial Building

Building Completion
2002

Building Type
**Office with
Retail at Ground Floor**

Number of Buildings
1 Tower + 1 Podium

Number of Storeys
18 + 6

Gross Floor Area
41,840 m²

Building EUI
115 kWh/m²/yr

Keppel Bay Tower

Tested and Proven Initiatives

1 Solutions to reduce energy costs



Cooling Systems



Cooling Tower
Water Mgt System

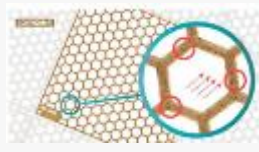
- Improves heat transfer efficiency by removing build up of sediment in the tower - increases energy efficiency of cooling tower & air-con



AHU



AHU Fan Sys



Air-Con Net

- More efficient AHU Fan system
- Innovative solutions – Air-con net improves heat transfer efficiency within air-con cooling coils



Lighting

LED

Landlord & tenanted spaces



Smart
Lighting
Control

- Adjusts lighting based on time of day/amount of natural light in building, body movement occupancy, and user experience.



Renewable Energy



On-site PV + 100% REC off-set

- Building is 100% powered by renewable energy via solar panels installed on rooftop & purchase of renewable energy certificates through Keppel Electric

2 Solutions to create healthier & efficient buildings



Air-Con Fresh Air
Intake Control Sys

- Integrated sensors installed with machine learning algorithms to optimise intake of outdoor air based on occupancy load to help enhance indoor environmental quality.
- Weather stations set up to measure and predict outdoor temperatures; indoor temperature adjusted accordingly for thermal comfort & to reduce energy consumption

3 Digital Twin to enhance building operating performance



Intelligent Building Control
& Optimization System

- Ingests building system and environmental data; Through machine learning algorithms advises on optimal system settings to optimize energy consumption, and advanced fault detection & diagnostics to reduce maintenance costs.
- Seamless tracking and provides transparency on sustainability related building data

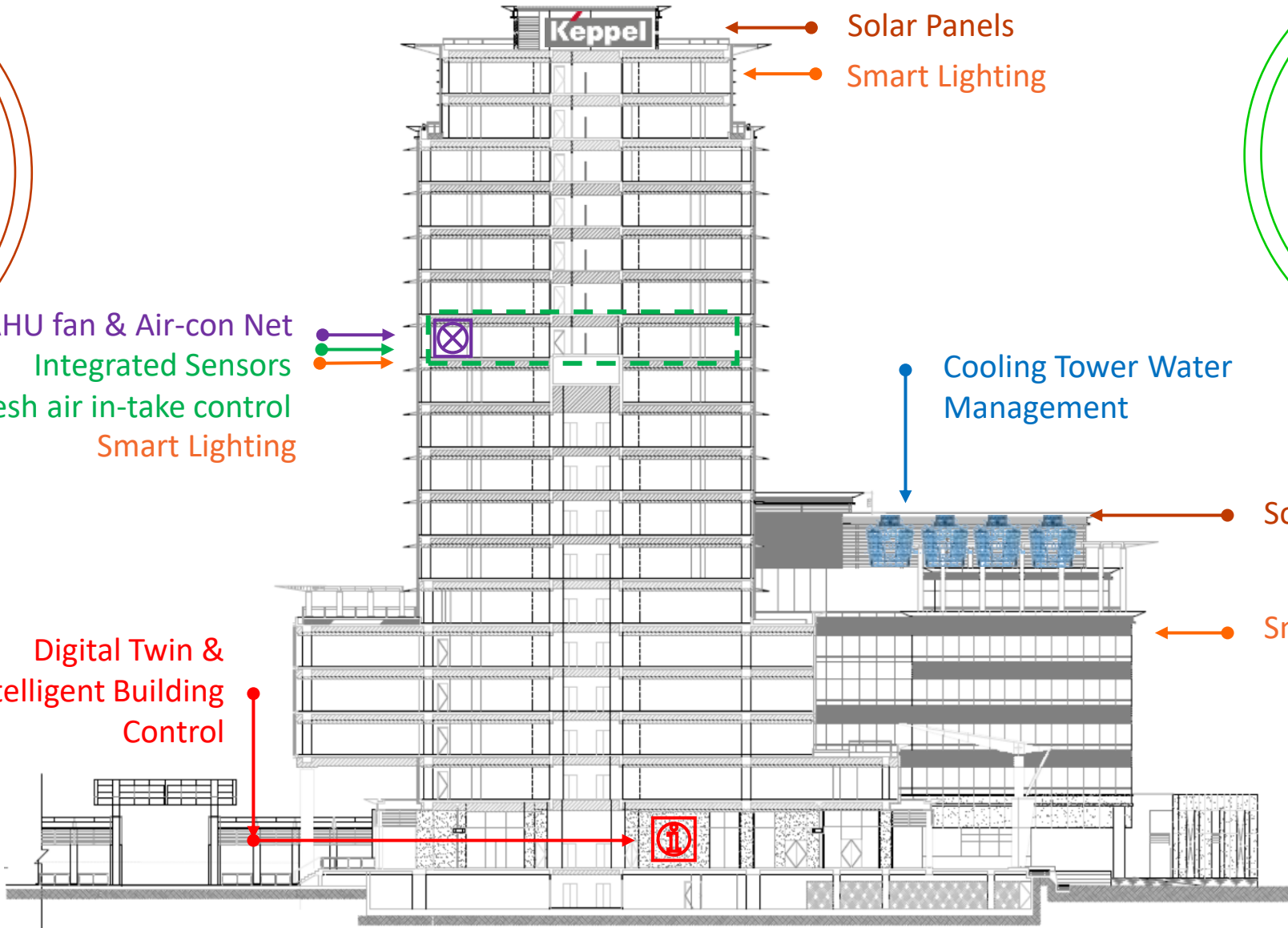
Keppel Bay Tower

Tested and Proven Initiatives

Energy Use Index (EUI):
167

Before Improvement
GM Platinum

AHU fan & Air-con Net
Integrated Sensors
Fresh air in-take control
Smart Lighting



Energy Use Index (EUI):
115

After Improvement
GM Platinum
(Net Zero)

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Collection of solutions to reach desired performance level

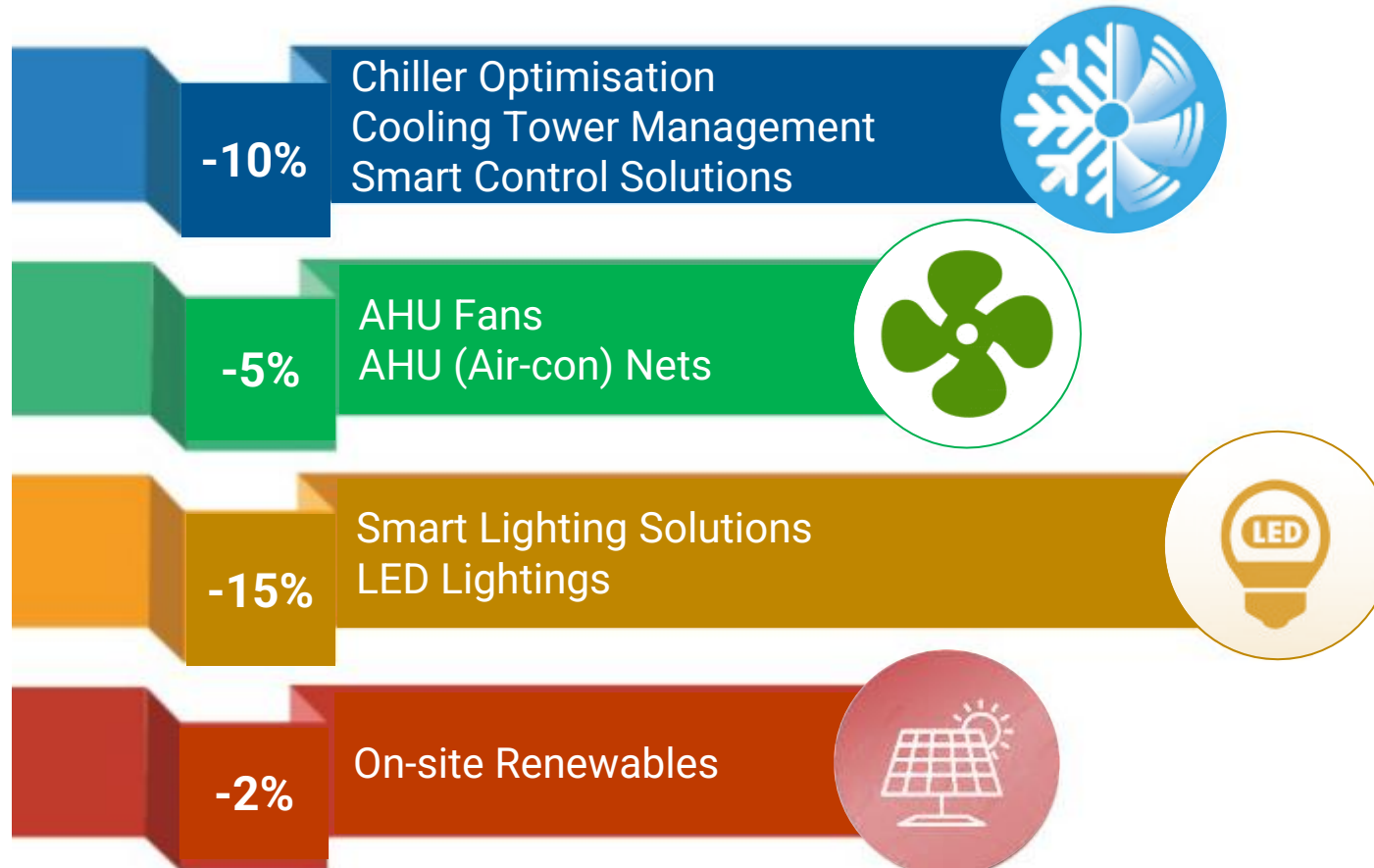
167 EUI

Before
GM Platinum



115 EUI

After
GM Platinum (ZE)



+RECs

Supplied by Keppel Electric with RE from Keppel O&M Yards

30%

Reduction in energy consumption from 2017
Green Mark Platinum
baseline

50%

More energy efficient than older office buildings (EUI > 220)

2.2 mil kWh/year

Additional savings a year
From Green Mark Platinum level
Power 400 homes

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Overcoming Challenges

1

Identifying Technologies

Source, identify, evaluate and test cutting-edge technologies suitable for an operating building

2

Carrying out work on an Operating Building

Implement technologies with existing building operations and infrastructure

3

Avoiding Disruptions

Implement improvement works without disrupting building's on-going operations

4

Integrating Multiple Solutions

Boosting system inter-operability, ingesting data, allowing data analytics to enhance performance

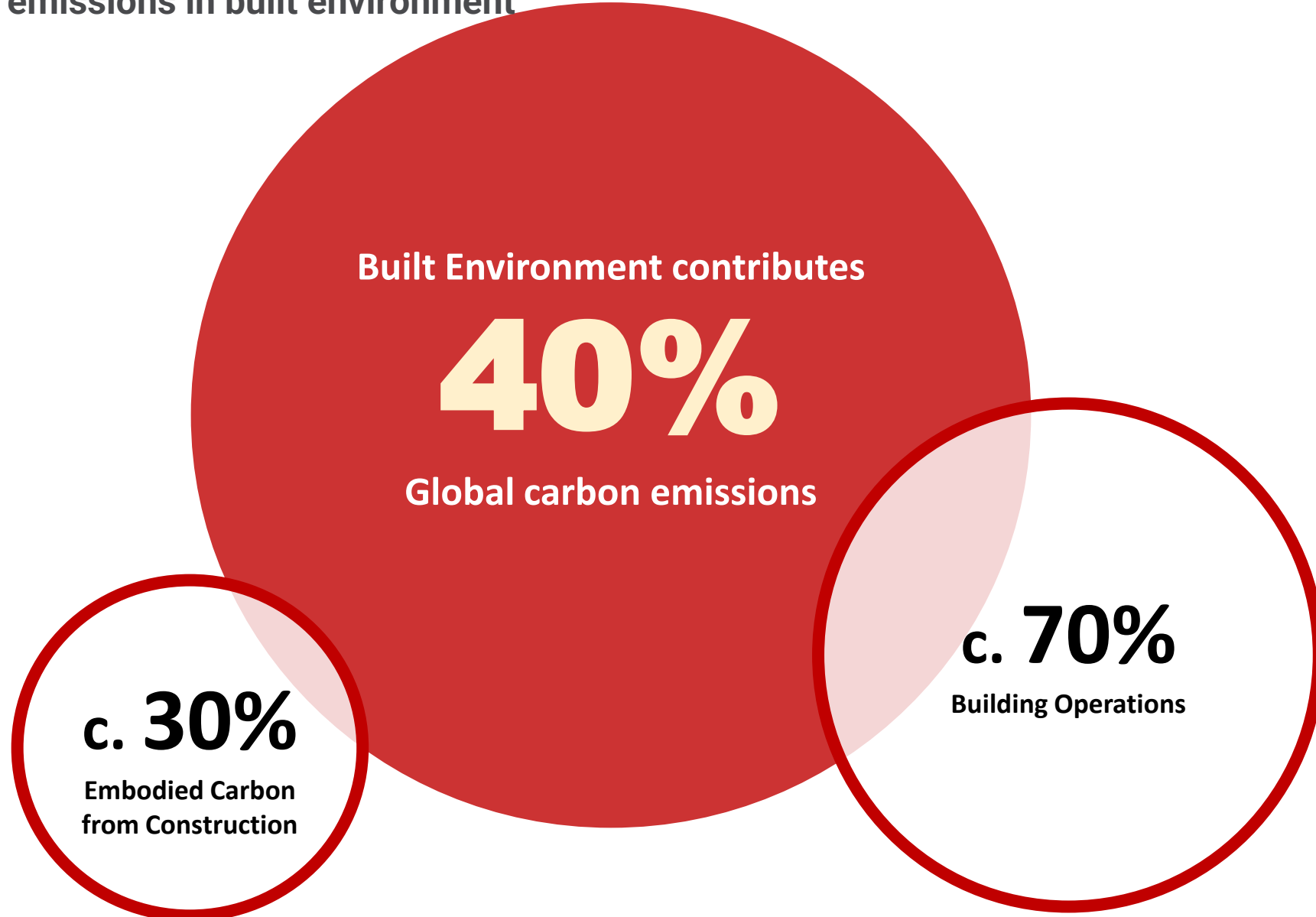


Sustainability

Playing our part

Playing Our Part

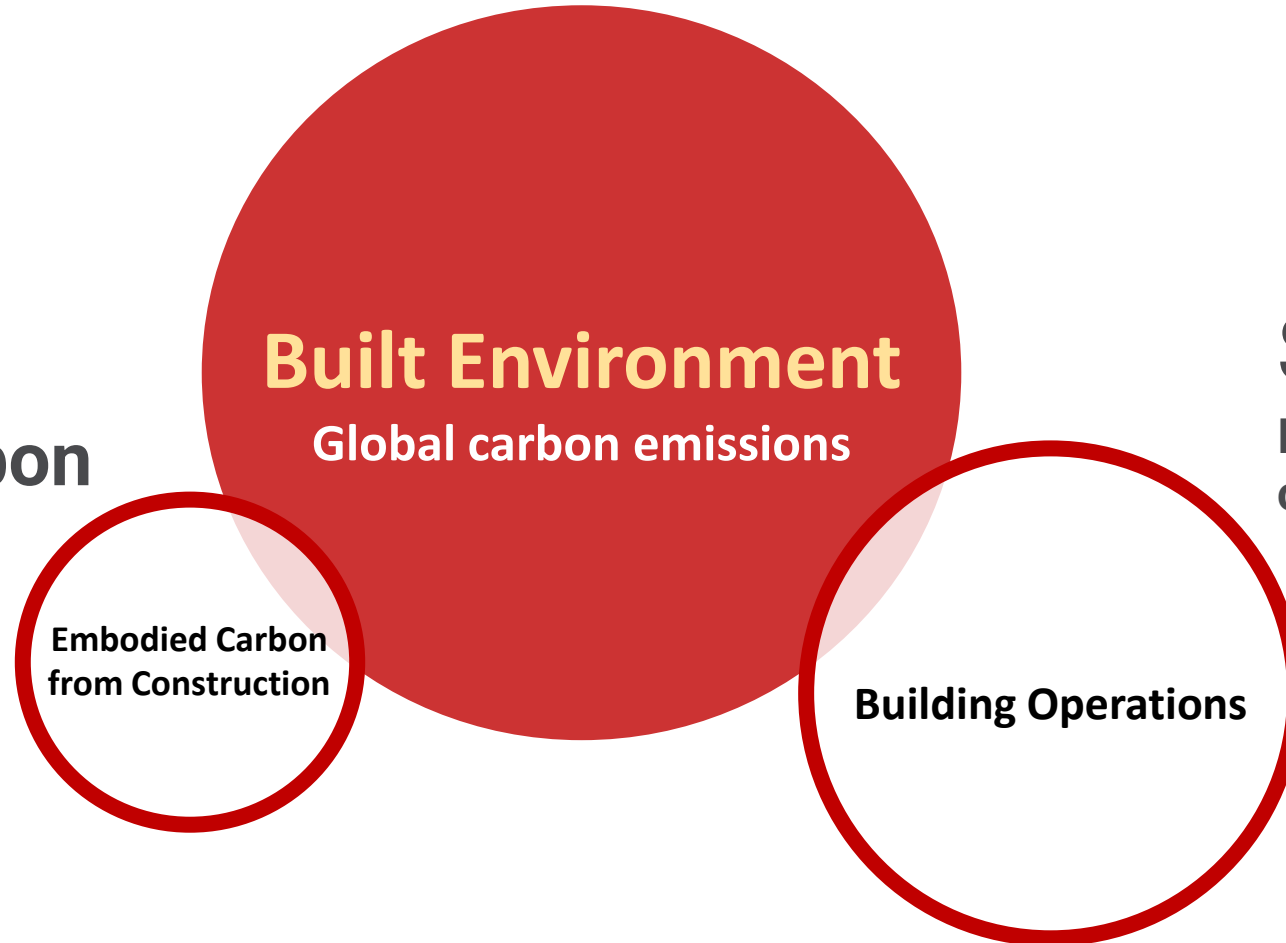
Reducing carbon emissions in built environment



Extending Lifespan and **Future Proofing Older Assets**

Reducing carbon emissions in built environment

How Might We Avoid
Embodied Carbon



Sustainability

Initiatives to enhance
operational performance



Sustainability

As our core business

Our Customers' Focus is Shifting

Sustainability

Both investors and enterprises require their real estate to be sustainable and meet their ESG requirements

Source: PWC & ULI – 2022 Emerging Trends in Real Estate Asia Pacific

62%

of enterprises currently have or plan to have Net Zero carbon emissions target for RE by 2025

72%

of investors treat sustainability as either a mandatory or significant consideration

Making Sustainability Our Business



Greening and future-proofing older assets to add value



Providing Sustainability as a Service to investors and asset owners

An aerial photograph of a city skyline at sunset. The sky is filled with golden and orange clouds, transitioning to a deep blue. The city features several prominent skyscrapers, including a cluster of blue glass buildings on the left. A large, semi-transparent red diagonal graphic, consisting of two overlapping chevron shapes, runs from the bottom left towards the top right. The text "Thank You" is written in a large, bold, yellow font, and "Sustainable Urban Renewal" is written below it in a smaller, bold, white font.

Thank You
Sustainable Urban Renewal