

Net Zero Operation Carbon

Michael Ching

10 June 2023

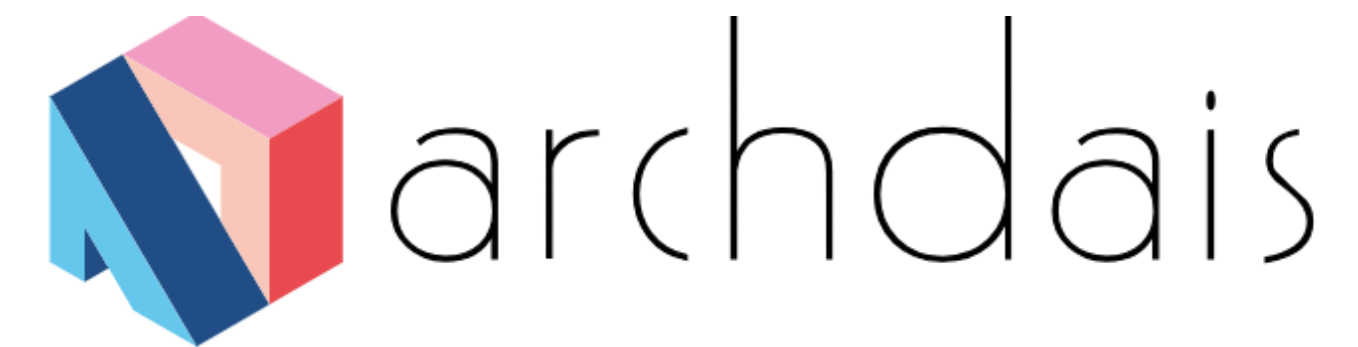


Introduction





BGREEN
ASSOCIATES
SDN BHD



Planet has only until 2030 to stem catastrophic climate change, experts warn

By [Brandon Miller](#) and Jay Croft, CNN

Updated 2254 GMT (0654 HKT) October 8, 2018



By 2030, our planet will reach the crucial threshold of 1.5°C above pre-industrial level (Currently about 1°C)

UN Intergovernmental Panel on Climate Changes (IPCC)

Arctic Ocean likely free of sea ice in summer



Global sea levels would rise around 10cm



Extreme rainfall, including flood and hurricanes



Coral reefs would decline by 70% to 90%



Loss of some eco-system



Heatwaves, includes drought and wildfires



By 2030, our planet will reach the crucial threshold of 1.5°C above pre-industrial level (Currently about 1°C)



The Beginning of The End of the World

Familiar sight in KL



Familiar sight in KL

SUMMARY OF RAIN FALL

By Rainfall in mm

		April	May	June	July	Aug	Sept	Oct	Nov	Dec	
1	2008	325.4	87.8	224.4	86.8	194.4	191	397.4	477.2	203.6	
2	2009	264.6	51.2	141.2	116.8	176	191.6	239.6	349.4	392.8	
3	2010	419.8	415	169.6	245.6	190	289.6	149	247.8	242.6	
4	2011	297.8	199.6	119.4	116.6	235.8	201	380.4	350.2	192.4	
5	2012	197	202	104.6	115.6	240.6	132	355.6	428.6	543.6	
6	2013	273.2	235	52.6	162.6	107	334.2	159	444	314	
7	2014	274.6	372	25.2	118	199.4	211.8	276.8	388.6	356.2	
8	2015	385.6	156.1	183.4	87.4	324.8	195.8	417.2	448.4	427.8	
9	2016	246.6	367.4	182.6	230.6	118.2	247.4	173.4	363.2	256.2	
10	2017	335.8	233	202.4	147.2	289.6	267.2	174	336.4	91.6	rainfall for Sept, Oct, Nov
		302.04	231.91	140.54	142.72	207.58	226.16	272.24	383.38	302.08	881.78
11	2018	221.6	531.2	208	119.8	95.6	375.6	449.2	416.6	214.6	1,241.40
	Different	-80.44	299.29	67.46	-22.92	-111.98	149.44	176.96	33.22	-87.48	359.62

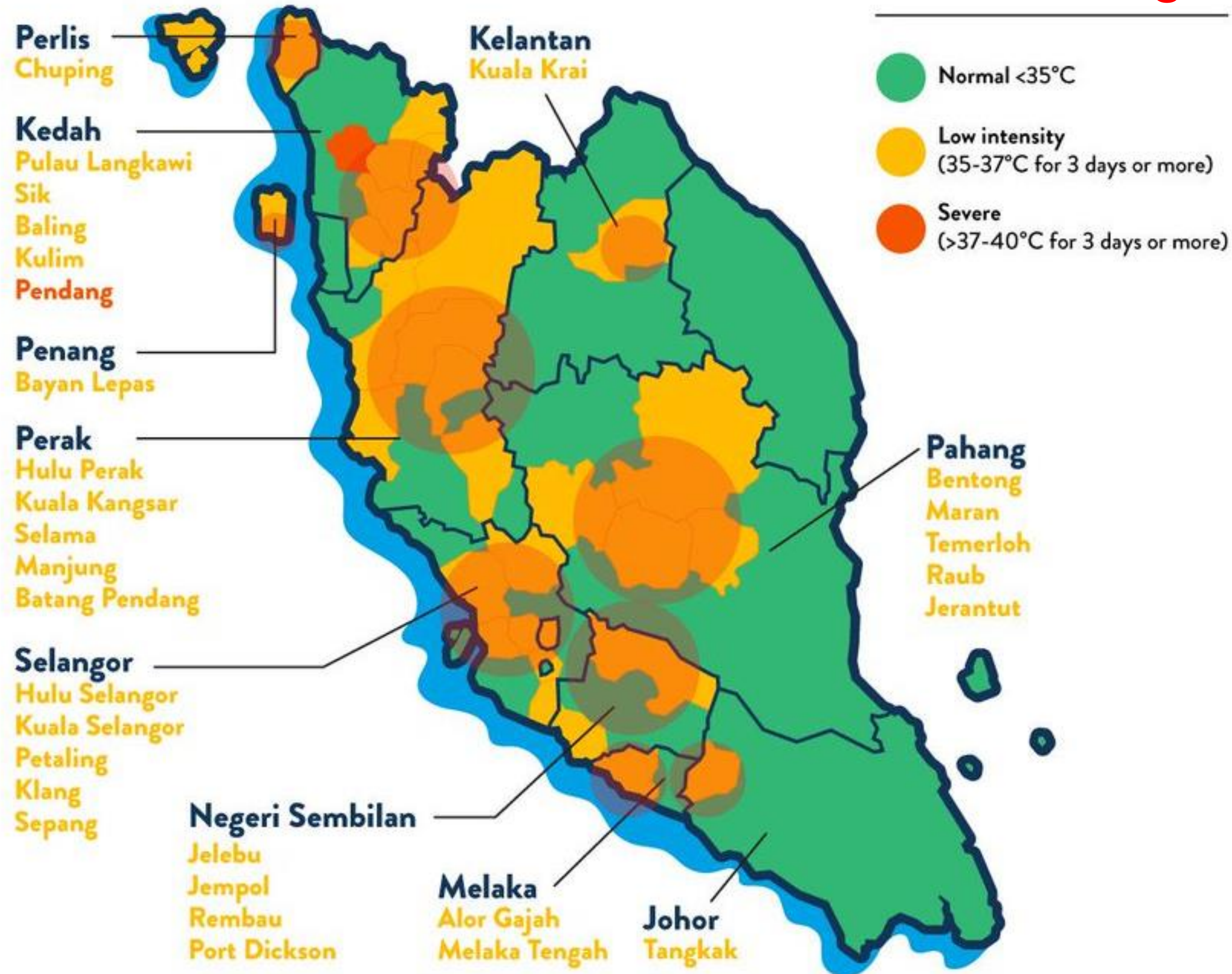
By Rainfall in day

1	2008	24	10	17	11	12	14	20	23	18	
2	2009	14	11	9	11	16	14	17	24	22	
3	2010	21	21	15	15	14	26	13	19	16	
4	2011	22	18	12	14	17	12	18	25	17	
5	2012	18	10	6	12	13	17	18	23	23	
6	2013	18	20	6	10	12	15	17	25	20	
7	2014	20	22	4	8	15	18	22	24	26	
8	2015	26	6	17	19	15	15	19	24	20	
9	2016	14	23	9	13	9	14	18	20	23	
10	2017	20	18	14	10	17	22	14	26	15	rainfall for Sept, Oct, Nov
		19.7	15.9	10.9	12.3	14	16.7	17.6	23.3	20	57.60
11	2018	19	22	12	10	11	21	26	23	22	70.00

Familiar sight in KL

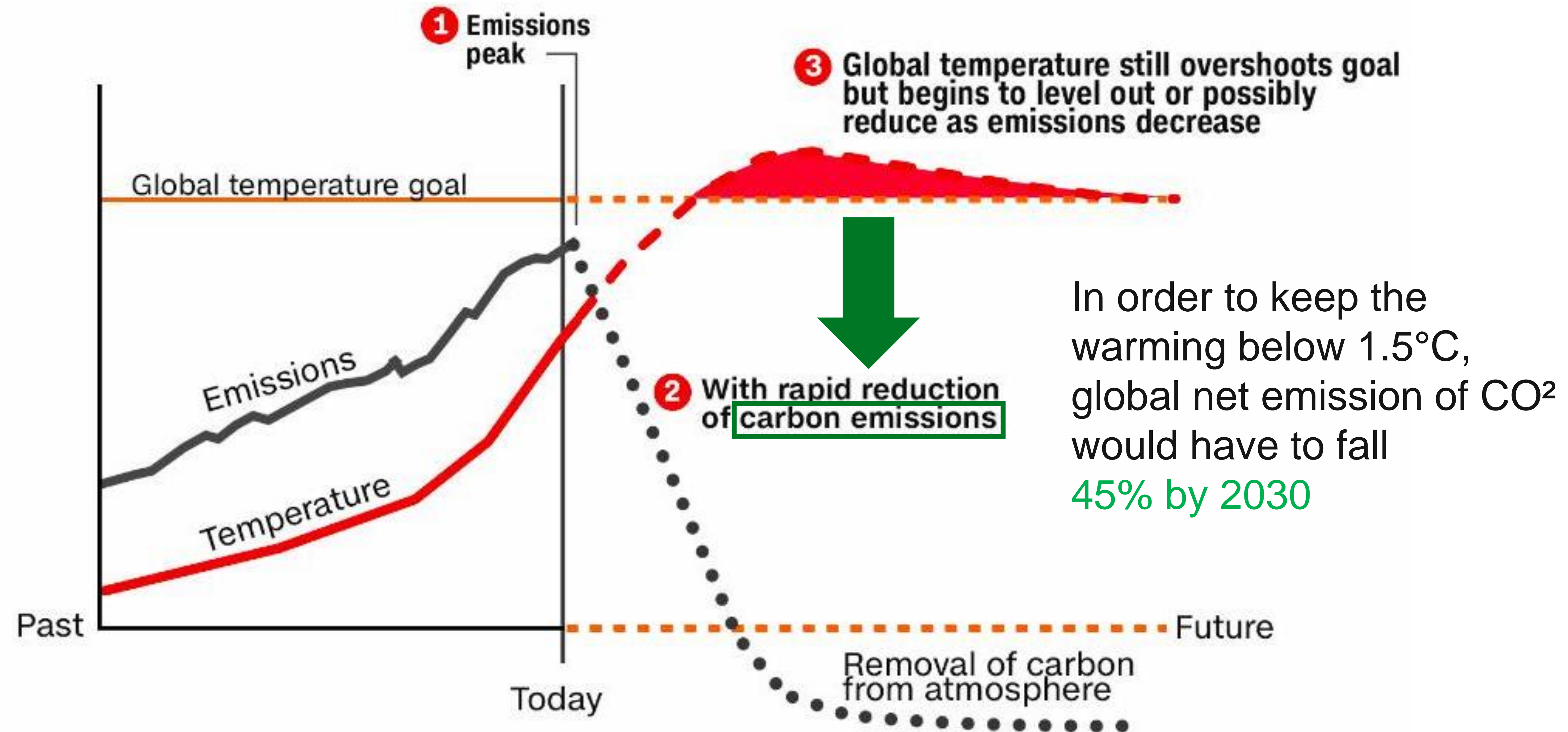


Familiar sight in KL





197 countries (including Malaysia) agreed to the goal to hold global temperatures below 2°C above pre-industrial levels and to pursue efforts to limit it to 1.5°C



The Time to Take Action is Now

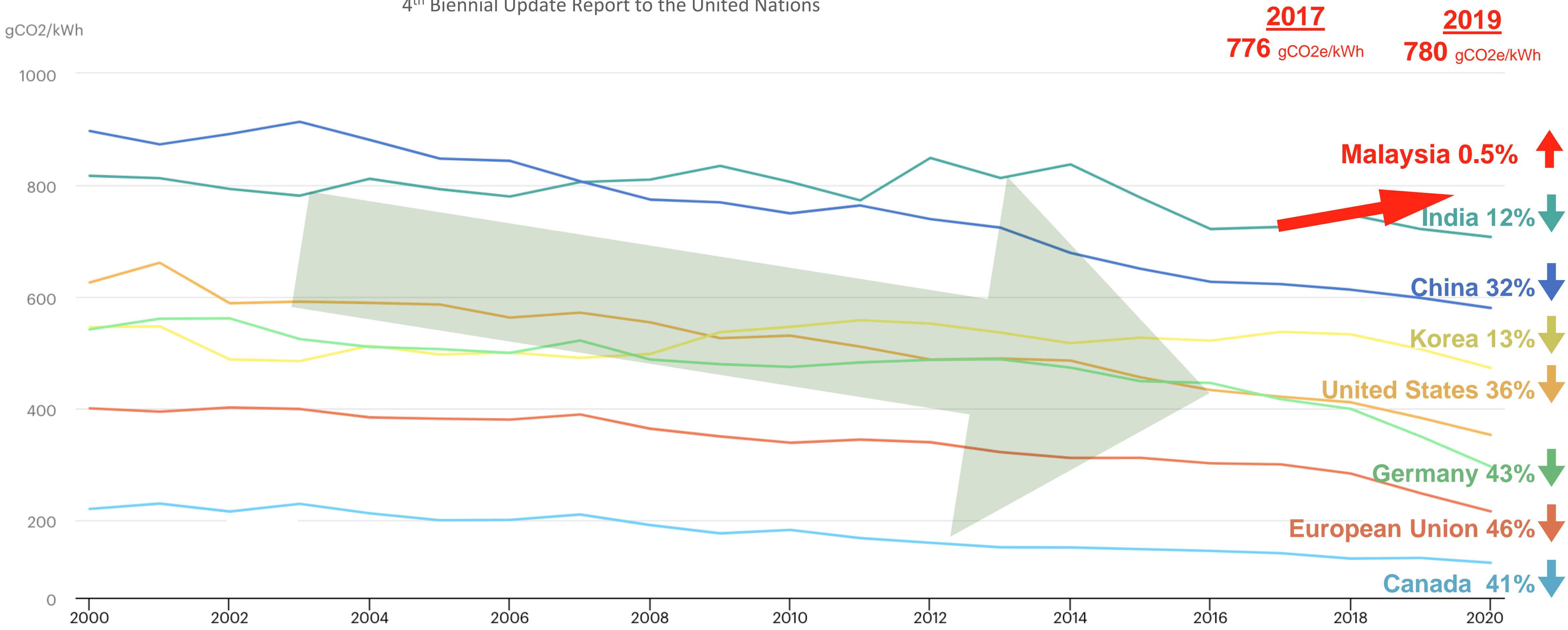
Development of CO2 emission intensity of electricity generation in selected countries, 2000-2020

Last updated 26 Oct 2022

Sources: www.IEA.org

www.worldbenchmarkingalliance.org

4th Biennial Update Report to the United Nations



We are the largest local-regional-global action network accelerating sustainability in the built environment

Leadership: Net Zero Carbon Buildings Commitment (businesses & organisations)

By 2030, **existing buildings** reduce energy consumption and eliminate emissions from energy and refrigerants.

By 2030, **new developments and major renovations** to also achieve maximum reduction in embodied carbon.

Where necessary, compensate for residual emissions.

2030

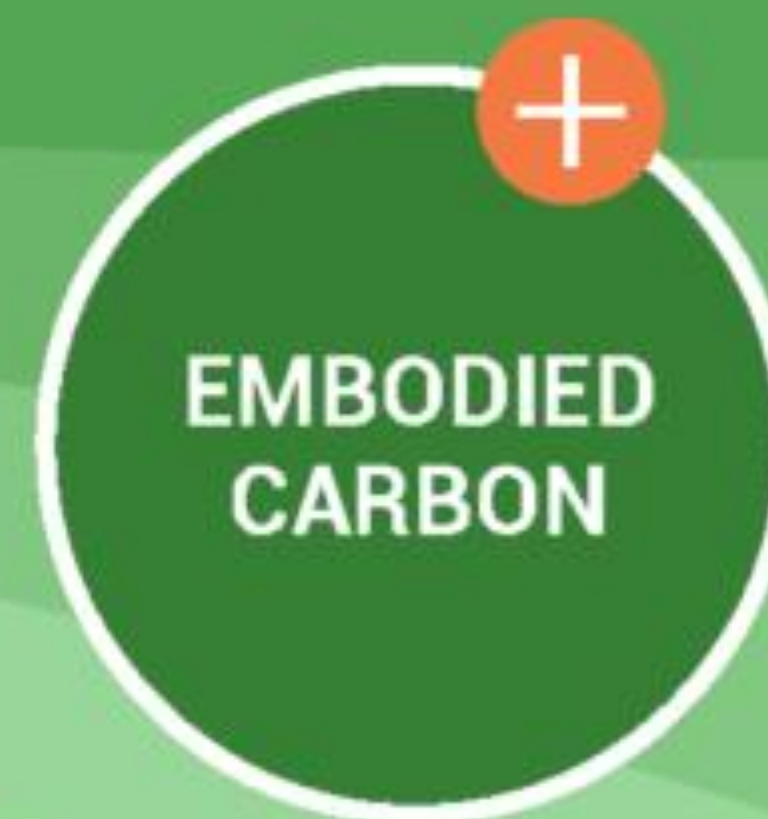
Mainstream: All buildings globally

By 2030, all new buildings, infrastructure and renovations will have at least **40% less embodied carbon** with significant upfront carbon reduction.

All new buildings must be **net zero operational carbon**.



Advancing Net Zero Whole Life Carbon



Advocate through business activities for **all buildings to be net zero whole life carbon** by 2050.

2050

By 2050, all new buildings, infrastructure and renovations will have **net zero embodied carbon**,

All buildings, including existing buildings must be **net zero operational carbon**.

2030



WORLD
GREEN
BUILDING
COUNCIL

2050

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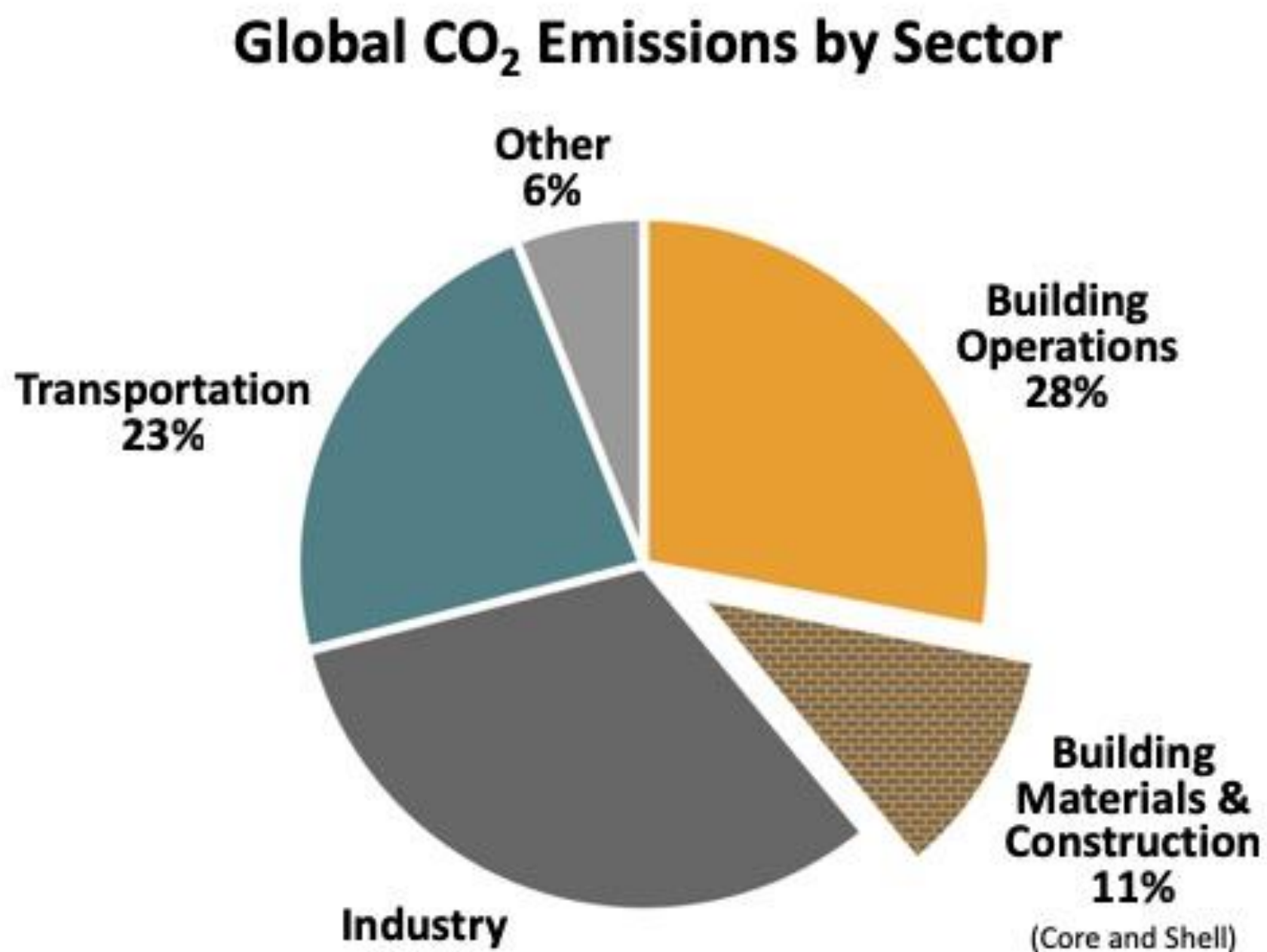
Why Net Zero Carbon?

Green Building Limitation



Why Green Buildings?

Buildings generate > 40% of total annual global CO₂ emissions and urban areas are responsible for 70% of global energy consumption.



Source:
Global Alliance for Buildings and Construction.
2018 GLOBAL STATUS REPORT.



The background is white with various light beige geometric shapes, including triangles and parallelograms, scattered across it. In the center, there is a red speech bubble with a white interior and a red border. The text "Where are we now?" is written inside the bubble in a red, sans-serif font. Below the bubble, there is a red downward-pointing arrow. To the left of the arrow is a solid green rectangle, and to the right is a solid green circle. At the bottom center, there is a small, dark, circular shadow.

Where are
we now?



7 million properties

Malaysia Property Market Centre (NAPIC) 2020



644 certified green building

Green Building Index (GBI) 31 Dec 2022



0.0092% only





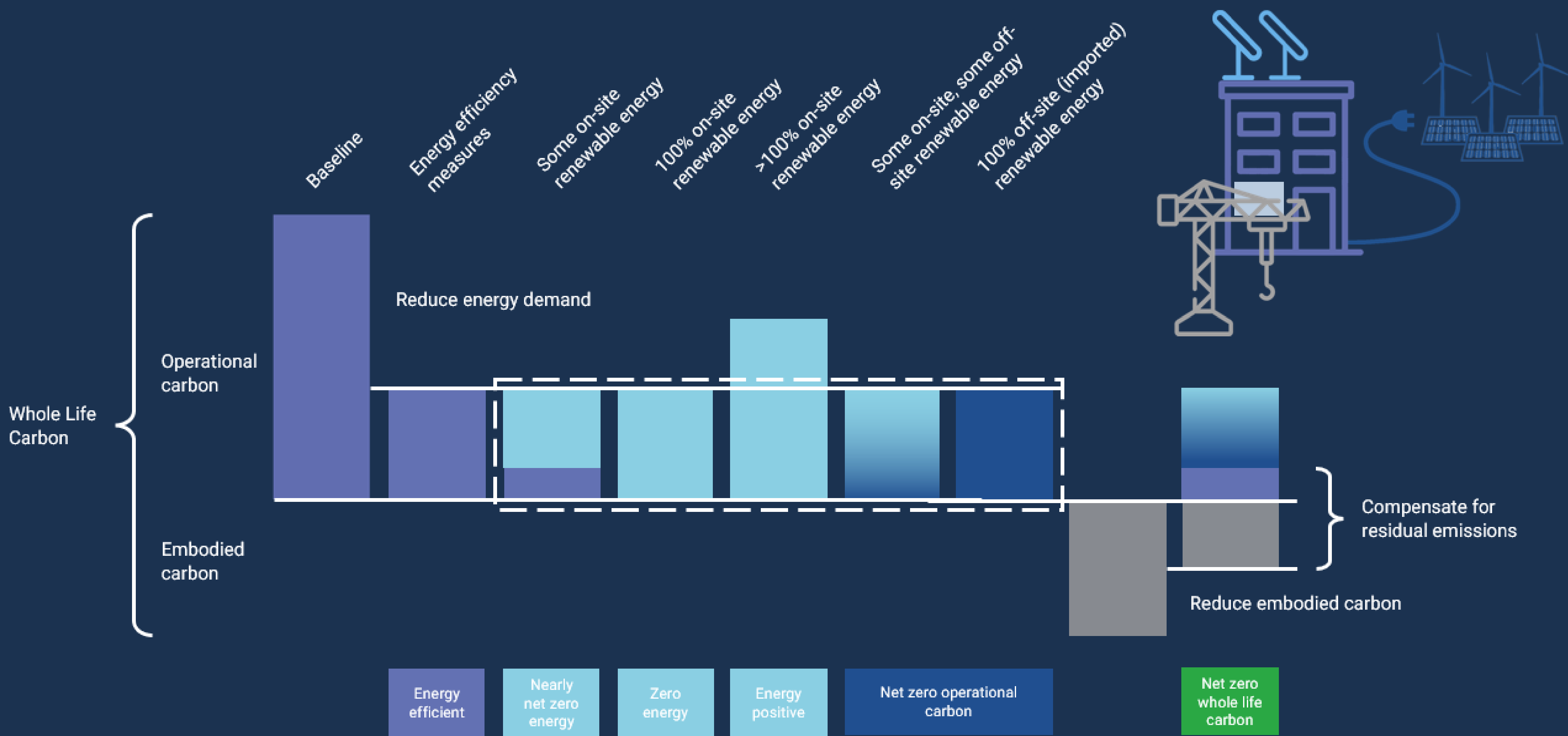
What can we do ?



green building index



Definitions: Net Zero Carbon Buildings





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Net Zero Operational Carbon

Definition

A net zero carbon building is highly energy efficient with all remaining energy from onsite and/or offsite renewable sources

Net Zero Embodied Carbon

Definition

A net zero embodied carbon building (new or renovated) or infrastructure asset is highly resource efficient with upfront carbon minimised to the greatest extent possible and all remaining embodied carbon reduced or, as a last resort, offset in order to achieve net zero across the lifecycle.



Operational Carbon

Building energy consumption



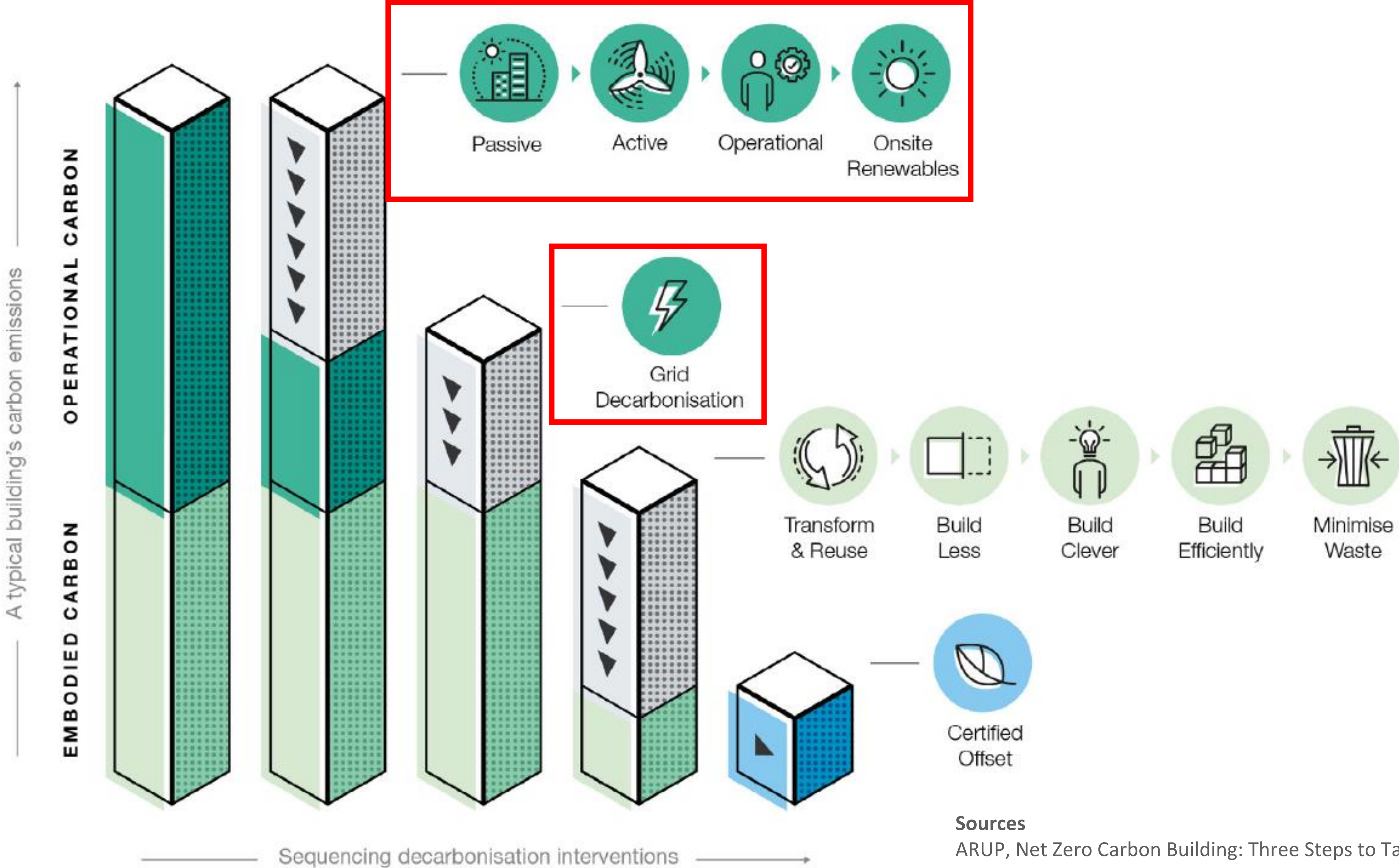
Embodied Carbon

Manufacture, transport and
installation of construction materials



How do we **achieve** it ?

Route to Net Zero: Getting the Sequencing Right



Sources
ARUP, Net Zero Carbon Building: Three Steps to Take Now



- 1. Orientation** : Building Orientation
- 2. Façade Design** : Facade Thermal Envelope (OTTV)
- 3. Daylighting** : Natural day lighting by windows and/or skylight,
daylighting system such as light tube, light shelf etc.
(Eliminate glare)
- 4. Natural Ventilation** : Naturally ventilated building by cross and
stack ventilation
- 5. Thermal Insulation** : Roof U-Value, Roof Thermal Envelope (RTTV)
- 6. Strategic Landscaping** : Biophilic Design



- 1. EE Lighting** : Efficacy (Illuminance Level / Lighting Power)
- 2. Lighting Control** : Motion and Light Sensor
- 3. Electric Power** : Motor with Inverters or Variable Speed Drives (VSDs)
with Harmonics Filters
- 4. Sub Metering** : Monitor of energy consumption
- 5. AC Design** : Zoning and Indoor design conditions (Dry Bulb Temperature, Relative Humidity, Air Movement)
- 6. AC System** : Efficiency devices such as variable speed drive, high efficiency motor, efficient unloading devices, multi compressors, etc with temperature sensors within occupancy height



The indoor design conditions of an air-conditioned space for comfort cooling should be as follows:

- | | |
|--|----------------------|
| a) recommended design dry bulb temperature | 24 °C to 26 °C |
| b) minimum dry bulb temperature | 23 °C |
| c) recommended design relative humidity | 50 % to 70 % |
| d) recommended air movement | 0.15 m/s to 0.50 m/s |
| e) maximum air movement | 0.70 m/s |



7. MV System : Timer switch control, thermostat control, duty cycle programming, CO/CO2 sensor control.

8. EMS (>4000m2) : Control of equipment, Monitoring of equipment, Integration of equipment and other sub systems, Energy related data collection and analyses

9. RWHS : Gravity Rainwater Harvesting System to reduce Pumping Load

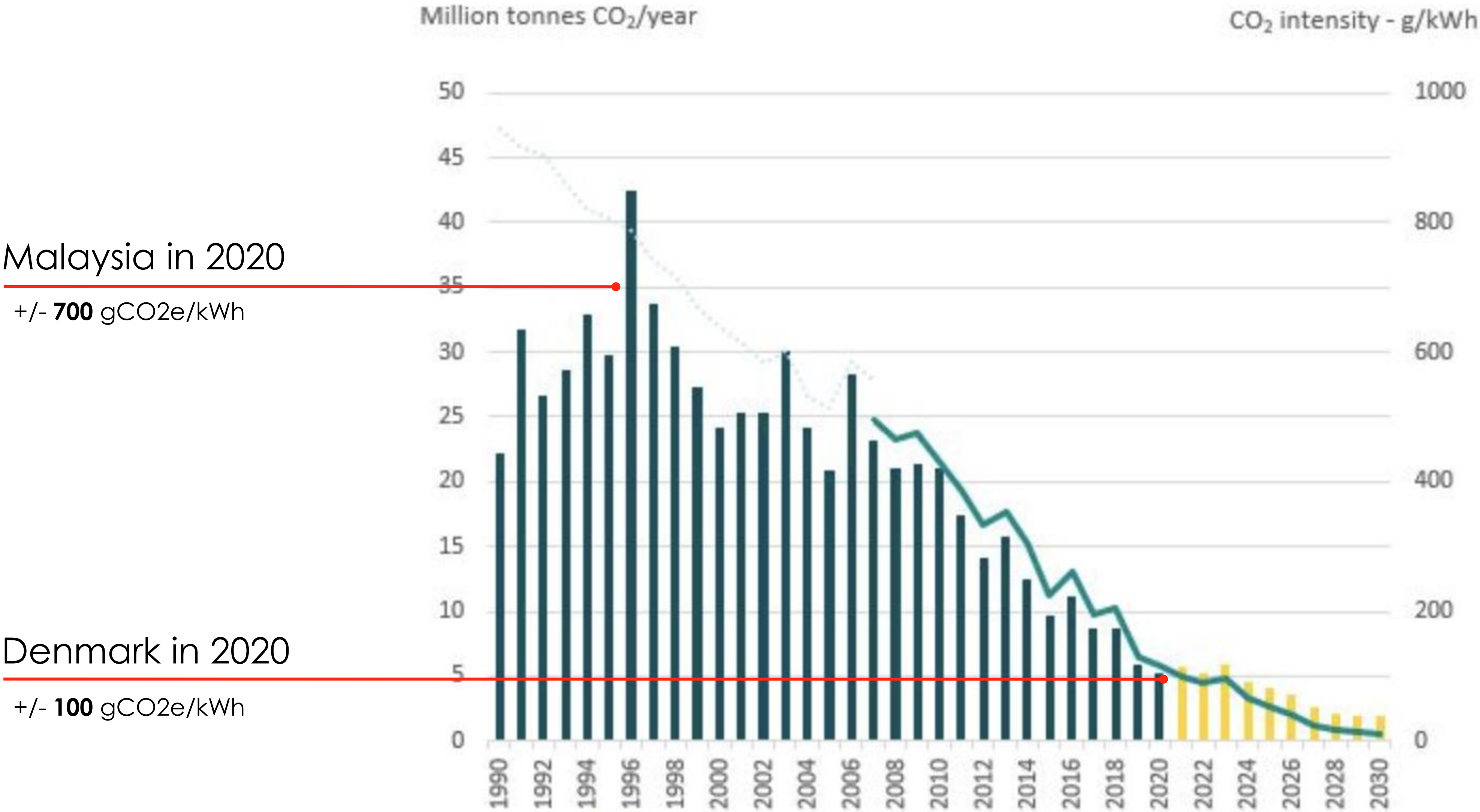


- 1. Facility Management** : Maintenance Plan and Team
- 2. Maintenance** : Passive and Active Green Features (including RE)
- 3. Landscaping** : Conserve and Increase (if possible)
- 4. Energy Management Commitment** : Policy, Energy Audit, Emission Reduction Reporting (Scope 1)
- 5. Survey** : Occupant Comfort
- 6. Re-Commissioning** : Further or additional sustainable system solutions.



1. Renewable Energy (Grid Connect) : Solar Energy (Thin Film Solar Cell, BIPV), Wind Energy, Biomass

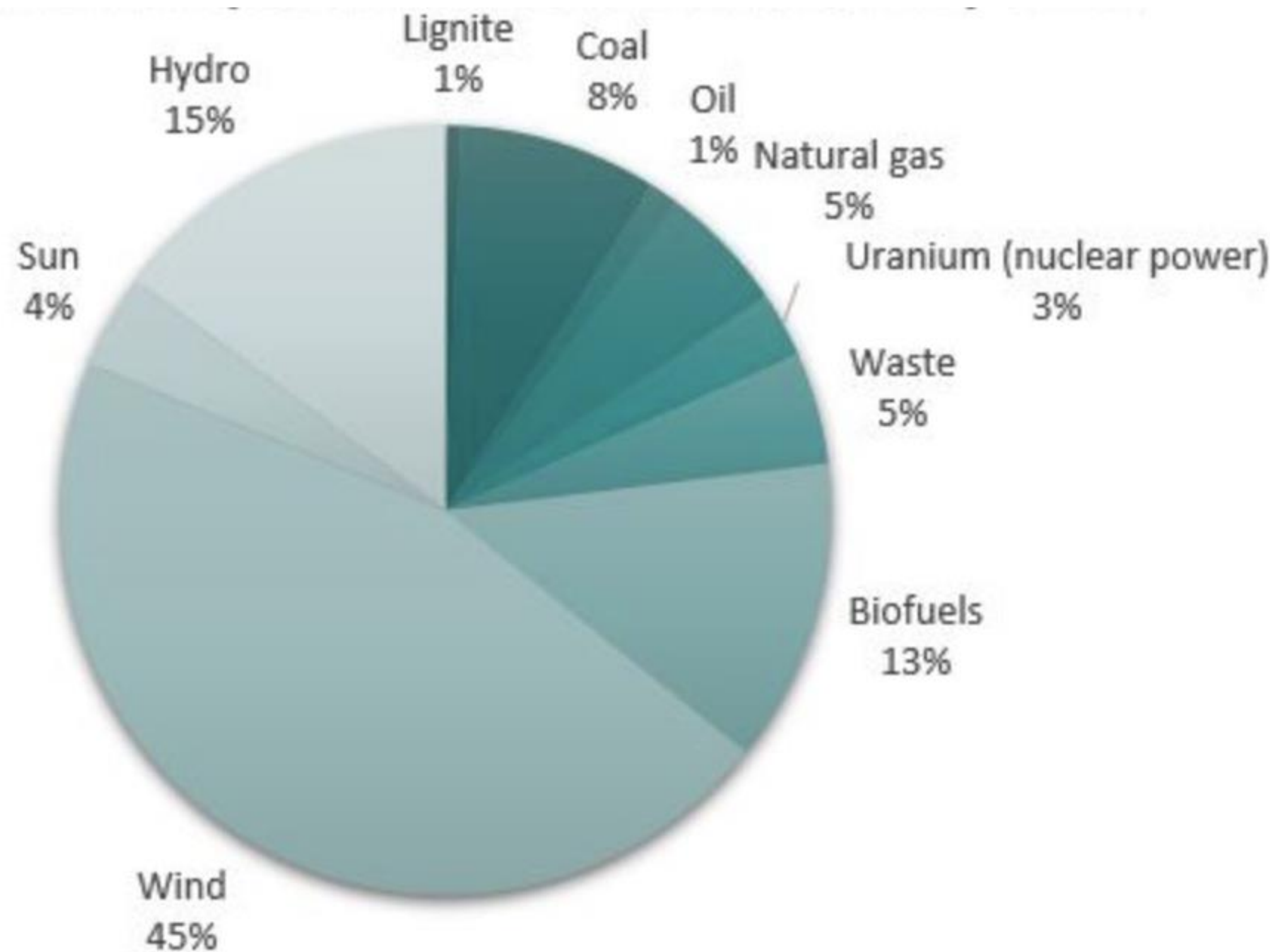
Electricity Grid CO₂ Intensity



Denmark 2020 - CO₂ Intensity

> 85% Renewable Sources

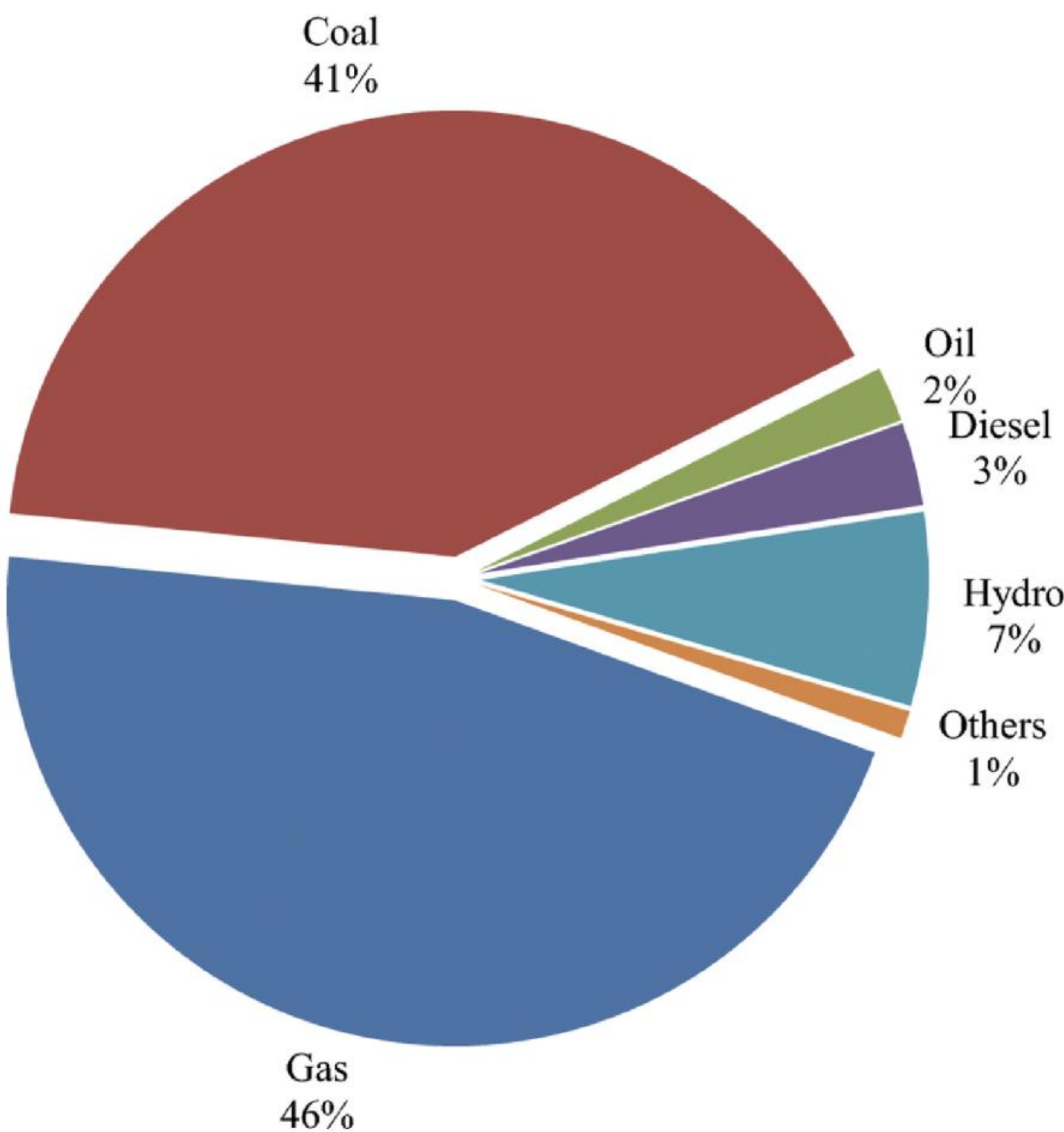
+/- 100 gCO₂e/kWh



Malaysia 2020 - CO₂ Intensity

< 1% Renewable Energy

+/- 700 gCO₂e/kWh



The figure shows how an average kilowatt hour in the Danes' sockets was composed seen across 2020.

Source: Universiti Teknologi PETRONAS, 2022

Malaysia sets new goal of 20% clean energy generation by 2030

Neily Syafiqah Eusoff / The Edge Financial Daily

September 19, 2018 10:00 am +08



This article first appeared in The Edge Financial Daily, on September 19, 2018.



KUALA LUMPUR: The energy, science, technology, environment and climate change ministry has set a target of 20% of the country's electricity to be generated by renewable sources by 2030, from 2% currently.

Minister Yeo Bee Yin said her ministry is having a series of meetings to ensure the national grid is prepared to cater for this renewable energy (RE) generation mix, as well as studying the policies to meet its target.

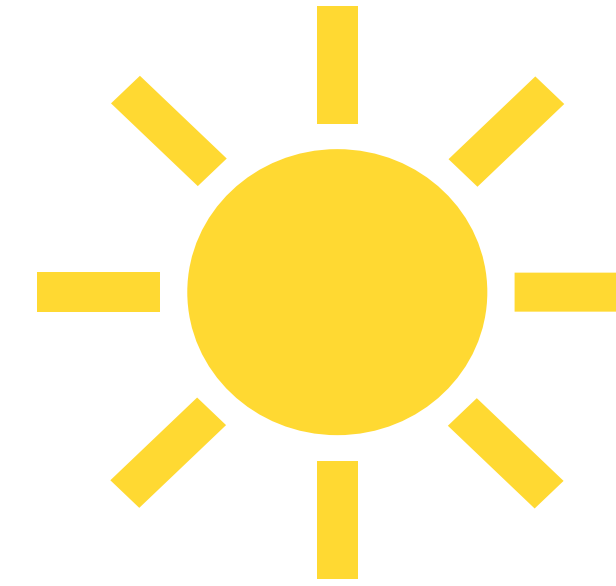


Energy Efficiency.

2005 – LEO Building
(100 kWh/m².year)

2007 – PTM Building
(65 kWh/m².year)

2008 – Suruhanjaya Tenaga
(65 kWh/m².year)



Renewable Energy

RE with highest potential in Malaysia –
Photovoltaic.

Energy from PV
(without fit-in-tariff or any kind subsidy)

is cheaper than buying electricity
from TNB on life-cycle-cost

RE Feasibility

Solar PV Panel Feasibility on Rooftop		
Cost of PV	3,500	RM per kWp
Min. Energy Output/Year	1,200	kWh/kWp per yr
Lifespan of PV (~30 years)	10	years
Energy Output for Lifespan (no efficiency loss)	12,000	kWh over 10 yrs
Efficiency drop of <1% per yr	90%	Ave. efficiency loss over 10 yrs
Energy Output over Lifespan	10,800	kWh over 10 yrs
Average Energy Output per yr	1,080	kWh per yr
Cost of Electricity by Solar PV	0.51	RM/kWh produced
Current Average TNB Tariff	0.50	RM/kWh TNB tariff

ROI 6-7 Years (without Tax Saving)

ROI 4-5 Years (with 24% Tax Saving)

30% renewable energy rule for all new projects

By BAVANI M



METRO NEWS 🔒

Monday, 17 May 2021

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park

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market needs makeover'

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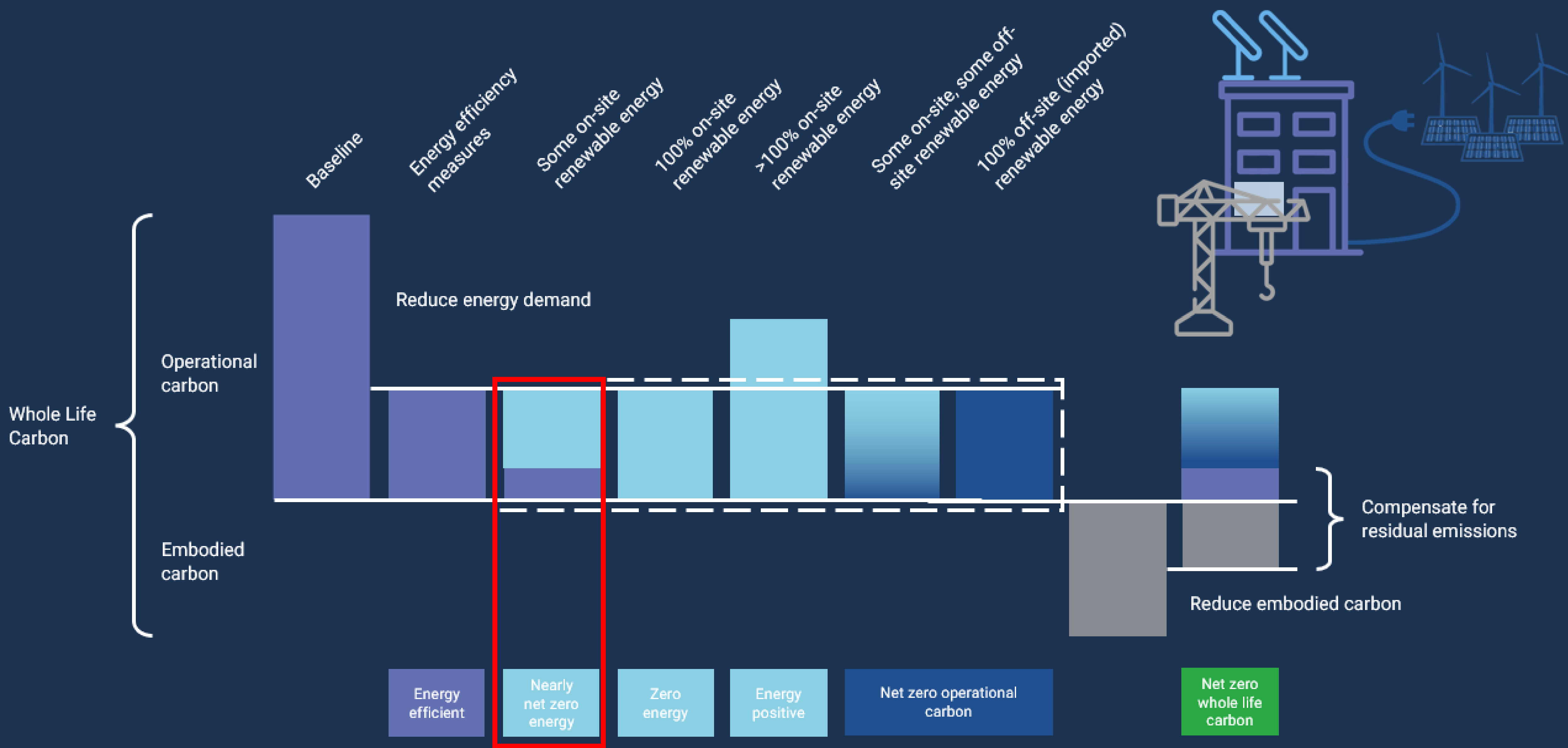


Kuala Lumpur mayor Datuk Mahadi Che Ngah.

ALL future development projects in Kuala Lumpur, be they commercial or residential, must rely on 30% renewable energy, says Kuala Lumpur mayor Datuk Seri Mahadi Che Ngah.

Fuse Rating / CT Ratio (Ampere)	kilovolt-ampere kVA	kilowatt kW @ PF 0.85	Limit Kapasiti Solar kilowatt (kW) (CT Ratio/Fuse Rating*60%)
Fuse 32A	22.17	18.84	11.31
Fuse 63A	43.65	37.10	22.26
CT 150/5	103.92	88.33	53.00
CT 200/5	138.56	117.78	70.67
CT 300/5	207.85	176.67	106.00
CT 400/5	277.13	235.56	141.34
CT 500/5	346.41	294.45	176.67
CT 600/5	415.69	353.34	212.00
CT 800/5	554.26	471.12	282.67
CT 1000/5	692.82	588.90	353.34
CT 1200/5	831.38	706.68	424.01
CT 1600/5	1108.51	942.24	565.34

Definitions: Net Zero Carbon Buildings



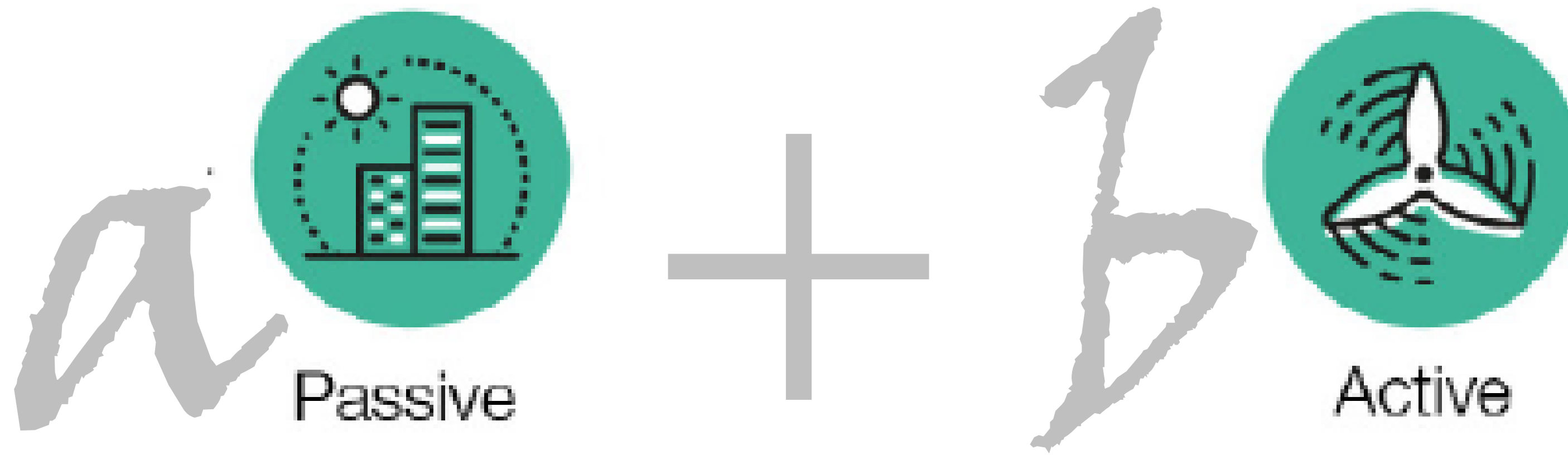


1. Renewable Energy (Off Grid) : TNB Green Electricity Tariff (GET)
(+3.7 sen/kWh)





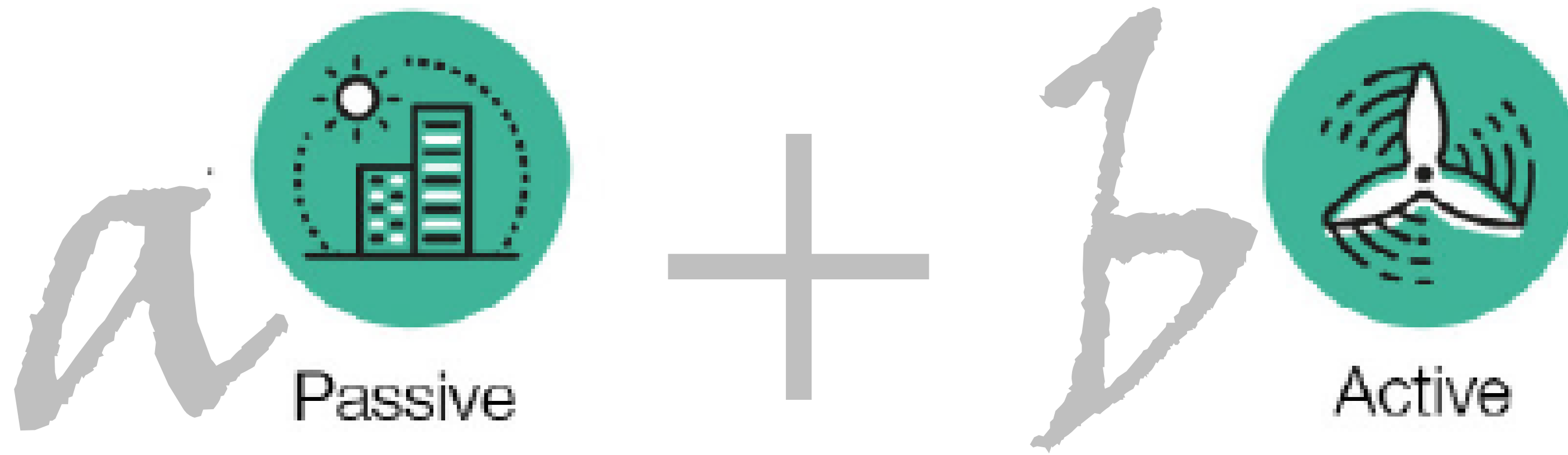
Any gov initiatives ?



2023 Budget

The government will improve the Green Technology Financing Scheme (GTFS) by increasing the guaranteed value to RM3 billion up to 2025.

Bank Negara Malaysia will also provide RM1 billion in soft loans under the High Technology and Green Facility to support innovative start-ups, as well as RM1 billion under the Low Carbon Transition Facility for small and medium enterprises (SMEs).



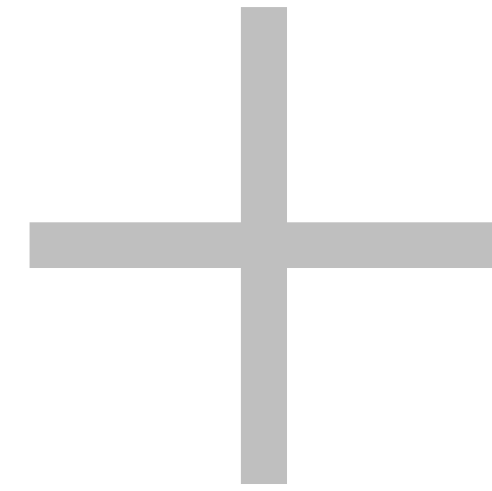
Green Investment Tax Allowance (ITA) for Project

For companies that undertake green technology projects for business purposes.

Qualifying Capital Expenditure (Green Cost) incurred **until 31 Dec 2023**.

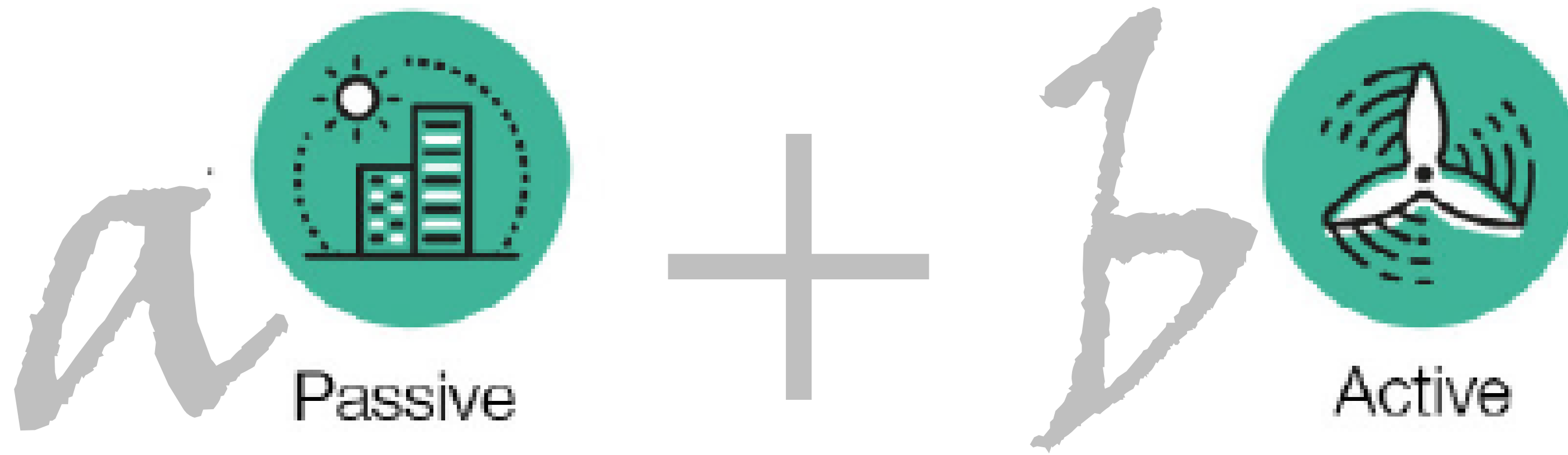
The allowance can be offset against **70%** of the statutory income in the year of assessment.

Unutilised allowances can be carried forward for **3 years**.



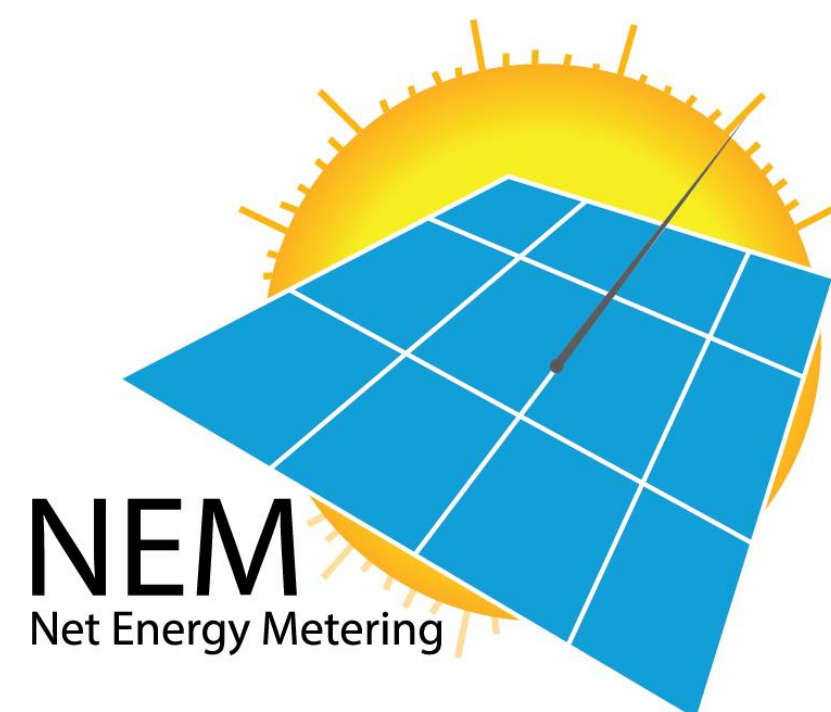
Green Investment Tax Allowance (ITA) for Project

Total Construction Cost	= RM 100,000,000
Qualifying Expenditure (Green Cost)	= RM 1,000,000 (1%)
Statutory Income 2021	= RM 1,000,000
Tax Allowance 2021 (70%)	= RM 700,000
Statutory Income 2022	= RM 1,000,000
Tax Allowance 2022	= RM 300,000



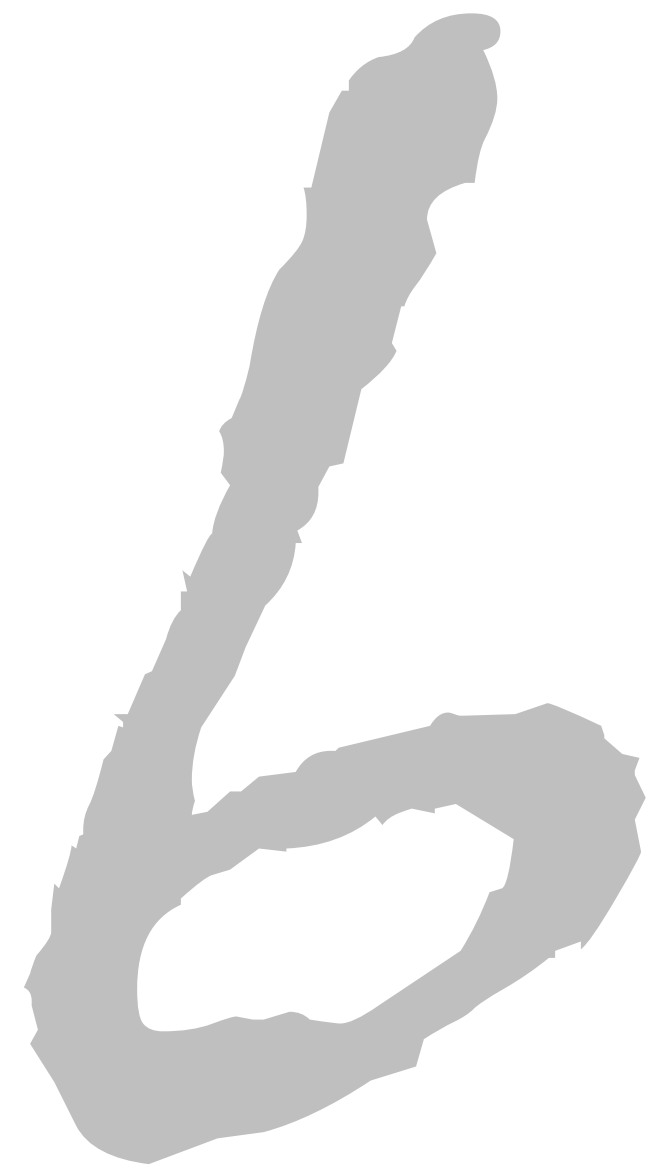
Local Authorities Incentives

- 1) Higher Plot Ratio / Density
- 2) Reduce Development Charges
- 3) Reduce Assessment Fee



NEM 3.0

	Rakyat Domestic	GoMEn Government Buildings	NOVA Commercial, Industrial, Agriculture and Mining Buildings
Quota Allocation	100 MW	100 MW	600 MW
Mechanism (Roll-over)	1:1 (12 Months)	1:1 (12 Months)	Average SMP (1 Month)
Offer Period	until 31 st Dec 2023	until 31 st Dec 2023	until 31 st Dec 2023
Offset Rate	Prevailing Gazetted Energy Rate	Prevailing Gazetted Energy Rate	Average System Marginal Price (SMP)
Offset Period	10 Years	10 Years	10 Years
Condition after 10 years	Self-Consumption (SelCo)	Self-Consumption (SelCo)	Self-Consumption (SelCo)
Capacity limit	Single Phase : 4kWac Three Phase : 10kWac	1 MWac	Nett offset : 1MWac Nett offset + Virtual aggregation : 5MWac
Eligibility	TNB registered consumer under domestic tariff	Government agencies under commercial tariff	Non-domestic account holder



Case Study :

Tzu Chi Jing Si Hall @ KL



静思堂

静思堂

DEWAN JING SI TZU-CHI KL

DEWAN JING SI TZU-CHI KL, 100, JALAN 2/107, WILAYAH PERSEKUTUAN, KUALA LUMPUR

100, JALAN 2/107



GOLD

100% TERSERBUK BILANGAN BANGUNAN
JENIS: BANGUNAN KAWAT
LOKASI: KUALA LUMPUR, MALAYSIA
KELOMPOK: KAWAT KUALA LUMPUR
KAWAT KUALA LUMPUR KAWAT KUALA LUMPUR
KAWAT KUALA LUMPUR KAWAT KUALA LUMPUR
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Sai Hye
MR. SAHABUDDIN
MANAGER
GREEN BUILDING INDEX (GRI) KUALA LUMPUR

DEWAN JING SI TZU-CHI KL, 100, JALAN 2/107, WILAYAH PERSEKUTUAN, KUALA LUMPUR
100, JALAN 2/107, WILAYAH PERSEKUTUAN, KUALA LUMPUR
100, JALAN 2/107, WILAYAH PERSEKUTUAN, KUALA LUMPUR
100, JALAN 2/107, WILAYAH PERSEKUTUAN, KUALA LUMPUR



Tzu Chi Jing Si Hall is located along Jalan Kepong, Kuala Lumpur.

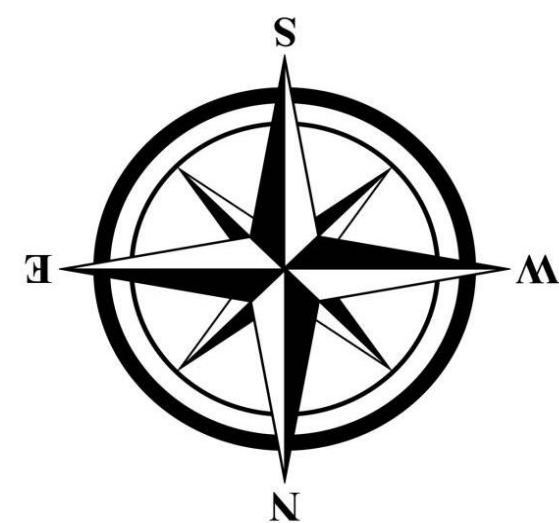
The building consists of 4 storey of institution building and 1 sub- basement car park.

The hall is designated to work on Tzu Chi's mission which are providing charity help on those who in needs, medical check and treatment, education to children and also exploring the humanistic culture.





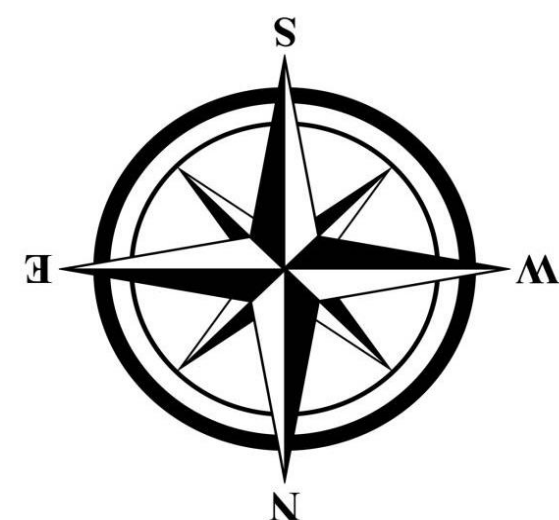
1. Orientation : North-South





2. Façade Design : OTTV = 48.56

- WWR = 16%
- Roof overhang and corridor as Shading Devices from East-West.





2. Façade Design : OTTV = 48.56

- WWR = 16%
- Roof overhang and corridor as Shading Devices from East-West.





3. Daylighting : 66.67%

Deep habitable spaces were daylit by skylight with 65% VLT





4. Natural Ventilation : 67.5%

- Triple volume atriums between blocks to promote natural stack ventilation.
- Louvers (with rain sensor) at the building perimeter to promote natural cross ventilation





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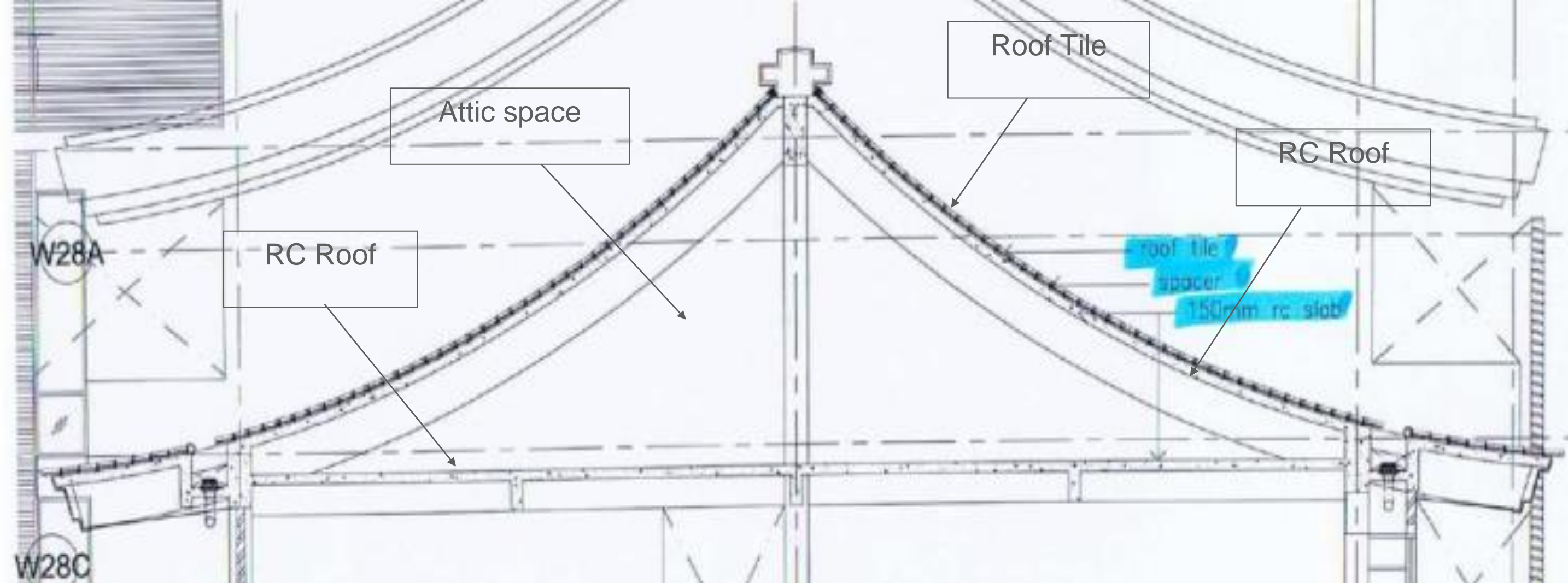
- Triple volume atriums between blocks to promote natural stack ventilation.
- Louvers at the building perimeter to promote natural cross ventilation





5. Thermal Insulation : RTTV =
24.46 W/m²

- Double Roof (Tiles on concrete)
- Skylight with low-e glass





6. Strategic Landscaping : 16.7%

- Central and Pocket Gardens



1. EE Lighting : Load = 5.89 W/m²

Office lux level = 185 lux

Task Light





1. Lighting Control : Motion and Light Sensor





5. AC Design : Zoning 78.16% (NV : 67.5%)

BEI = 49.21 kWm/m²/yr

6. AC System : Cooling Load = 86.52 W/m²

3 nos 200RT Chilled Water System

1 multiple compressor runs on weekdays with lower cooling load at efficiency of 0.7 kW/ton

2 chillers runs at average efficiency of 0.57 kW/ton and multi-compressor chiller at 0.7 kW/ton on weekends when there are community events.

CO₂ and CO Sensors



Active

5. AC Design

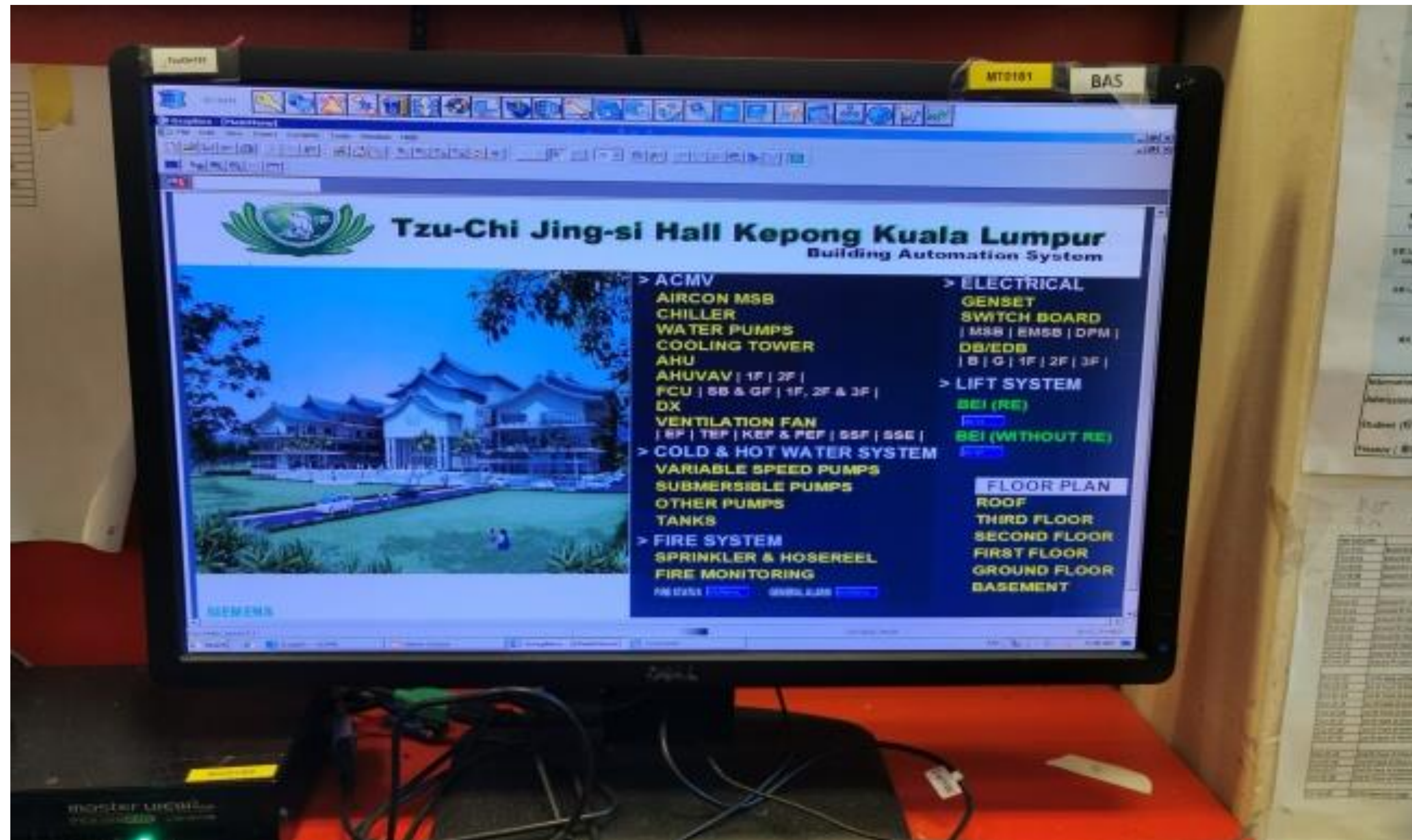
6. AC System





8. EMS : 1675 I/O Points

Realtime extraction of energy and water consumption to be analyzed for the improvements





2. Maintenance

Energy and water saving daily practices is ingrained among the management staff as Tzu Chi Foundation is a **humanitarian organization** which upholds sustainability as one of their core values.

For example, air conditioning is switched on only when the indoor temperature is above **28°C**. They also reduce reliance on artificial lighting as the building is abundantly naturally daylit.



1. Renewable Energy (Grid Connect)

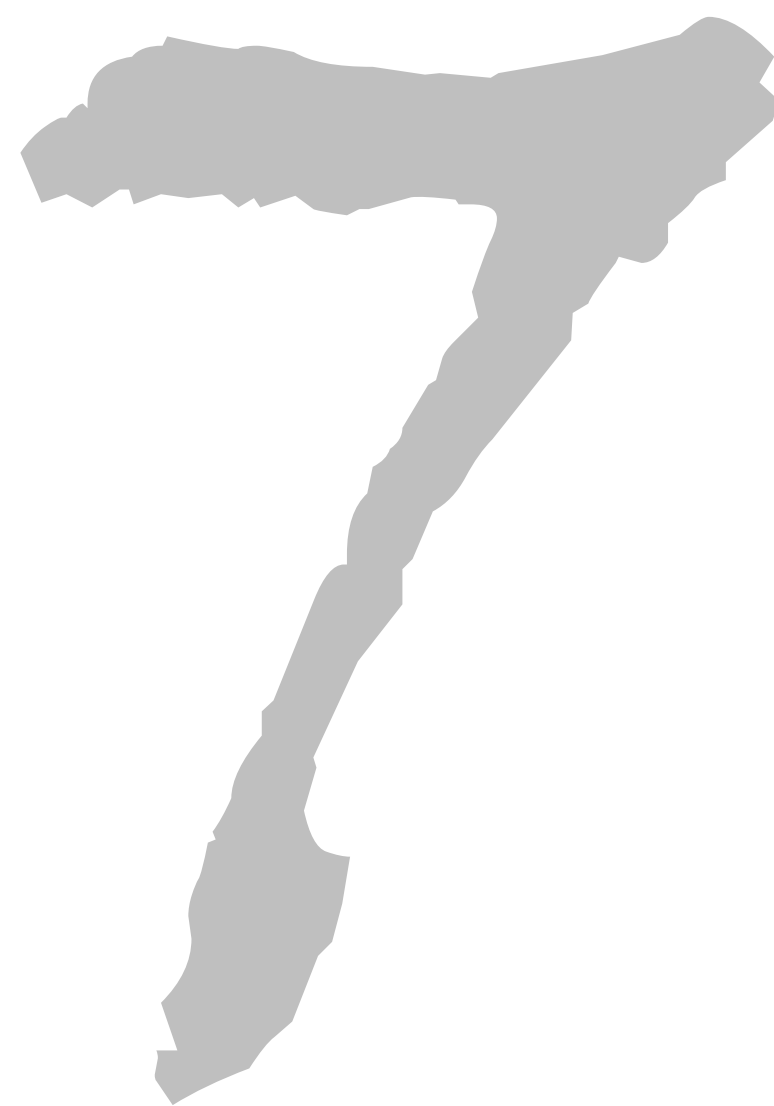
PV Capacity = 43.2kWp

Energy generated = 30,016 kWh

Percentage energy saved = 2.7%

If fully installed, BEI est 30.17
kWh/m²/yr (85% reduction from
baseline)





Malaysia carbon Score

carbonScore

Advancing Net Zero

CarbonScore is an malaysiaGBC initiative affiliated with the WorldGBC's global *Advancing Net Zero* programme, targeting total decarbonisation of the construction sector by 2050.



Towards Net Zero Carbon Buildings

- Operational Carbon from on-site energy consumption
- On-site Renewable Energy (Grid Connect)
- Off-site Renewable Energy (Off Grid) (with Renewable Energy Certificates)
- Embodied Carbon from construction materials / activities
- CO₂ emissions associated with the disposal of municipal solid waste as well as water supply and treatment



Towards Net Zero Carbon Buildings



CarbonScore is a scale of building-related CO₂ emissions from 0 to 100 where:

0 represents business-as-usual

100 is a zero carbon building

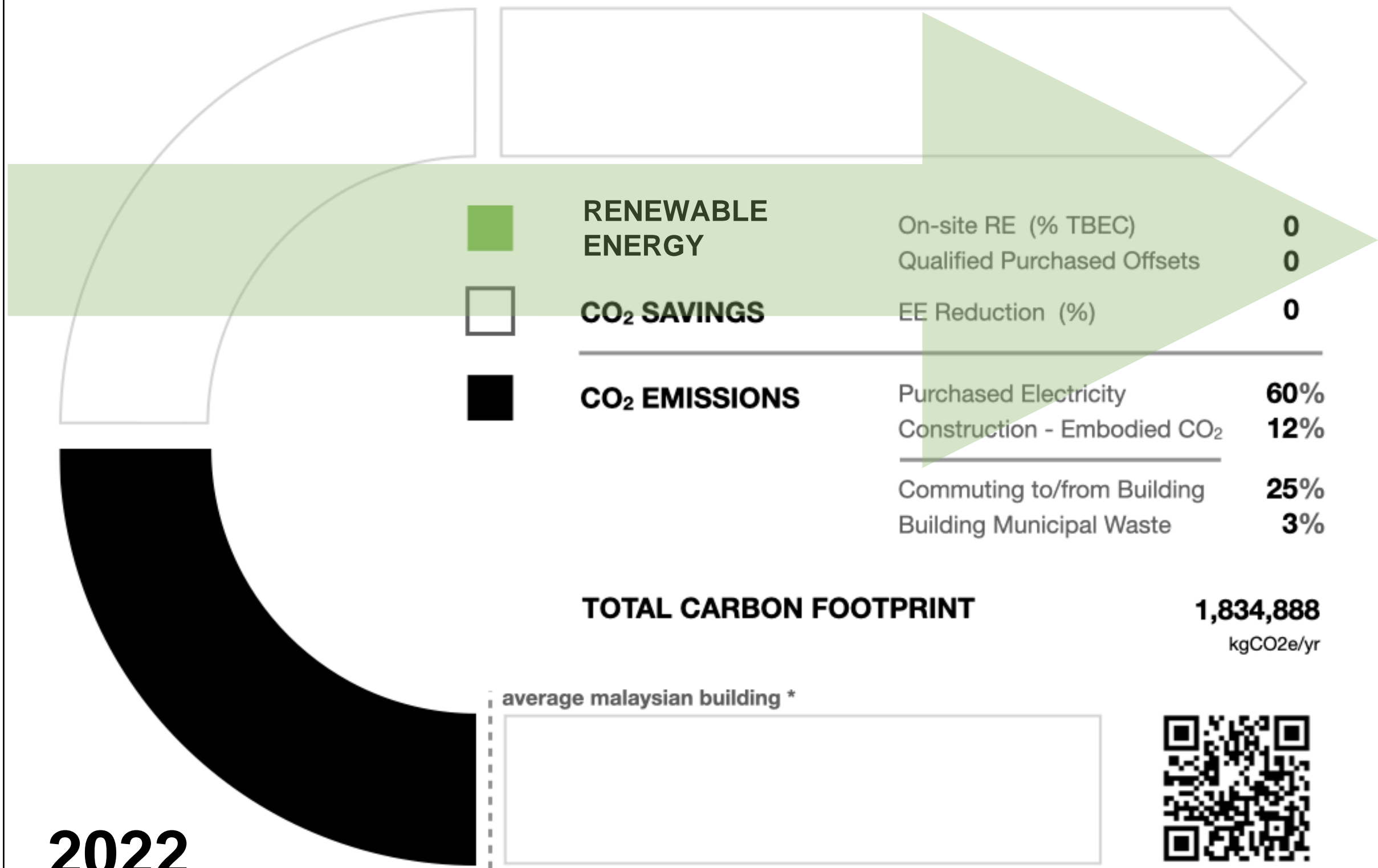
carb^{on}Score

0

Average Office Building

Malaysia

% towards Zero Carbon Building



2022



for more info

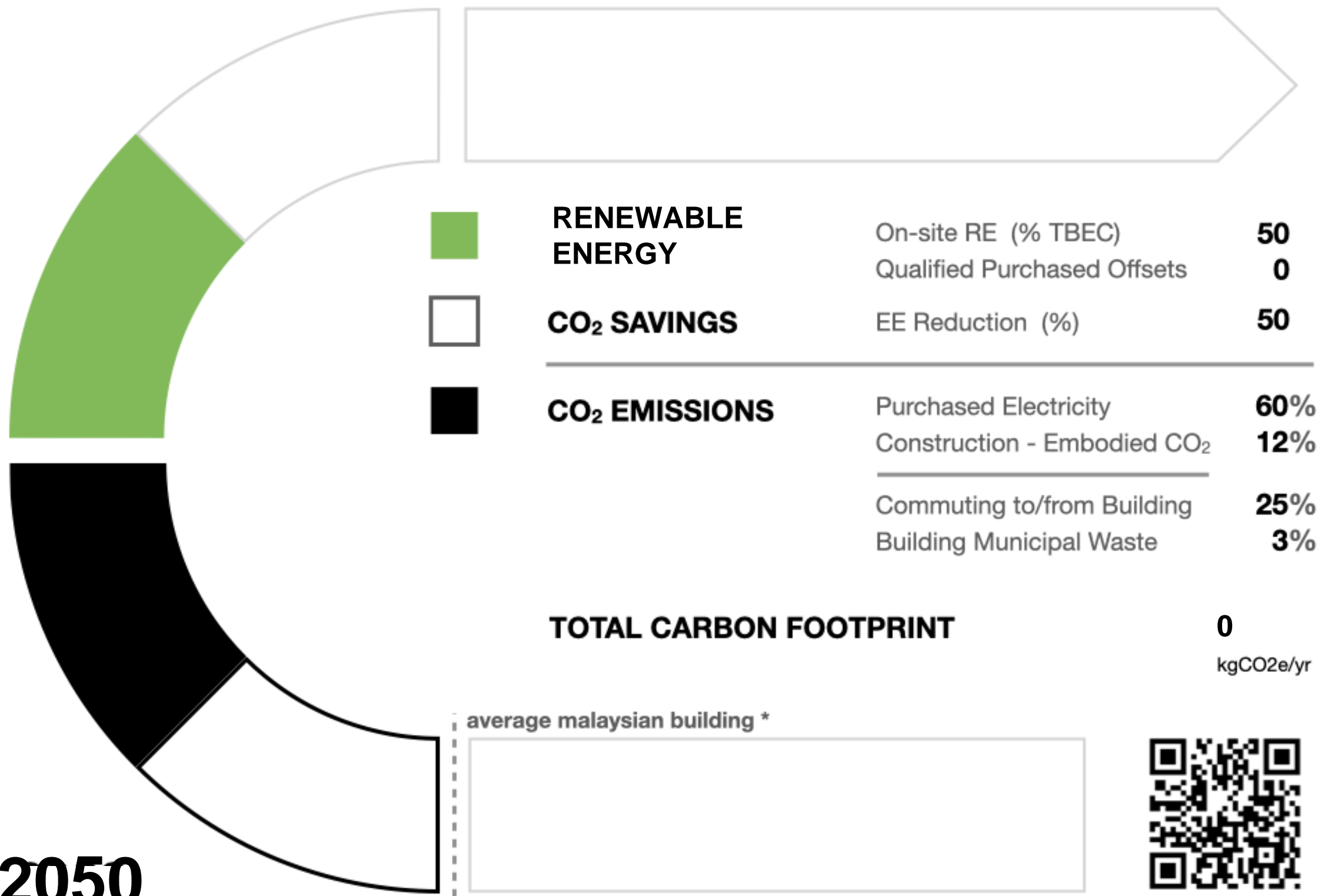
carb^{on}Score

100

Zero Carbon Building

Malaysia

% towards Zero Carbon Building



2050



for more info

carbonScore

Towards Net Zero Carbon Buildings



CarbonScore does not go below 0 (business-as-usual)

CarbonScore can go above 100 to represent a 'carbon positive' building that generates more power than it consumes

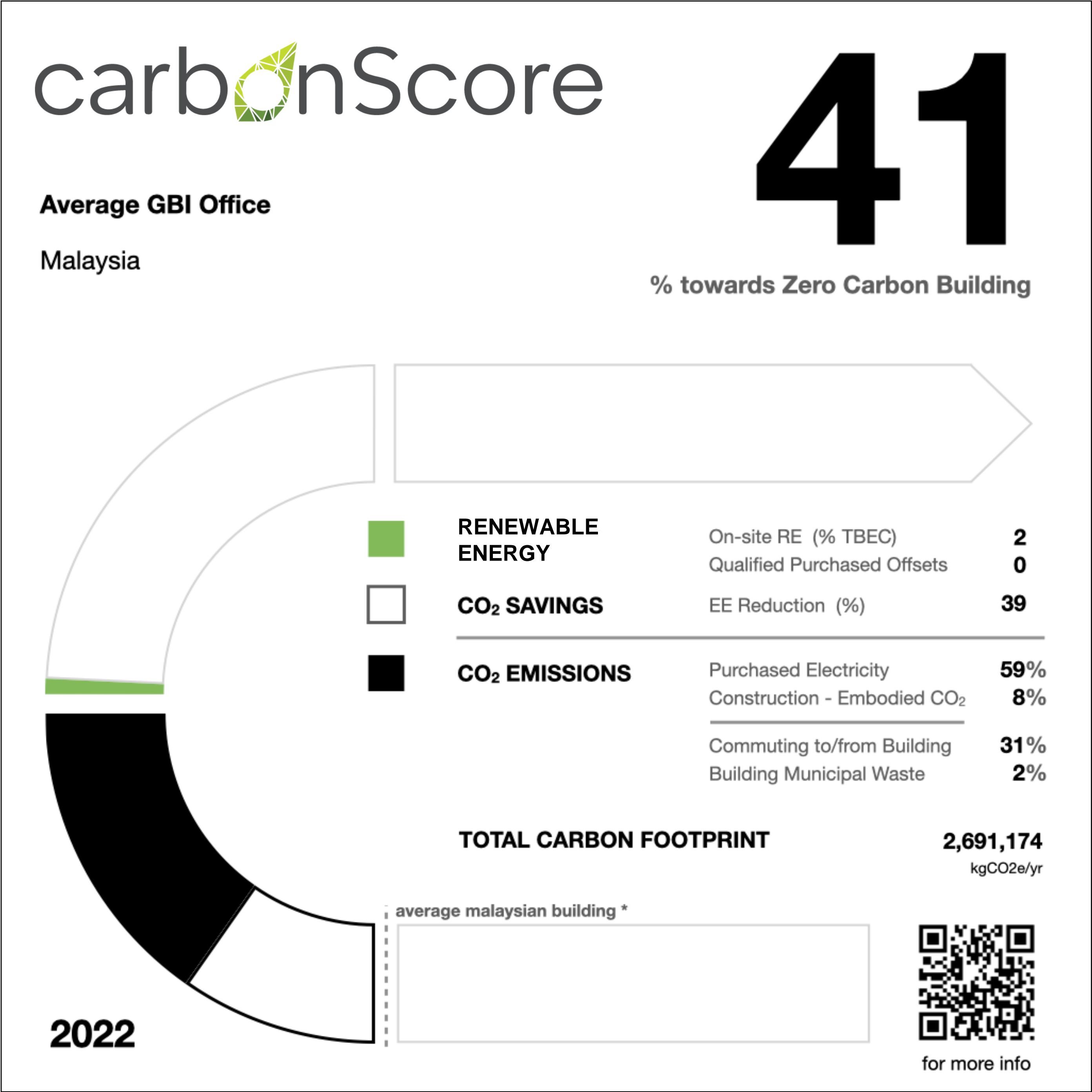
Case Study | 57 Green Buildings

Average Score:
41 %

Contribution from Energy
Efficiency: 39 %

Contribution from Renewable
Energy: 2 %

Average CO₂ Emissions
Reduction:
1,870,138 kgCO₂e/yr



IOI City Mall

Phase One

carbon
Score



IOI City Mall

Phase One



Project Location: **Putrajaya, Malaysia**

Project Size: **211,472** m²

Typology: **Retail Mall**

Constructed: **2014**

IOI City Mall

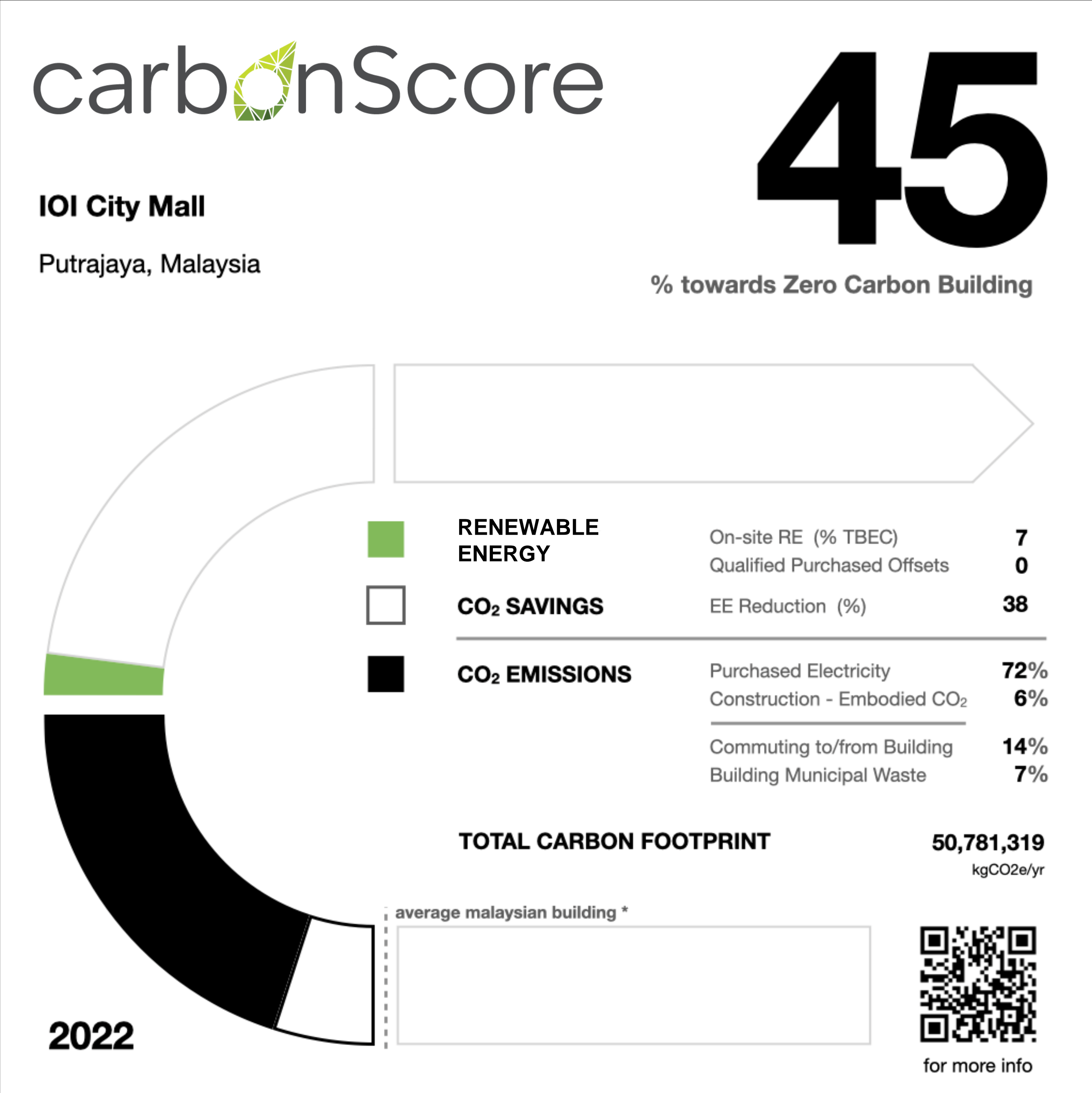
Phase One

CarbonScore: **45** % towards
zero carbon building

Contribution from Energy Efficiency:
84 %

Contribution from Renewable
Energy: **16** %

Average CO₂ Emissions Reduction:
41,548,352 kgCO₂e/yr



IOI City Mall

Phase One

Energy Efficiency

BEI: **286** kWh/m²/yr

Energy Savings: **38** %

compared to the MS1525 performance baseline for Malaysian high-intensity retail buildings



IOI City Mall

Phase One

Thermal Mass Storage

Accounts for: **50** % of cooling capacity

reduces peak demand &
Increases overall system
efficiency



IOI City Mall

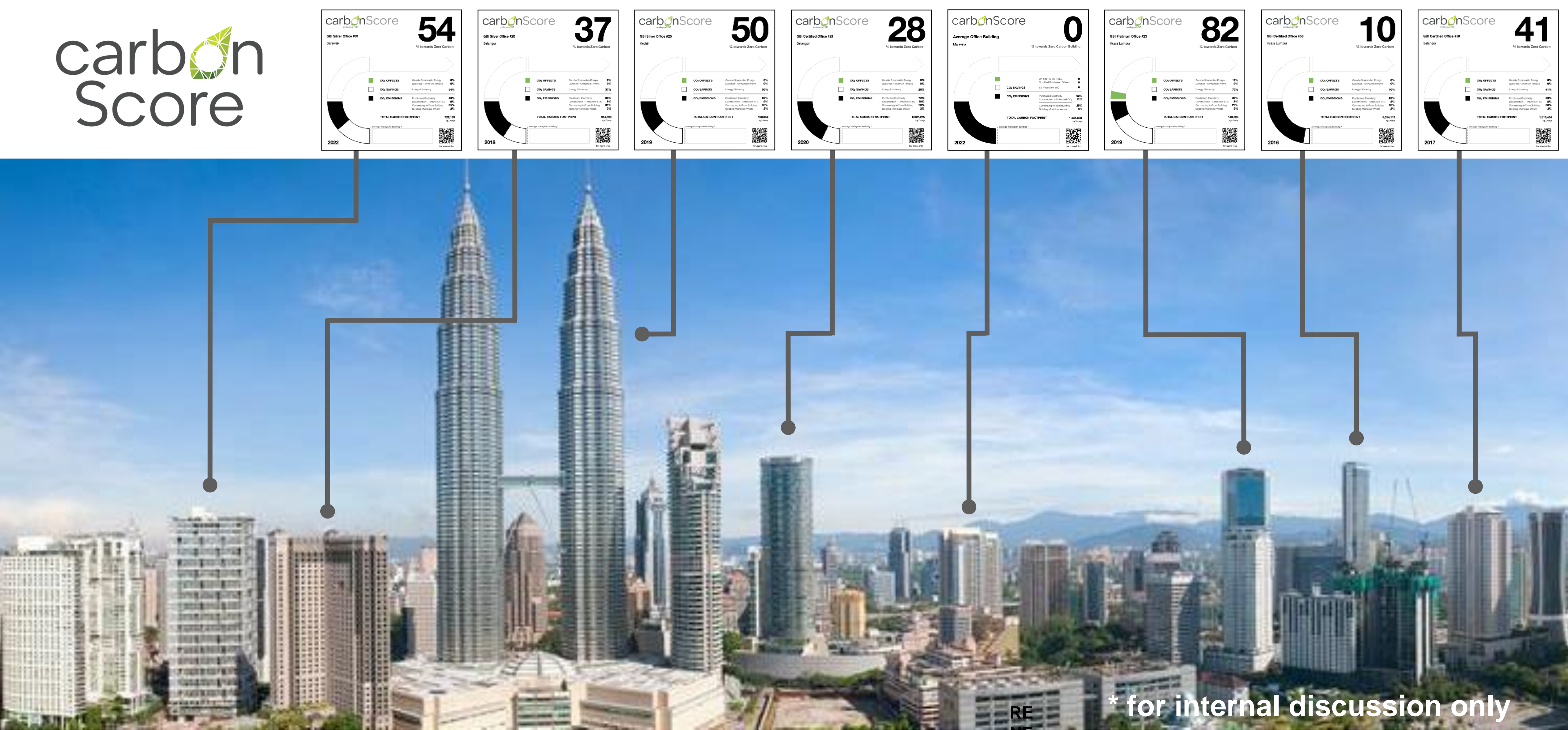
Phase One

Renewable Energy

Installed Capacity: **3,564** kWp

% of TBEC: **7.3** %





RECENTLY ABLISHED ENVIRONMENTAL IMPROVEMENTS

0 % towards Zero Carbon Building

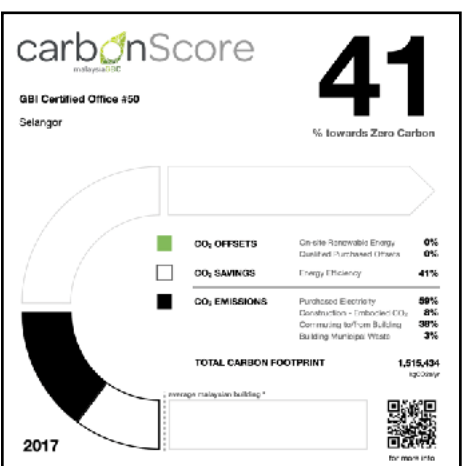
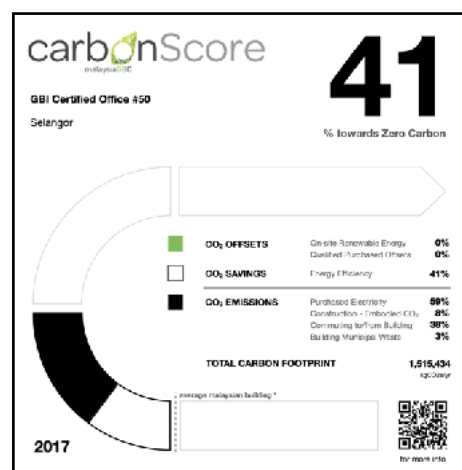
On-site RE (in TREES)	0
Qualified Purchased Offsets	0
EE Reduction (%)	0

Purchased Electricity	60%
Construction - Embedded CO ₂	12%
Commuting through Building Building Municipal Waste	25%
	3%

TOTAL CARBON FOOTPRINT

1,834,888 kgCO₂e

for more info



Thank you

Michael Ching

10 June 2023