

# TOWARDS A GREENER TOMORROW



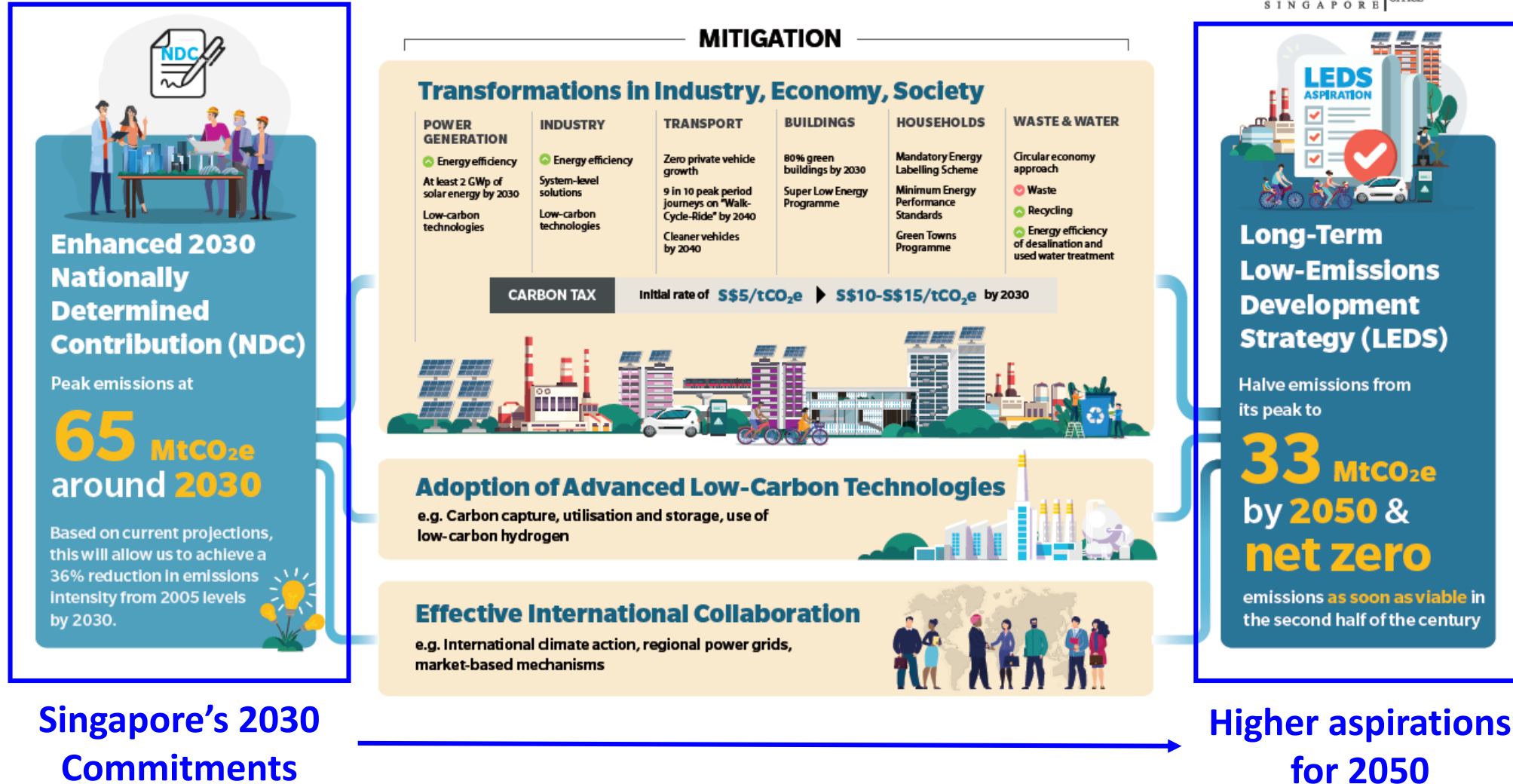


# Green Buildings and Today's Climate Crisis

**What do buildings have to do with climate change?**

# HIGHER ASPIRATIONS

## Charting Singapore's Low-Carbon Future



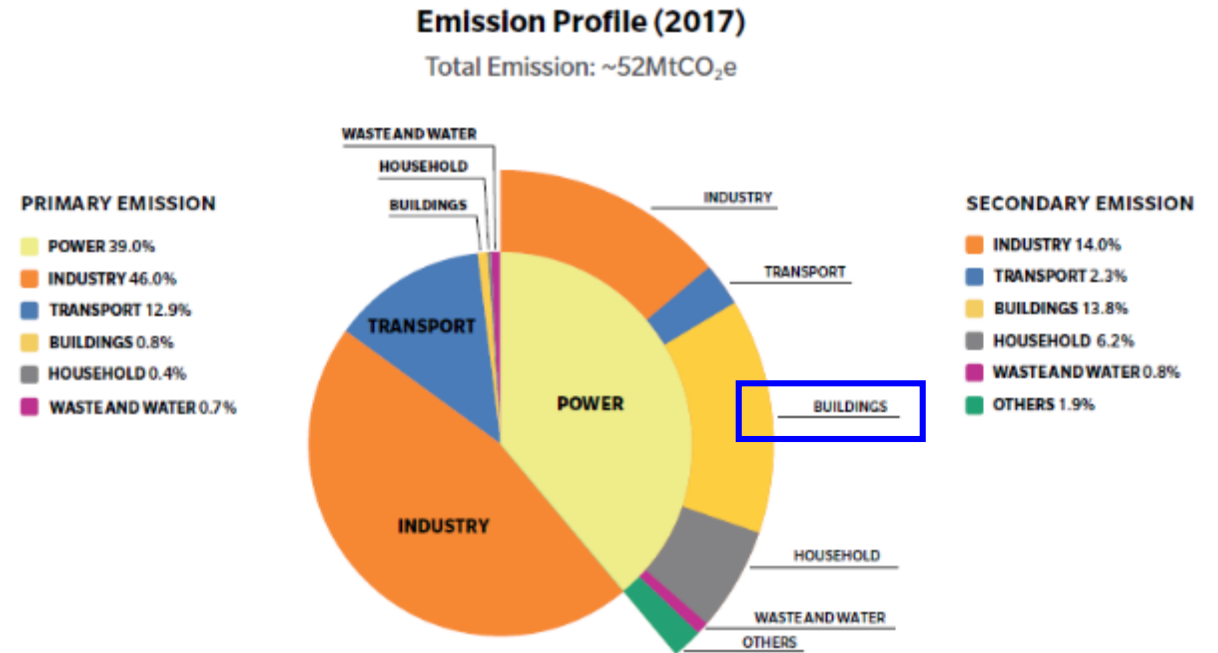
# SINGAPORE'S EMISSIONS PROFILE



Total emissions in 2017: 52.5MT

- Industry sector largest contributor ~ 60%
- ~¾ from refining and petrochemical sectors
- Transport, Households, and Buildings form most of the remaining 40%

## 2017 PERCENTAGE CONTRIBUTION OF SECTORS



Buildings are one of the key mitigation strategies for climate change!



# OUR GREEN BUILDING EFFORTS SO FAR

## Singapore's Green Building Journey

Target to green 80% of all buildings (by GFA) by 2030

\*GFA: Gross Floor Area



# OUR GREEN BUILDING EFFORTS SO FAR

Our achievements to date...

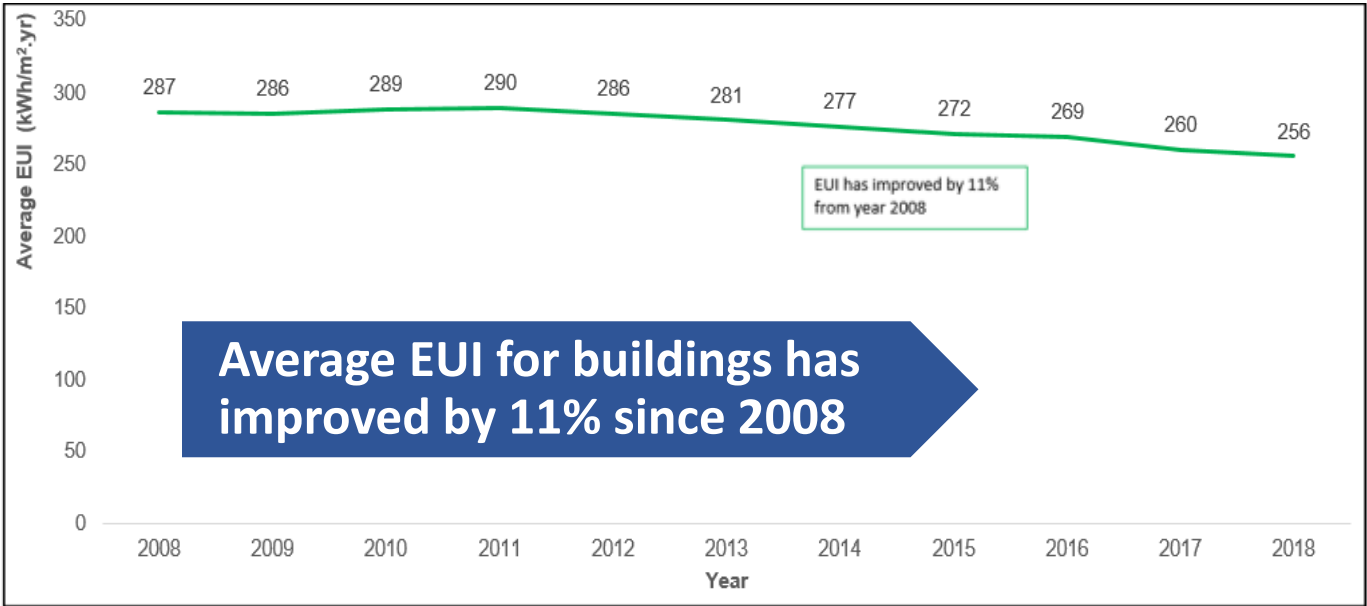


> 40% of Singapore's building Gross Floor Area is green



16 Countries, >300 overseas Green Mark Projects (87% involved SG based firms)

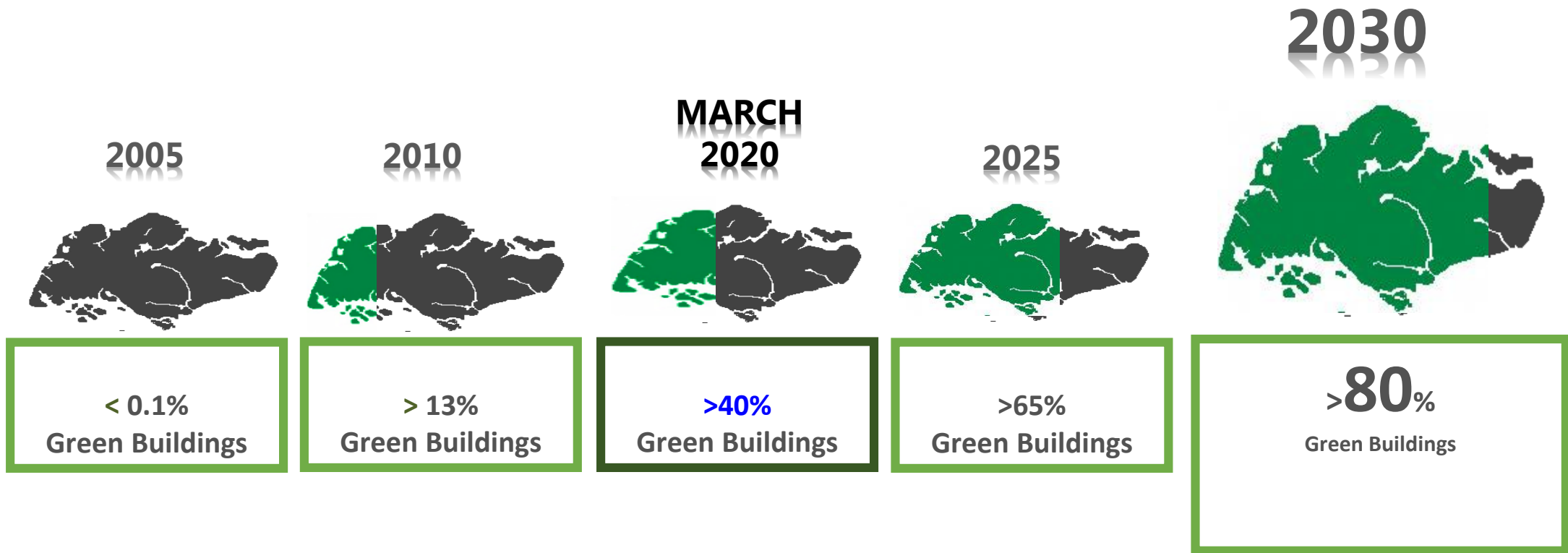
Average Energy Use Intensity (EUI) (kWh/m2•yr) for all Buildings

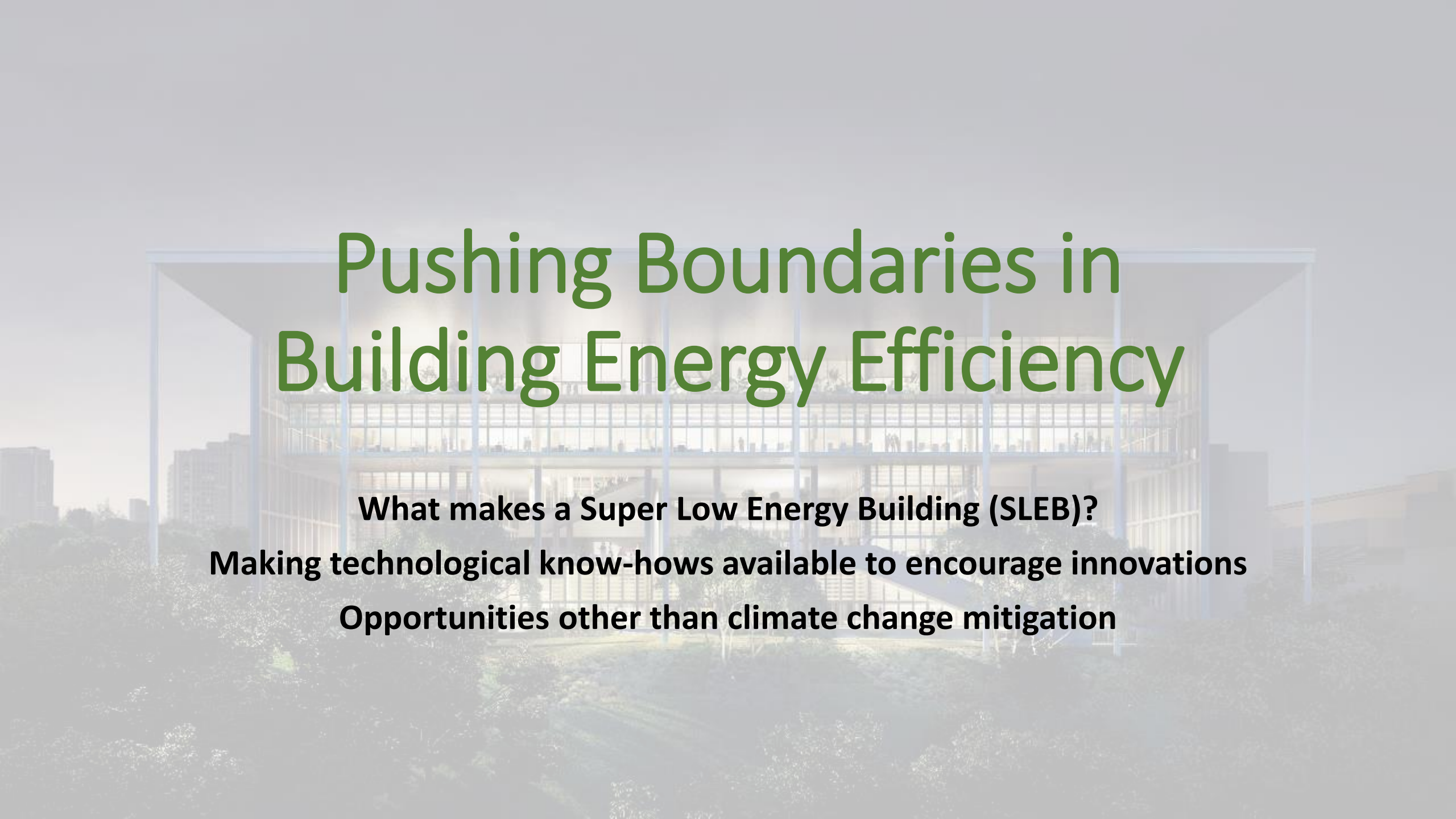


Can we do better?

# INTO THE FUTURE

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# Pushing Boundaries in Building Energy Efficiency

**What makes a Super Low Energy Building (SLEB)?**

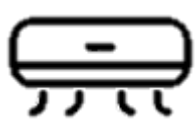
**Making technological know-hows available to encourage innovations**

**Opportunities other than climate change mitigation**



# SUPER LOW ENERGY BUILDINGS (SLEBs)

## Typical Building Energy Consumption Profile (common services):



Cooling  
60%



Lighting  
15%



Lifts &  
Escalators  
10%



Ventilation  
10%



Others  
5%



## Features of Super Low Energy Buildings (SLEB)



### 1) Passive Strategies

- Solar shading
- Natural Ventilation
- Façade & daylighting



### 2) Active Strategies

- State-of-the-Art Air Conditioning & Mechanical Ventilation (ACMV) system
- Mechanical Ventilation
- Artificial Lighting



### 3) Energy Management

- Building Automation
- Smart Control
- Plug Load Management



### 4) Renewable Energy

- Roof & Site optimisation
- Photovoltaic (PV) Technologies

# ENERGY SAVINGS OVER BUILDING LIFECYCLE

Independent consultancy study on BCA Green Mark Scheme by Squire Mech, BSD, RSP Architect, Arcadis on 25 Non-Residential Buildings

Green Mark Rating	Green Cost Premium	Simple Pay Back (yrs)	NPV Savings per GFA (median \$/GFA)
<b>SLEB (60% over '05)</b>	<b>1.00% - 4.60%</b>	<b>2.11 - 5.77</b>	<b>250</b>
Platinum (50% over '05)	1.00% - 4.40%	2.30 - 5.80	225
Gold <sup>Plus</sup>	0.70% - 1.87%	1.89 - 3.56	117
Gold	0.12% - 1.80%	0.81 - 2.45	48

- *Net positive savings over buildings' lifecycle which increases with higher standards of energy efficiency over 2005 baseline*
- Upfront premium is paid back within the building life cycle, with further energy savings beyond payback period
- Separate analysis conducted on 5 completed SLEB projects showed consistent results
  - Green Cost Premium: ~1% to 4.6%; Payback: 2 to 5.8 years
  - Median NPV savings of \$250/sqm

# CASE STUDY – SJ CAMPUS



**EUI: 82 kWh/m<sup>2</sup>/yr (estimate)**



## 1. Passive Strategies

Building & Façade optimization to achieve a super low ETTV of 34.55 W/sqm



## 2. Active Strategies

Use of Under Floor Air Distribution & Displacement Ventilation Systems along with smart lighting controls.



## 3. Smart Energy Management

Use of Integrated Building Control System to monitor and control lighting, thermostats, plug load etc . Live Energy & Water management Dashboards.



## 4. Renewable Energy

Latest high efficiency photovoltaic (PV) panels to offset energy consumption

# CASE STUDY – NUS SDE 4



**EUI: 52.5kWh/m<sup>2</sup>/yr**

*Project as completed Stage 1 verification.*



## 1. Passive Strategies

Massing to promote comfortable NV spaces. Large roof for shading and to aid with ventilation



## 2. Active Strategies

Hybrid cooling system using ceiling fans and air-conditioning set at a higher temperature (27°C)



## 3. Smart Energy Management

Extensive sensors for lighting and cooling systems



## 4. Renewable Energy

Latest high efficiency photovoltaic (PV) panels to offset 100% of its energy consumption



# SLEBs CHALLENGE

To-date, we have **25** developers & building owners aspiring to push the boundaries through SLE Challenge.



GM Criteria Pilot – work with early adopters for testing, and assessments



IGBC 2018 – Launch of GM for SLE & Tech Roadmap



SLE Challenge – owners to commit to SLE via pledge



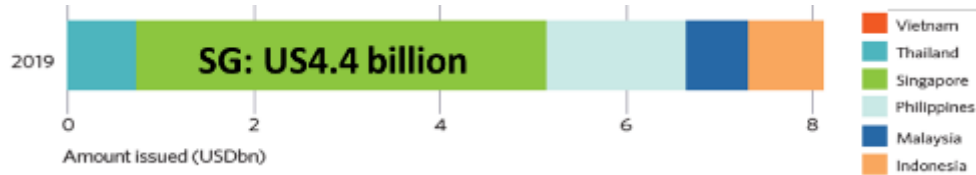
Awards Night 2018 – First batch of SLE projects to receive their awards



Companies/Organisations onboard	
Private Sector	
CDL	Capitaland
Chevrans	Hongkong Land
Keppel Land	Mandai Park Holdings
Samwoh	SIAEC
SJ	
IHL	
NTU	SIT
NUS	UWCSEA
SMU	
Public Sector Agencies	
BCA	DSTA
Home Team Academy	JTC
LTA	NEA
NParks	PA
PSA	Safra
SportSG	

# KEY OPPORTUNITIES FROM SLEBs

## GREEN STIMULUS FOR ECONOMY



Source: ASEAN Green Finance State of the Market 2019 (Climate Bonds Initiative)

- Singapore regional leader for green financing in ASEAN, green buildings take 43% of share**

YEAR	TOTAL LOAN. (No.)
2017	100 million (1)
2018	1.5 billion (2)
2019	5.4 billion (15)

Source: BCA internal tracking of Green Loans by calendar year (from 2017 to 2019)

- Growth in size and number of green loans for building projects in Singapore**

Singapore to invest US\$2 billion in green funds to drive climate action



### DBS launches transition financing framework to help 'less than dark-green' industries

To bridge the gap between traditional and sustainable financing, DBS's transition framework will facilitate the move of key industries towards a low-carbon economy. But transition financing risks fossil fuel lock-ins, experts say.



### Commentary

### Real estate green financing booms in Singapore

Real estate green financing is catching on in Singapore, driven by a rise in ESG investing and sustainability consciousness.

July 10, 2020

### OUTLOOK 2020

### Singapore charts path on green finance

NATALIE CHOY

JAN 6, 2020 05:50 AM



# THE NEW SIA GREENBOOK



SINGAPORE INSTITUTE OF ARCHITECTS

## GREEN BOOK

SUSTAINABILITY AT THE HEART OF PRACTICE

Transformation by Design



Parkroyal at Pickering  
Architect - WOHA Architects Pte Ltd

### Overview of the SIA Environmental Design Guidelines

The SIA expects that all our members should place sustainability at the heart of practice.



Figure 3 (Above)  
The SIA Environmental Design Guidelines – Placing sustainability at the heart of professional practice

The SIA EDGs provide practical guidance for the implementation of the NUA and the urban dimension of the UN SDGs into our professional architectural practice. The EDGs contextualise them in a way our members can demonstrate the Architect's role in contributing to the outcomes of sustainable development, the way Architects are actively working to meet the goals, and finally a guideline for us to measure our success at the practice and project level.

The development of these guidelines is in full support of the NUA with particular emphasis on Paragraph 13 which calls for the development of cities and human settlements that amongst other aspects:

- Fulfill their social function, including the social and ecological function of land;
- Are participatory, engender a sense of belonging and ownership among all their inhabitants, prioritise safe, inclusive, accessible, green and quality public spaces that are friendly for families, enhance social and intergenerational interactions, cultural expressions and foster social cohesion, inclusion and safety;
- Meet the challenges and opportunities of present and future sustained, inclusive and sustainable economic growth, leveraging urbanisation for



PROJECT TIMELINE & BUILDING LIFE CYCLE



# Call for Collective Action from the Community

**What do people think about green buildings?**

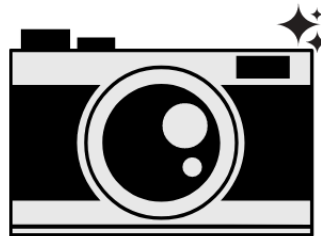
**What can you & I do as users and consumers?**

# WHAT DO PEOPLE THINK ABOUT GREEN BUILDINGS?

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## WHAT ARE PEOPLE IN SINGAPORE SAYING ABOUT **THE FUTURE OF GREEN BUILDINGS?**



*Snapshot on Public Engagement Insights for the  
Singapore Green Building Masterplan (SGBMP)*

# WHAT DO PEOPLE THINK ABOUT GREEN BUILDINGS?

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- 1 People want **more ambitious actions** for green buildings to tackle the impacts of climate change.



# WHAT DO PEOPLE THINK ABOUT GREEN BUILDINGS?

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**2** People expressed an urgent need to take climate action through greening Singapore's buildings in the next

**5-10  
years**



# WHAT DO PEOPLE THINK ABOUT GREEN BUILDINGS?

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- 3 People are calling for more education and awareness on the benefits of green buildings to encourage behaviour change.



# SGBC-BCA ENGAGEMENT CUM VISIONING EXERCISE

**Objective: Collectively set vision and key outcomes for Singapore Built Environment**

**Co-hosted by CEO/BCA and SGBC President**

Half-day workshop with

- a) Sharing by stakeholders on current initiatives and the aspiration for the Built Environment; and
- b) Discussion on shared vision and key outcomes for SGBMP 2020.

## KEY TAKEAWAYS

- Need to set ***higher and more ambitious standards*** today as buildings stay with us for a long time
- There is a need to ***look beyond infrastructure into consumption patterns***, and make lifestyle or behavioural changes
- To get the buy-in and bring the relevant stakeholders on board, there is a need to ***raise awareness and challenge common misconceptions***



***Attended by nearly 100 youth and industry representatives***

# BEYOND INFRASTRUCTURE – WHAT YOU & I CAN DO

## BUILDING OWNERS' & TENANTS' ELECTRICITY CONSUMPTION RELATIONSHIP



### Offices

51% (Building Owner's Electricity Consumption)

49% (Tenants' Electricity Consumption)



### Retail Buildings

47% (Building Owner's Electricity Consumption)

53% (Tenants' Electricity Consumption)

From BCA's Building Energy Benchmarking Report (BEBR) 2017



### *SGBC-BCA Behavioural Change Training Programme (BCTP)*

- First-of-its-kind Training Programme to build capability in individuals to drive sustainability through engaging other users to demonstrate sustainable behaviours



### *BCA-SGBC-SEAA Community Outreach Programme (COP)*

- To raise the awareness of BCA Green Mark buildings and quality homes to the public, especially homebuyers and estate agents

END

