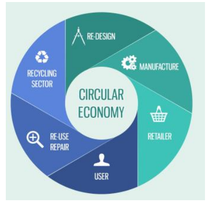
Insetting Net Zero Carbon in Construction Industry

Vichai Rairat
Sustainable Development Director
SCG Cement - Building Materials Business

CIRCULAR & DECARBONIZATIION IN THE CONSTRUCTION VALUE CHAIN



contractor consultant

- Waste Management
- Reduce cut on site
- Optimize Ordering
- Good Storage

End User Facility Manager Owner

Manufacturer

- Product with components of recycle materials.
- Easy disassembly and reassembly

Developer Architecture Consultant

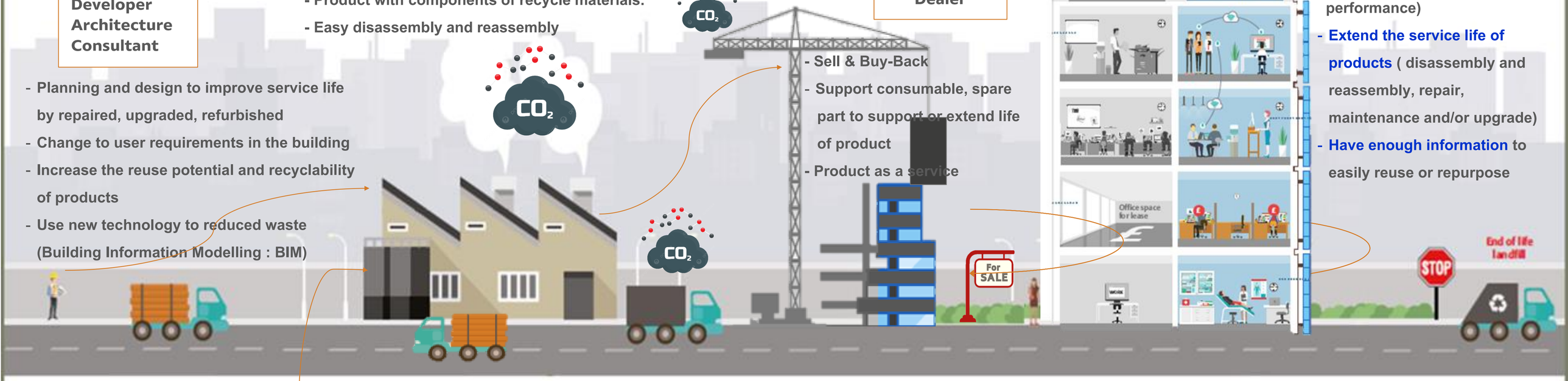
- Planning and design to improve service life by repaired, upgraded, refurbished
- Change to user requirements in the building
- Increase the reuse potential and recyclability of products
- Use new technology to reduced waste (Building Information Modelling : BIM)

Dealer

- Sell & Buy-Back
- Support consumable, spare part to support or extend life of product
- Product as a service

Maintain and improve

- **Sharing Platform** (Utilization and adaptable for different uses)
- **Product as a service** (Pay for performance)
- **Extend the service life of products** (disassembly and reassembly, repair, maintenance and/or upgrade)
- **Have enough information** to easily reuse or repurpose



Material Extraction

- Transforming waste into raw materials
- Recapture material suppliers

Recycles / Reuse banks

- Recover useful resource
- Digital platform to sell and purchase surplus material.

Logistic

- Take-Back systems and collection services

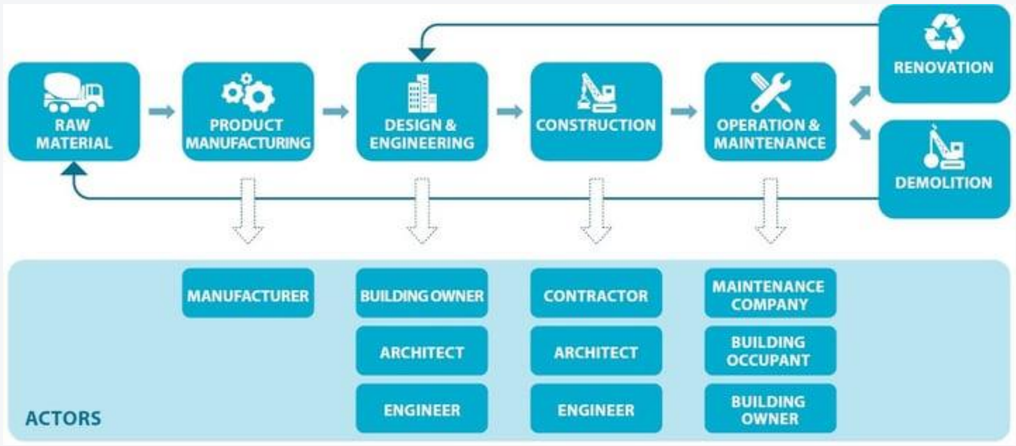
Embodied Carbon

Operational Carbon

Decarbonization within company's supply chain

CARBON INSETTING

What is it: Embedding carbon reduction initiatives within a company's supply chain.



How it works: Implement projects to reduce emissions within company operations, such as switching to renewable energy sources.

Benefits:

- Direct emissions reduction
- Enhances supply chain resilience
- Strengthens brand value

Circular Economy in Construction Industry

CIRCULAR ECONOMY IN CONSTRUCTION INDUSTRY

Group of collaboration to enhance construction industrial value chain to Green Low Carbon & Circular process

CECI Membership 38 Companies

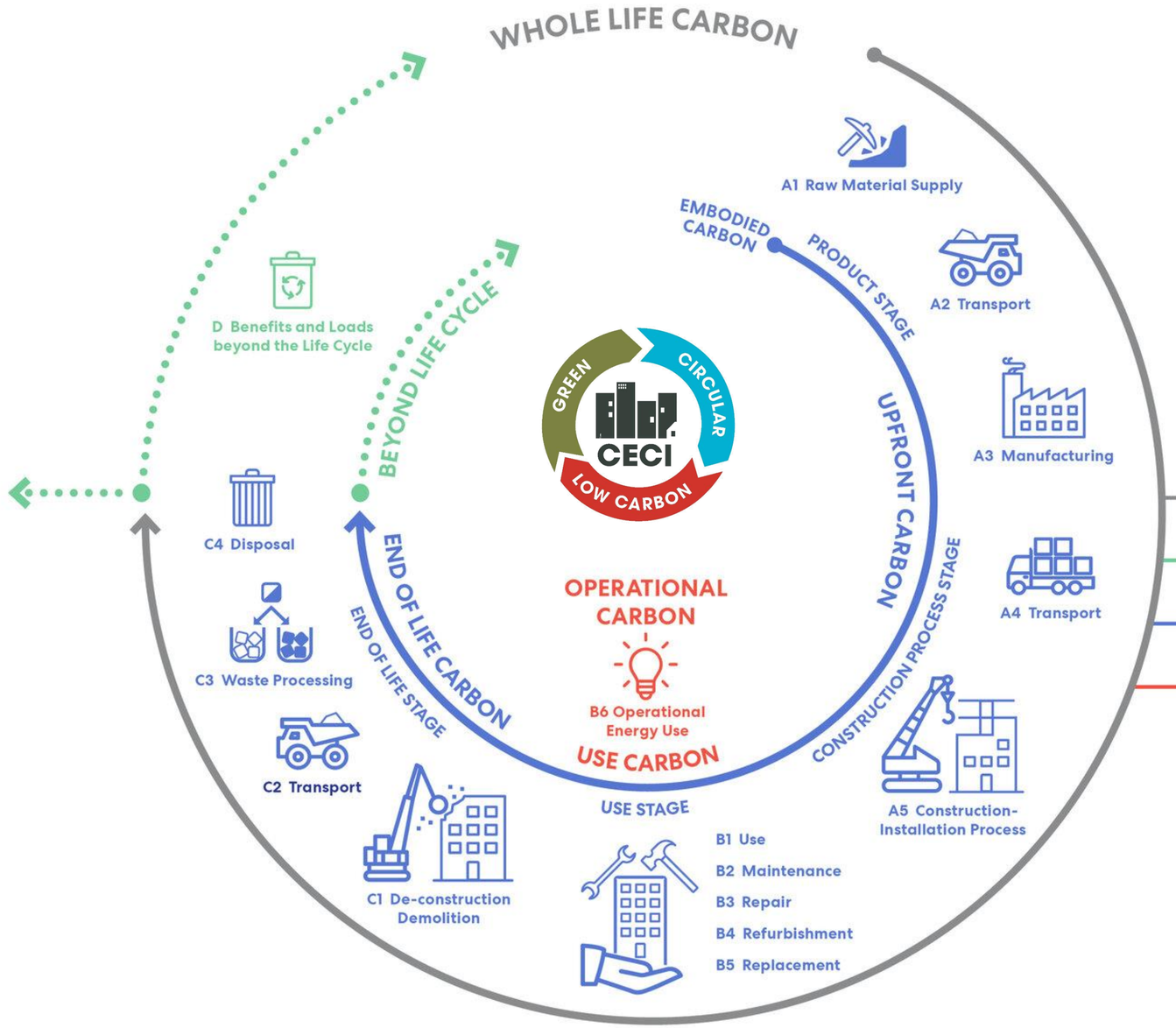
1. Architect / Consultant *(6)*


2. Developer/ Owner *(11)*

3. Contractor *(7)*


4. Supplier / Distributor *(9)*

5. Waste management *(5)*



Whole Life Carbon Reduction

CIRCULAR DESIGN

EMBODIED CARBON

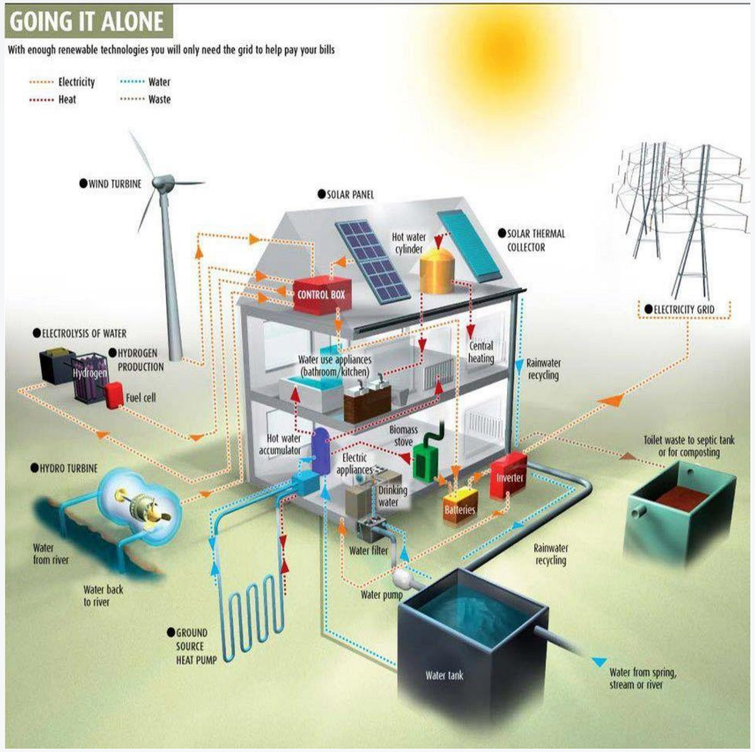
OPERATIONAL CARBON

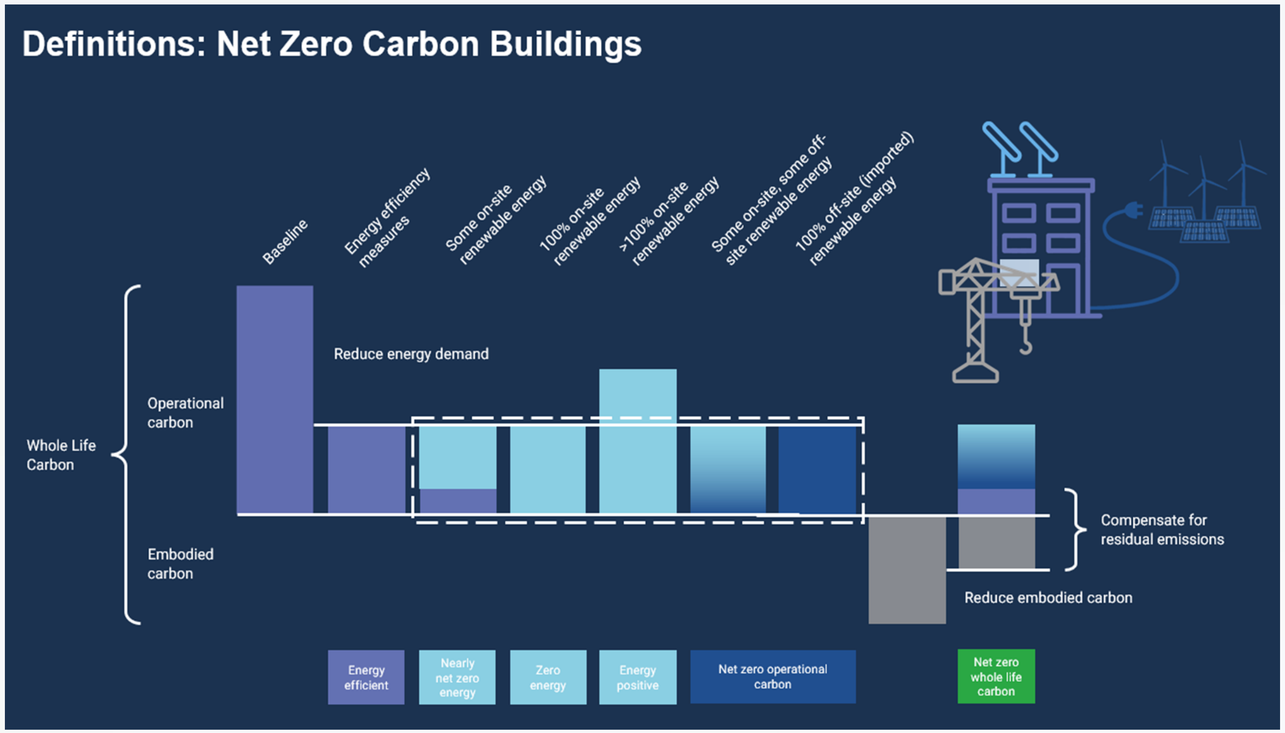
ACTIONS FOR DESIGN:

1. REUSE RESOURCES OPTIMIZE DESIGN TO REDUCE EMISSIONS

2. PRODUCE ENERGY & MATERIALS WITH RENEWABLE RESOURCES

3. SEQUESTER, CAPTURE & STORE CARBON IN LONG-TERM SINKS





Whole Life Carbon Reduction

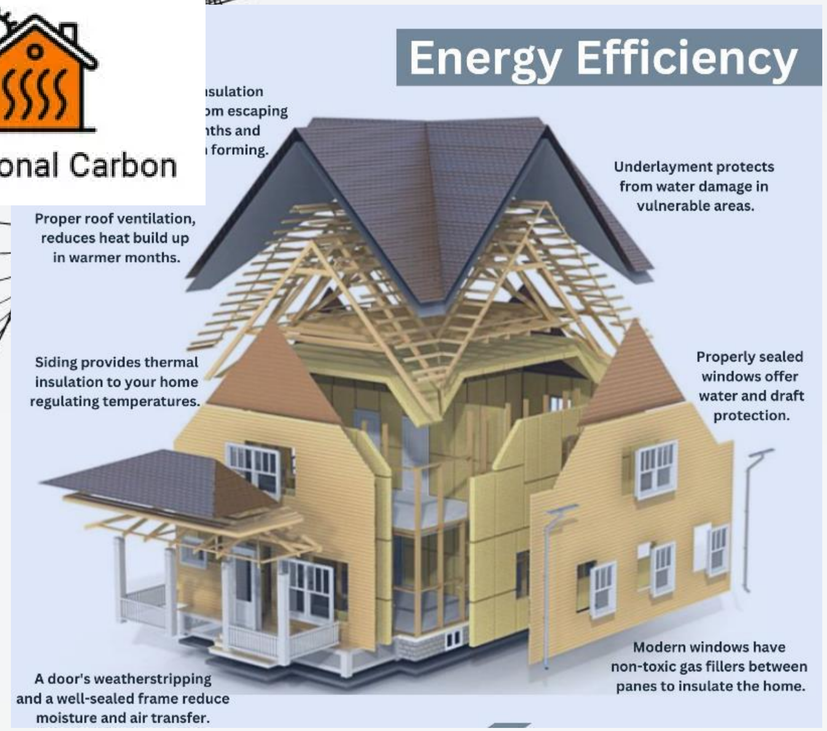
OPERATIONAL CARBON

28% จาก Operation Carbon
(คาร์บอนที่เกิดจากการใช้พลังงานภายในอาคาร)

EMBODIED CARBON OF MATERIALS

11% จาก Embodied Carbon
(คาร์บอนแฝงที่วัดค่าคาร์บอนตลอดวัฏจักรชีวิตของผลิตภัณฑ์นั้นๆ)

Operational Carbon



THAILAND ENERGY EFFICIENCY PLAN

กรมพัฒนาพลังงานทดแทนและอนุรักษ์พลังงาน กระทรวงพลังงาน

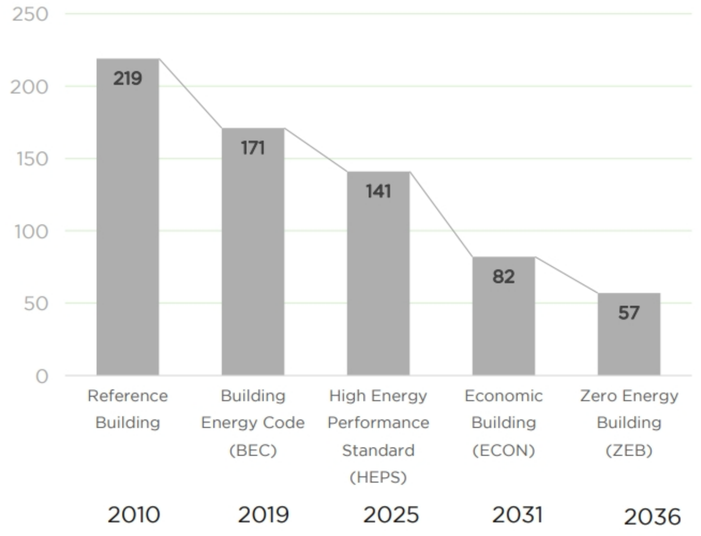
Energy Efficiency Buildings

Table -3.2 Net Energy Consumption Derived from Modeling each building type under each level of Energy Saving Capability

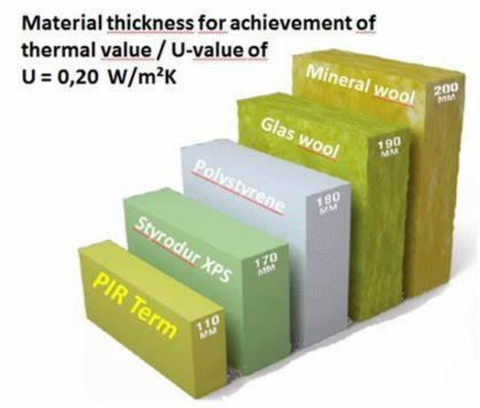
ยกระดับเกณฑ์ทุก 6 ปี

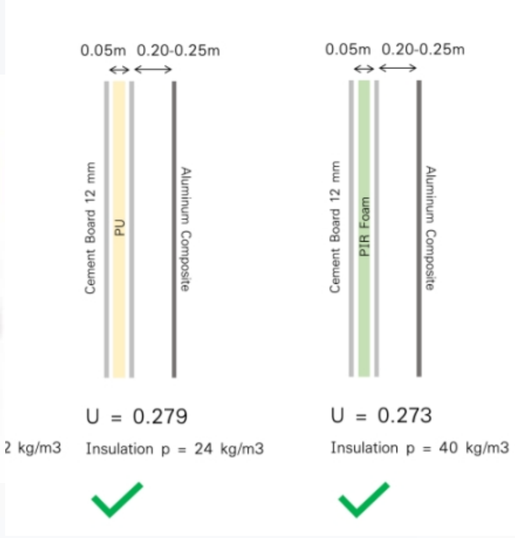
Building Type	Energy Consumption under Each Level of Energy Saving Capability (kWh/m²/y)				
	Reference	BEC	HEPS	Econ	ZEB
Office building	219	171	141	82	57
Department store	308	231	194	146	112
Retail & wholesale business facility	370	298	266	161	126
Hotel	271	199	160	116	97
Condominium	256	211	198	132	95
Medical center	244	195	168	115	81
Educational institution	102	85	72	58	39
Other general buildings	182	134	110	66	53
% Saving		~ 20-25%	~ 30-35%	~ 60-65%	~ > 70%
		ปี 2562	ปี 2568	ปี 2574	

Energy Use Intensity **(Office)**
(kWh/m²/year)



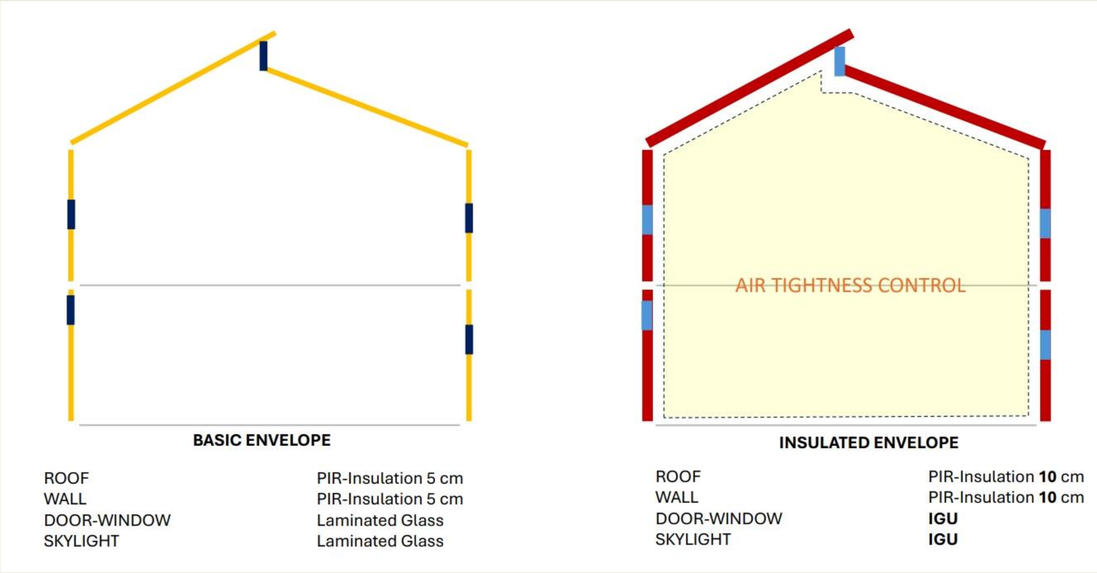
Low Energy Materials





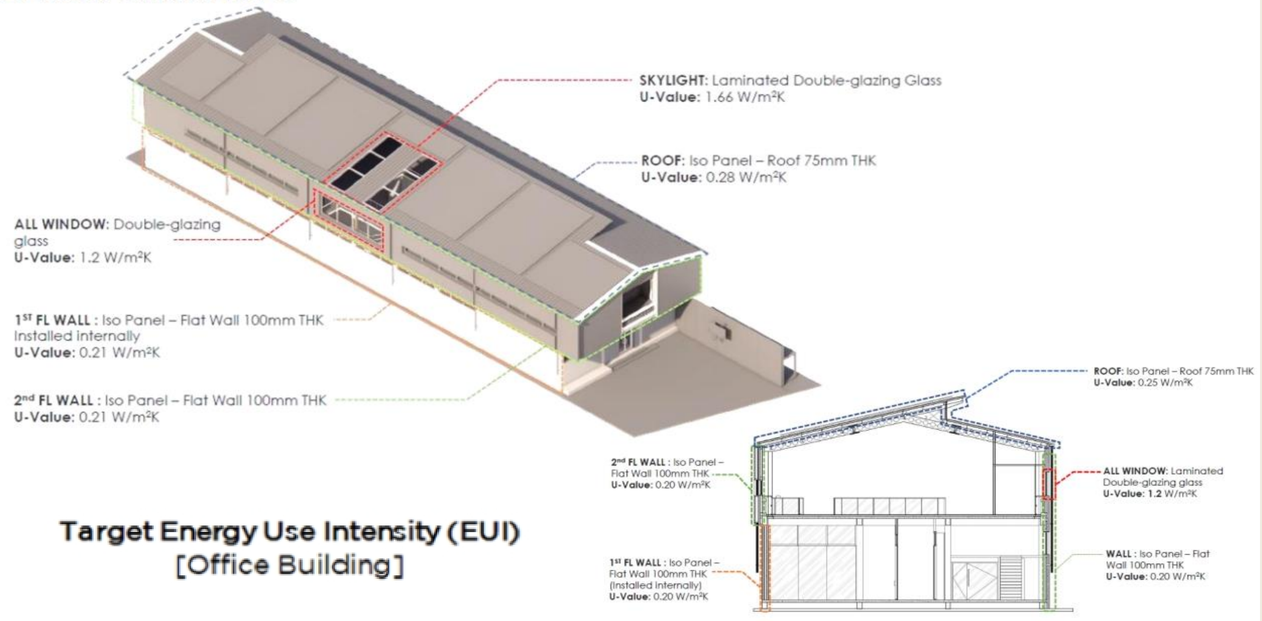
Building renovation to align net zero

Reuse materials. Whenever possible, look to salvage materials like brick, metals, broken concrete, or wood. Salvaged materials typically have a much lower embodied carbon footprint than newly manufactured materials, since the carbon to manufacture them has already been spent.

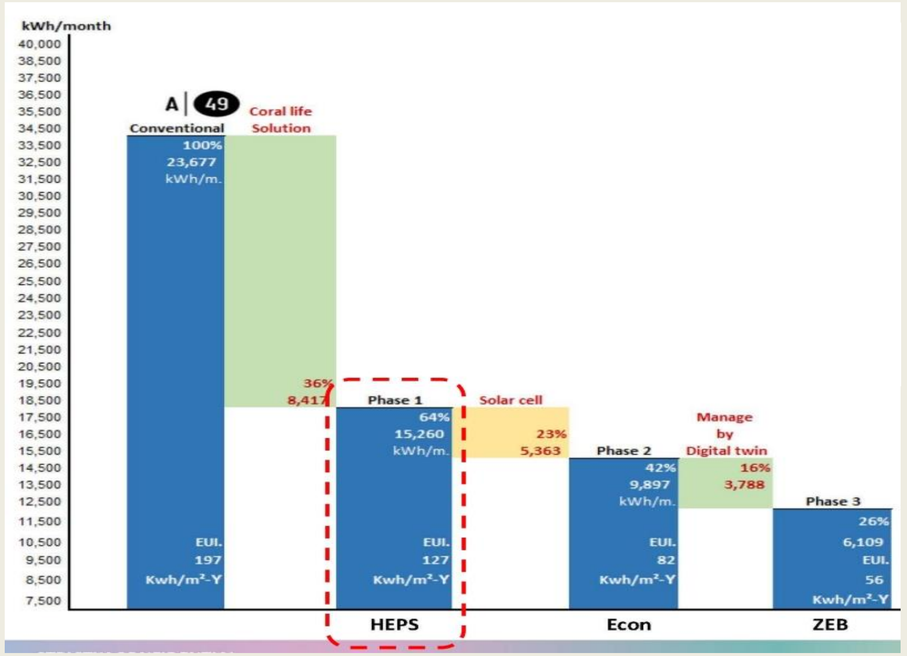


Building renovation to align net zero

DESIGN STRATEGIES

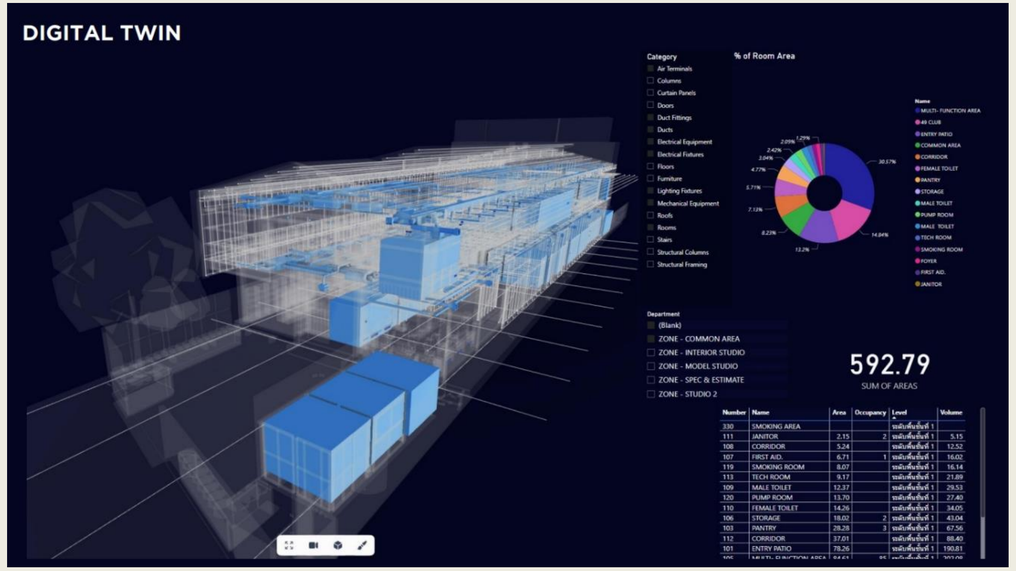


Target Energy Use Intensity (EUI)
[Office Building]

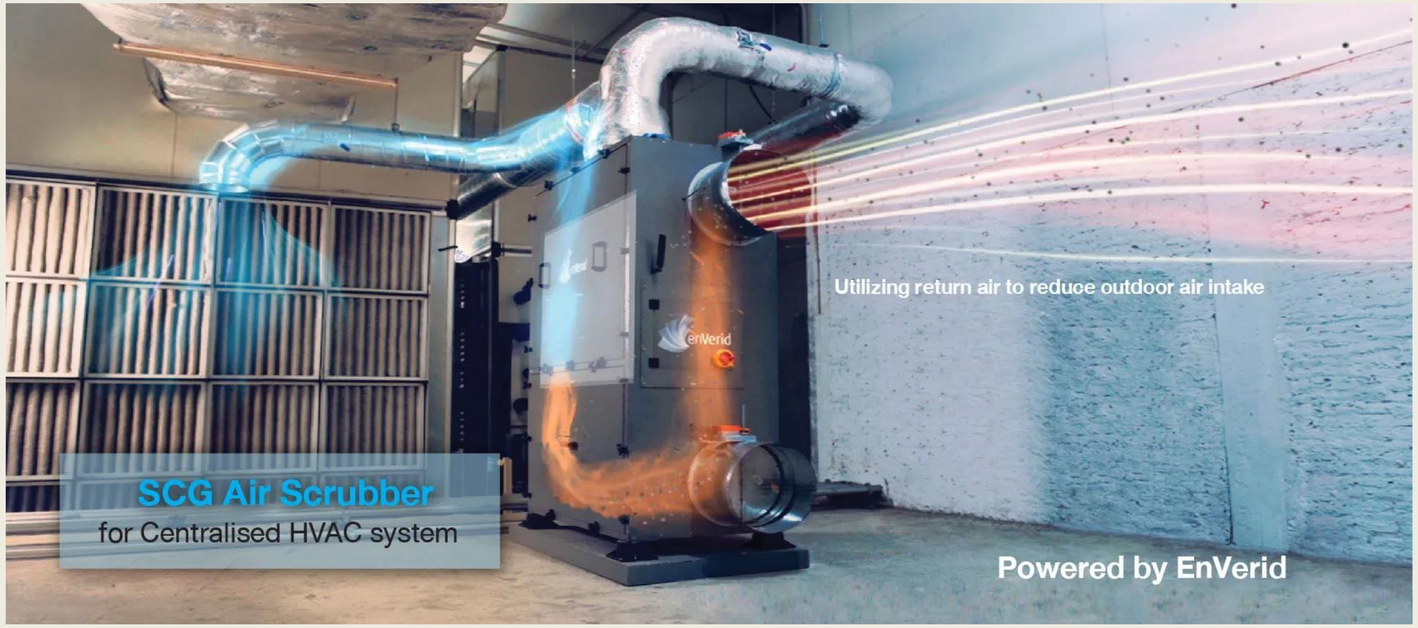


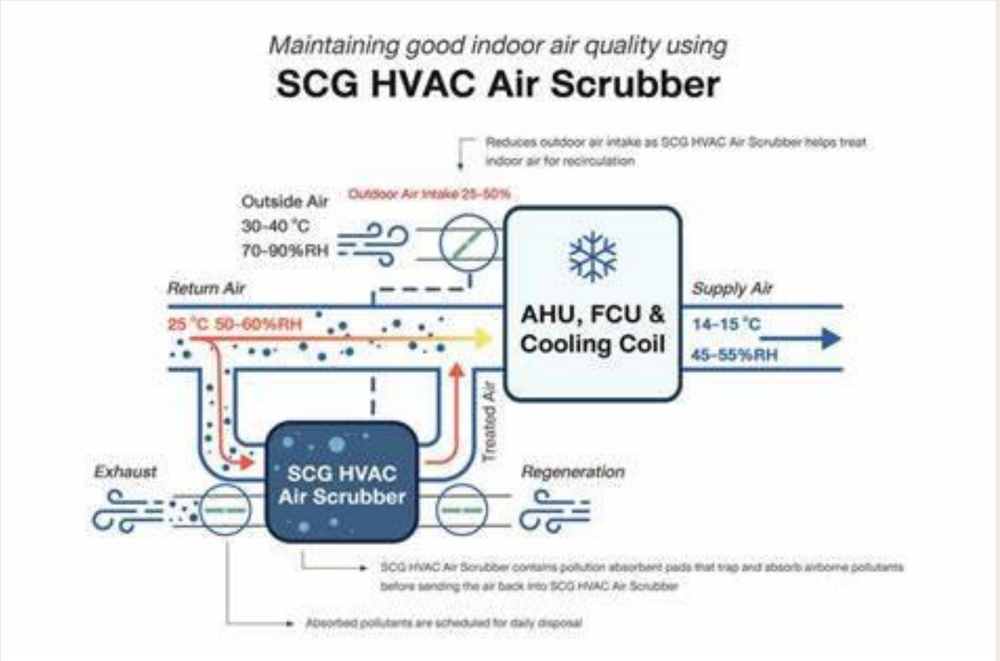
DESIGN

DIGITAL TWIN



Operational carbon



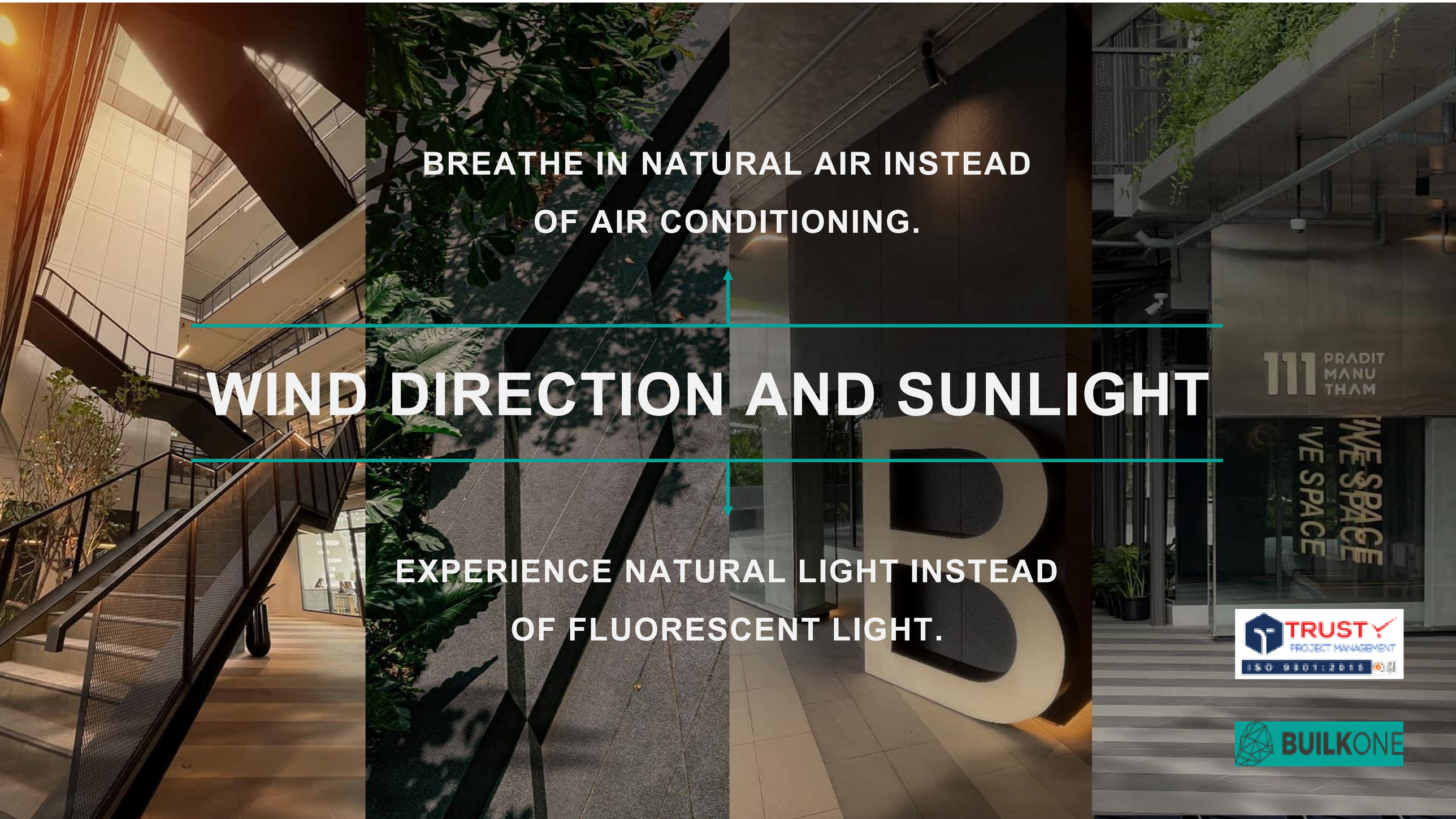


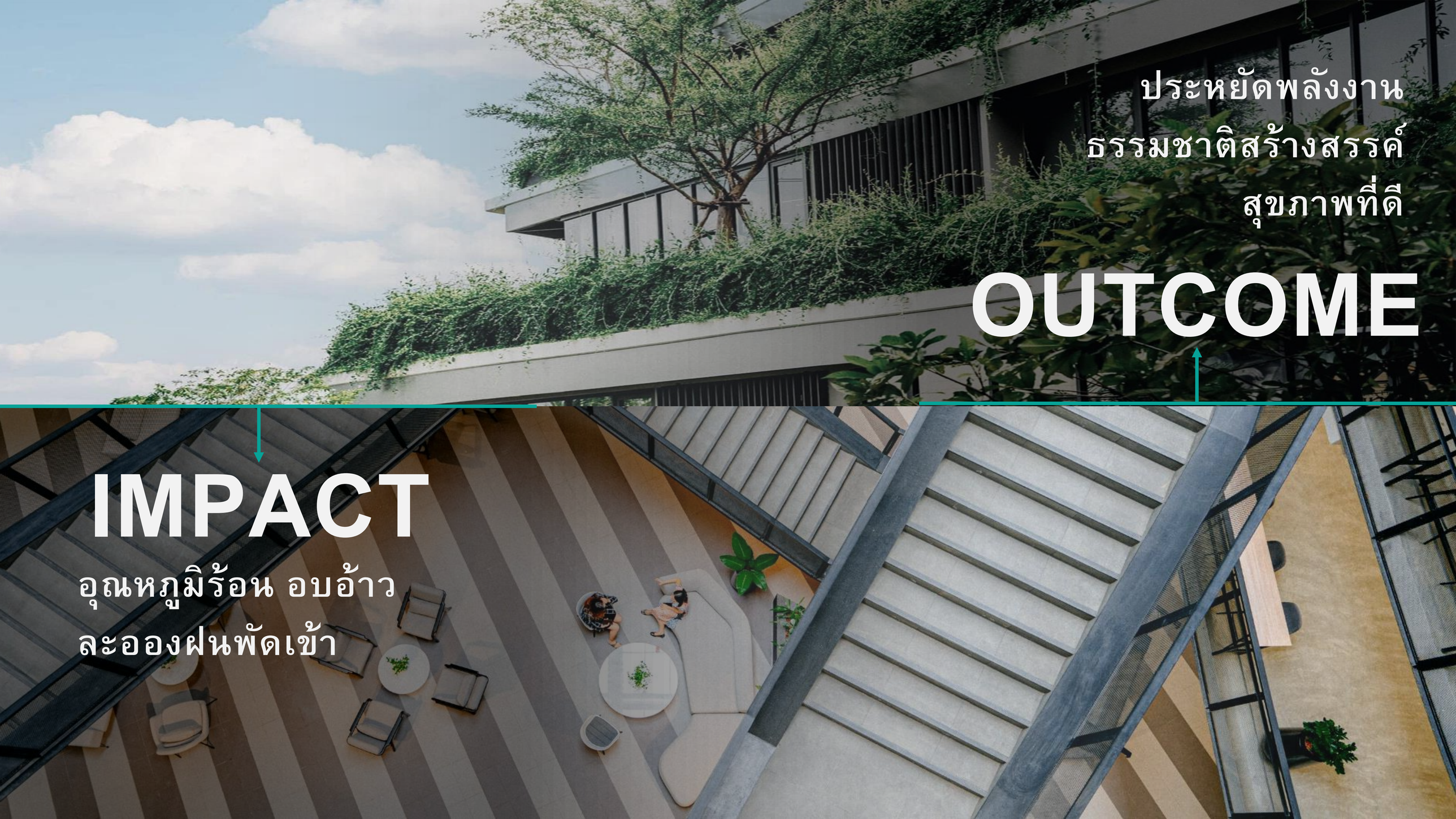
SCG

Reducing Outdoor Air Intake

save energy by 20-30% compared to conventional building air conditioning systems

- 45,790 sq.m Department store
- Occupancy is 40-75% from designed density
- Reducing OA 26% after using Air Scrubber (Sorbent Ventilation)
- CO2 ≤ 800 ppm, while other contaminants are within standard.
- Saving energy 0.74 Million kWh/year


BREATHE IN NATURAL AIR INSTEAD
OF AIR CONDITIONING.
WIND DIRECTION AND SUNLIGHT
EXPERIENCE NATURAL LIGHT INSTEAD
OF FLUORESCENT LIGHT.
111 PRADIT MANU THAM
TRUST
PROJECT MANAGEMENT
ISO 9001:2015
BUILKONE



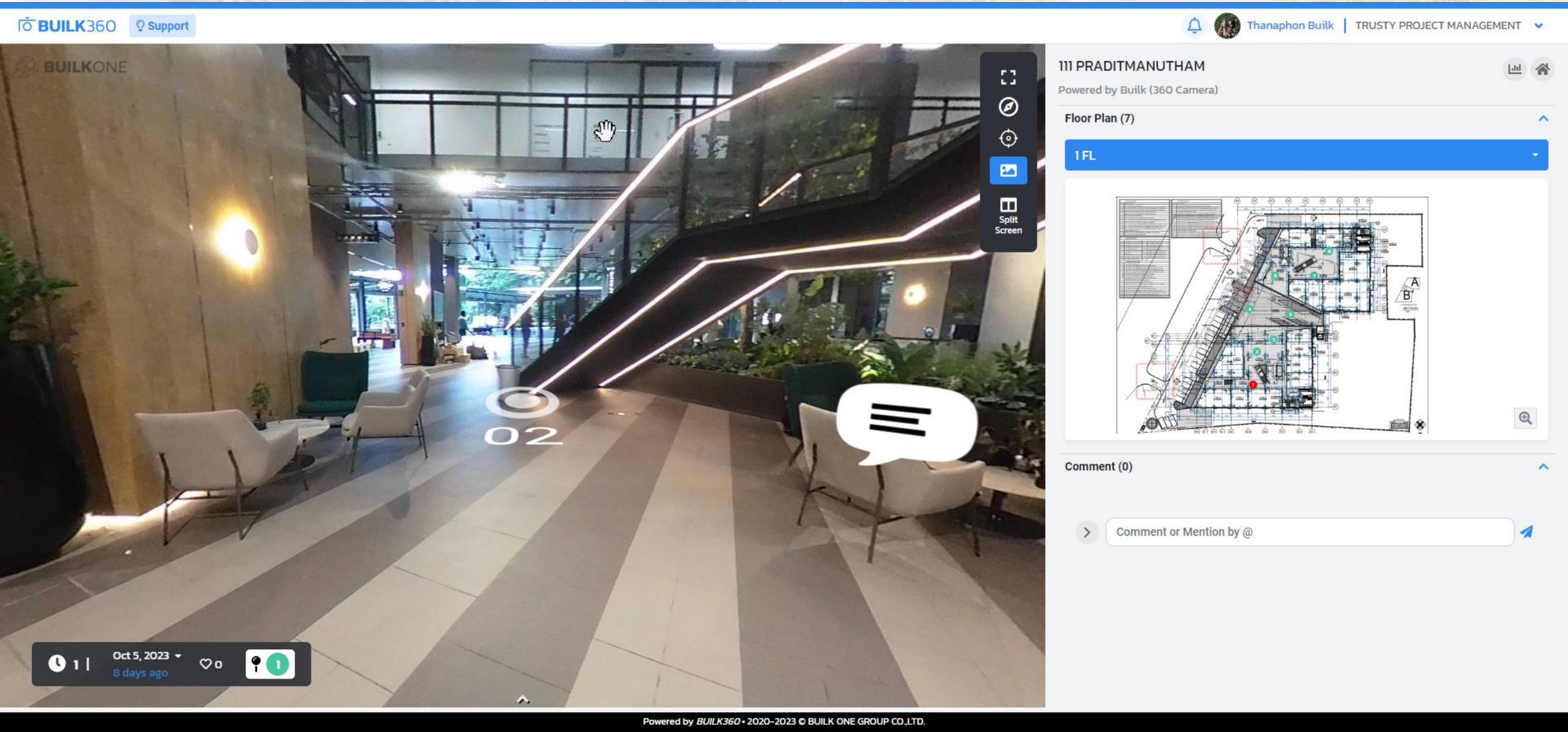
ประหยัดพลังงาน
ธรรมชาติสร้างสรรค์
สุขภาพที่ดี

OUTCOME

IMPACT

อุณหภูมิร้อน อบอ้าว
ละอองฝนพัดเข้า

Virtual tour current situation with feel like data.



Collecting Data

Zone	Floor	3 PM 2.5	10.00AM Temp C	Air flow	Hu	feel like	diff
External		3	30.5	2.20	69%	36.41	
B	1	3	30.4	0.00	68%	36.11	-0.30
B		3	29.8	0.25	63%	34.32	-2.09
B		3	30.1	0.20	69%	35.64	-0.76
C		3	31.7	0.15	75%	39.12	2.72
C		2	30.0	1.40	66%	34.23	-2.18
A		3	30.2	0.30	68%	35.59	-0.82
A		3	30.2	0.42	70%	35.79	-0.62
A		4	30.0	0.13	66%	35.12	-1.29
B	2	2	30.2	0.02	73%	36.49	0.08
B		2	30.2	0.02	72%	36.35	-0.06
B		2	30.2	0.02	73%	36.49	0.08
B		2	30.2	0.02	73%	36.49	0.08
B		2	30.2	0.02	73%	36.49	0.08
C		2	30.6	1.50	65%	34.94	-1.47
A		2	30.5	0.03	72%	36.82	0.41
A		2	30.5	0.03	71%	36.67	0.27
A		2	30.5	0.03	72%	36.82	0.41
A	3	2	30.3	0.15	74%	36.70	0.29
A		2	30.3	0.15	73%	36.56	0.15
A		2	30.3	0.15	74%	36.70	0.29
A		2	30.3	0.15	74%	36.70	0.29
B		3	30.2	0.00	75%	36.79	0.38
B		3	30.2	0.00	74%	36.65	0.24
B		3	30.2	0.00	75%	36.79	0.38

Zone	Floor	3 PM 2.5	10.00AM Temp C	Air flow	Hu	feel like	diff
A	4	3	30.4	0.00	72%	36.68	0.27
A		3	30.4	0.00	71%	36.54	0.13
A		3	30.4	0.00	72%	36.68	0.27
C		4	30.7	1.20	60%	34.57	-1.83
B		3	30.2	0.00	73%	36.50	0.10
B		3	30.2	0.00	73%	36.50	0.10
B		3	30.2	0.00	71%	36.22	-0.19
B		3	30.2	0.00	73%	36.50	0.10
B	5	3	30.3	0.03	73%	36.64	0.23
B		3	30.3	0.03	71%	36.36	-0.05
B		3	30.3	0.03	73%	36.64	0.23
B		3	30.3	0.03	73%	36.64	0.23
A		4	30.7	0.72	68%	36.07	-0.34
A		4	30.7	0.72	68%	36.07	-0.34
A		4	30.7	0.72	68%	36.07	-0.34
B	6	2	30.5	1.70	66%	34.79	-1.62
B		2	30.5	1.70	66%	34.79	-1.62
A		3	30.9	1.60	64%	35.18	-1.23
A		3	30.9	1.60	64%	35.18	-1.23
A		3	30.9	1.60	64%	35.18	-1.23
Parking						36.53	0.12

Electricity comparison at 111 Praditmanutham

Building A	Area (sq.m)	Electricity Cost per mo. (THB)		Diff.
		Actual	Calculated	
FL1	682	7,009.48	27,624.00	20,614.52
FL2	513	5,272.52	22,880.00	17,607.48
FL3	513	5,272.52	22,880.00	17,607.48
FL4	513	5,272.52	22,880.00	17,607.48
FL5	513	5,272.52	22,880.00	17,607.48
FL6	276	2,836.68	13,440.00	10,603.32
		Saving cost per month		**101,647.75**

Building B	Area (sq.m)	Electricity Cost per mo. (THB)		Diff.
		Actual	Calculated	
FL1	573.5	5,423.80	22,880.00	17,456.20
FL2	434.7	4,111.12	18,144.00	14,032.88
FL3	434.7	4,111.12	18,144.00	14,032.88
FL4	434.7	4,111.12	18,144.00	14,032.88
FL5	434.7	4,111.12	18,144.00	14,032.88
FL6	276	2,610.23	13,440.00	10,829.77
		Saving cost per month		**84,417.50**

Assumption

- Compare between current situation and calculated method.
- Control variables are temperature (30°C) , operate 8hr. per day in same light situation.
- Collect sample data from 5 OCT and 12 OCT on 9.00AM – 12.00 AM.
- Calculated feel like temperature by dry temperature , wind speed and humidity.
- Electricity cost calculated by adjusting the common area in each floor.

Construction Materials for Net-Zero Buildings

Embodied Carbon

Low Carbon Materials

RENEWABLE MATERIALS

Use **recyclable** and **recycled** materials

207.16 TONS

Foundation
CONCRETE | AVERAGE REBAR | XPS INSULATION

Exterior
CEMENT BRICK | VINYL WINDOWS | CLAY TILES

Insulation
XPS | SPRAY FOAM

Framing
WOOD | STEEL FRAMING

Interior
METAL STUDS | DRYWALL
MGO BOARD CEILINGS | TILE | CARPET

Roofing
CLAY TILES | STEEL JOISTS

109.92 TONS

Foundation
CONCRETE | AVERAGE REBAR

Exterior
VINYL SIDING | VINYL WINDOWS

Insulation
EPS | Mineral Wool

Framing
WOOD

Interior
DRYWALL WALLS & CEILINGS | OSB SUBFLOOR
VINYL TILE | ENGINEERED WOODS

Roofing
ASHPHALT ROOF, WOOD JOISTS

-10.23 TONS

Foundation
SLAG CONCRETE | BEST REBAR

Exterior
FSC SOFTWOOD SIDING | WOOD/ALUMINUM WINDOWS

Insulation
CELLULOSE | FIBRE BOARD

Framing
Wood

Interior
5/8 DRYWALL WALL | FSC WOOD CEILINGS
PLYWOOD SUBFLOOR | FSC HARDWOOD FLOORING

Roofing
STEEL ROOF | WOOD JOISTS

- ❑ Use Low Carbon Materials
- ❑ Circular design
- ❑ Product Decarbonization
  - ➢ In Factory (Scope 1&2)
  - ➢ In supply chain

Concrete

Optimize concrete mix

14%–33% reduction
None to low cost premium

Rebar

Use high recycled content rebar

4%–10% reduction
None to low cost premium

Insulation

Select low- or no-embodied-carbon insulation products

16% reduction
No cost premium

Glazing

Select low-embodied-carbon glazing products

3% reduction
10% cost premium

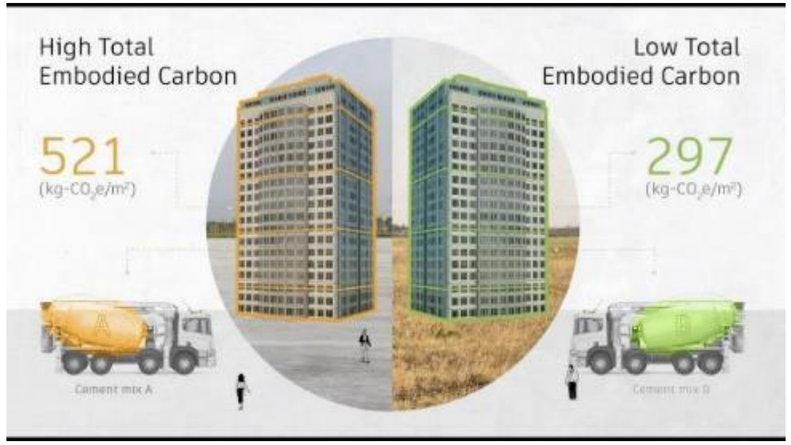
Finish Materials

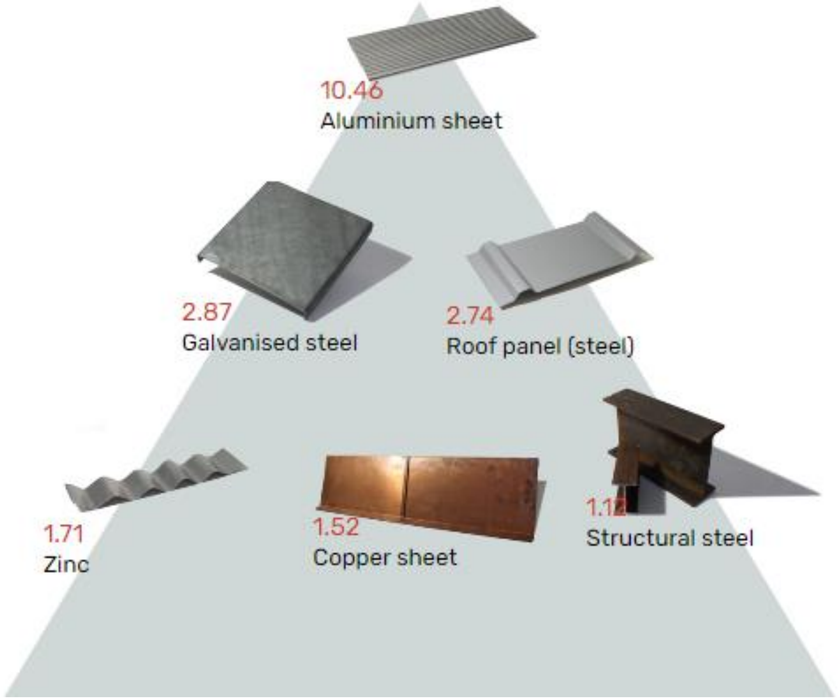
Select low- or no-embodied-carb on finish materials

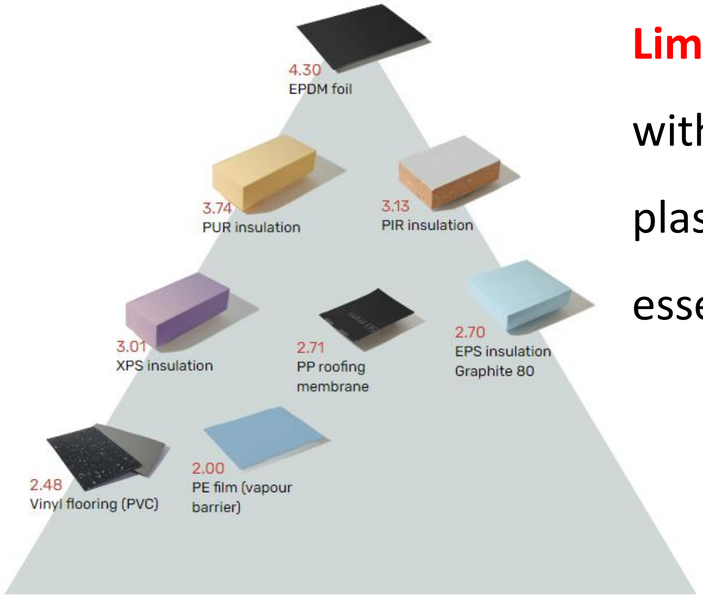
5% reduction
None to low cost premium

Low Carbon Materials

Specify low-carbon concrete mixes. Even though emissions per ton are not relatively high, its weight and prevalence usually make concrete the biggest source of embodied carbon in virtually any project.







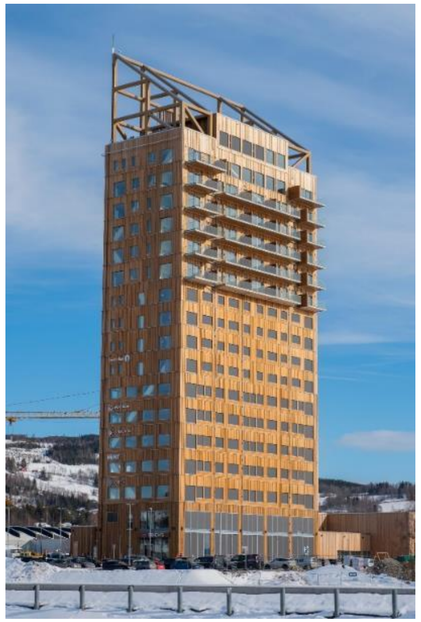
Limit carbon-intensive materials. For products with high carbon footprints like aluminum, plastics, and foam insulation, thoughtful use is essential.

Carbon Footprint

| GWP [kg $CO_{2\ eq}$ / kg]
| module A1-A3

Low Carbon Materials

Choose lower carbon alternatives. Think about the possibilities. If you can utilize a wood structure instead of steel and concrete, or wood siding instead of vinyl, you can reduce the embodied carbon in a project.



Wood

Choose carbon sequestering materials.

Using agricultural products that sequester carbon can make a big impact on the embodied carbon in a project.

Use Green Product

SCG

SUPALAI

Product decarbonization

❖ **กระเบื้องหลังคาคอนกรีต เอสซีจี รุ่นซีแพค**

16.5 $kgCO_2e$

❖ **กระเบื้องหลังคาคอนกรีต เอสซีจี รุ่น เพรสทีจ เอ็กซ์ซิลด์**

22 $kgCO_2e$

❖ **ฉนวนกันความร้อน เอสซีจี รุ่น STAY COOL 75 มม. พรีเมียม**

1.54 $kgCO_2e$

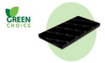
❖ **ฉนวนกันความร้อน เอสซีจี รุ่น STAY COOL 150 มม พรีเมียม**

1.33 $kgCO_2e$

❖ **วัสดุอะคูสติก เอสซีจี สำหรับผนังตกแต่งดูดซับเสียง รุ่น Cylence Zandera**

23.3 $kgCO_2e$

❖ **วัสดุอะคูสติก เอสซีจี สำหรับผนังตกแต่งดูดซับเสียง รุ่น Cylence ZoundBlock**



6.03 $kgCO_2e$

❖ **กระเบื้องซีเมนต์ปูพื้น เอสซีจี รุ่น Pavement ขนาด 40x40 ซม.**

20.8 $kgCO_2e$

❖ **ไม้เชิงชาย สมาร์ทวูด เอสซีจี ขนาด 20x400x1.6**

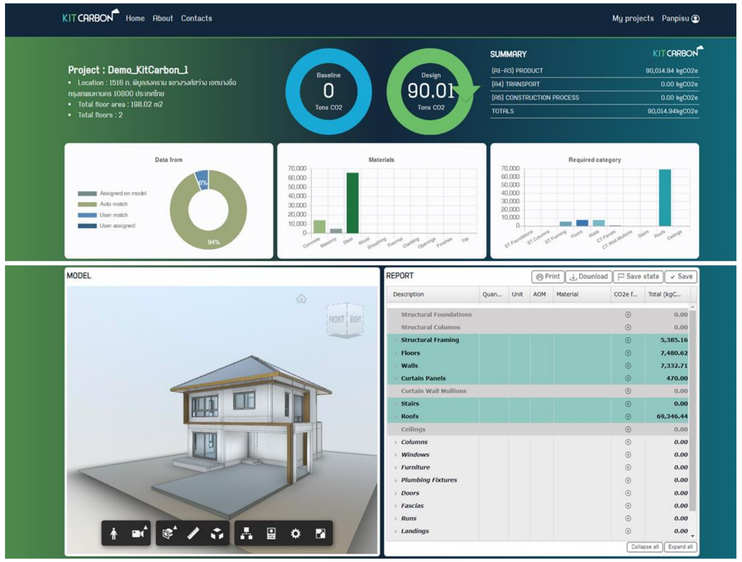
12.7 $kgCO_2e$

❖ **ไม้เชิงชาย สมาร์ทวูด เอสซีจี 23x300x1.8 รุ่น Fascia Sure**

14.2 $kgCO_2e$

❖ **คอนกรีตมวลเบาประเภทเสริมเหล็กคิวคอน**

628 $kgCO_2e$

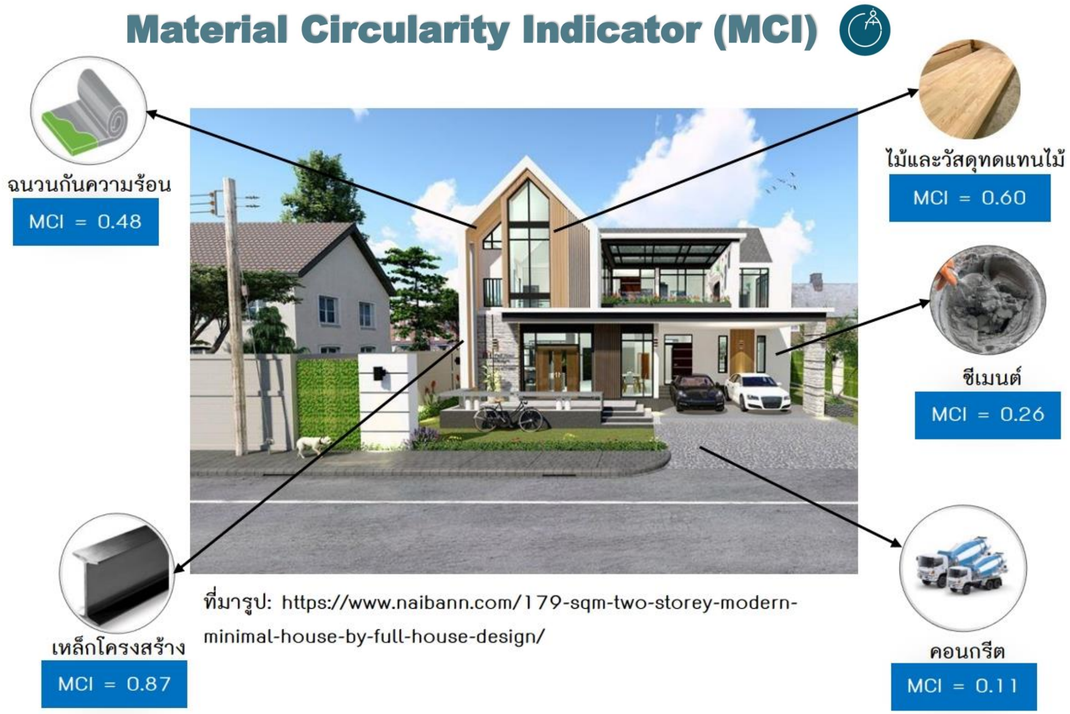


CPAC®
GREEN
Construction Solution

KAO MENGKOL GROUP

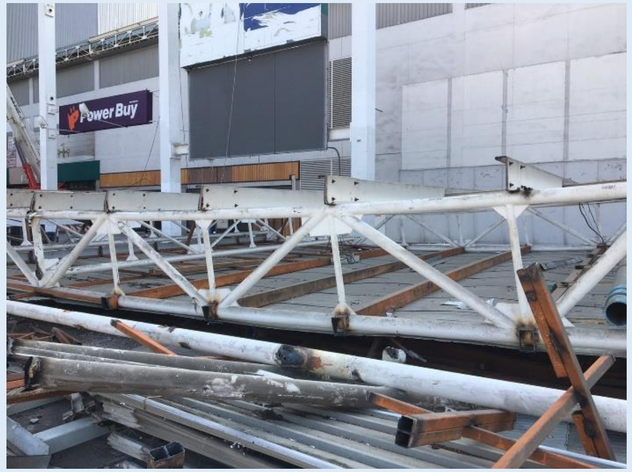
Use Circular Model

Reuse materials. Whenever possible, look to salvage materials like brick, metals, broken concrete, or wood. Salvaged materials typically have a much lower embodied carbon footprint than newly manufactured materials, since the carbon to manufacture them has already been spent.



Use high-recycled content materials. This is especially important with metals. Virgin steel, for example, can have an embodied carbon footprint that is five times greater than high-recycled content steel.

Construction Waste Management



CENTRAL PATTANA

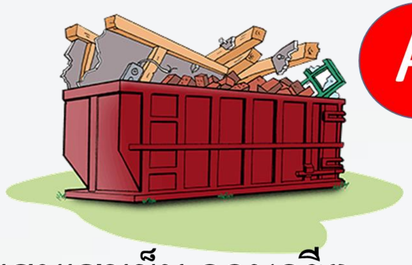
การจัดการขยะใน site ก่อสร้าง

- เศษหัวเสาเข็ม: ใช้ประโยชน์ในงานก่อสร้างเขื่อน ป้องกันน้ำกัดเซาะหน้าดิน และทำการบดย่อยใช้เป็นหินสำหรับงาน Subbase
- Concrete Block นำไปบริจาค ใช้เป็นวัสดุปูพื้นในโครงการอื่น
- เศษเหล็กนำไปขายให้กับองค์กร หรือผู้รับซื้อขยะเพื่อนำกลับมาใช้ใหม่หรือรีไซเคิล

Recycle Lean Concrete

G

Model B



A

เศษเสาเข็ม คอนกรีต

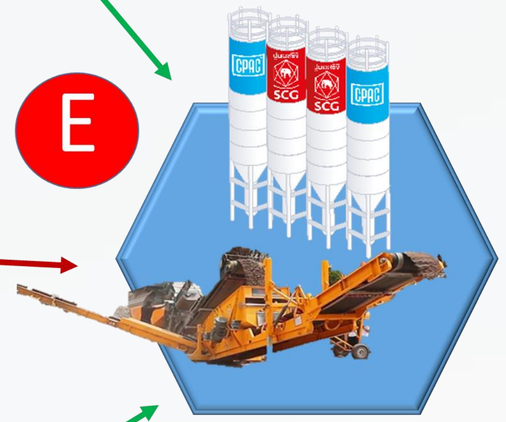
Concrete waste

F

I

Model C

E



H

C

D

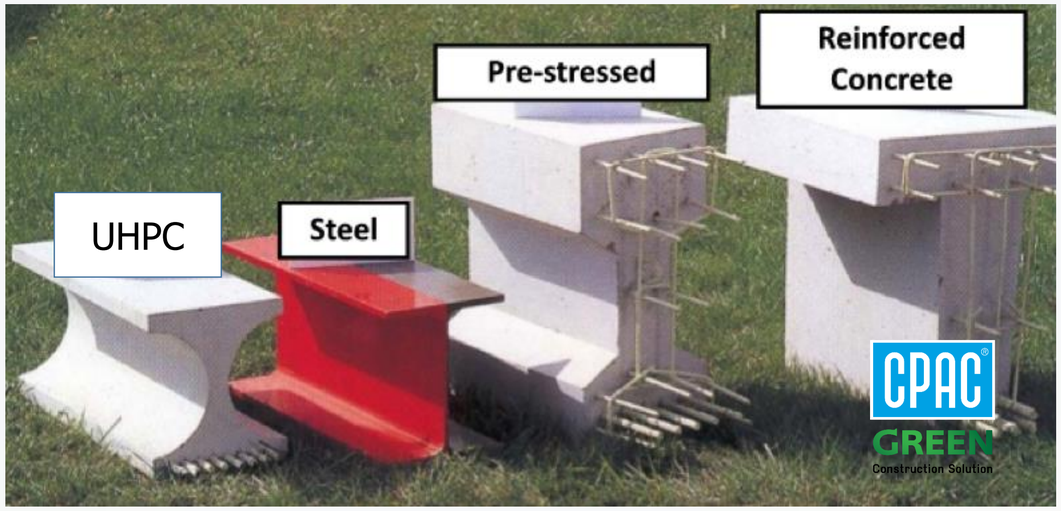
B

Model A

Waste hub

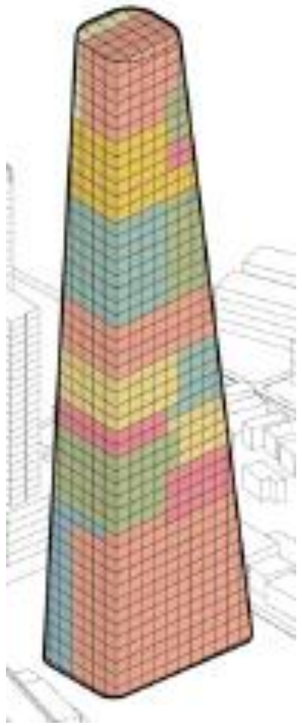
CDW : CONSTRUCTION DEMOLITION WASTE : GYPSUM

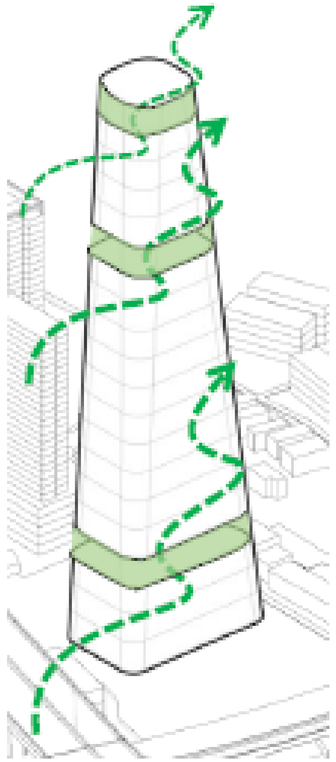
Thinner Sections



Use Circular Model

Maximize structural efficiency. Because most of the embodied carbon is in the structure, look for ways to achieve maximum structural efficiency. Using optimum value engineering wood framing methods, efficient structural sections, and slabs are all effective methods to maximize efficiency and minimize material use.



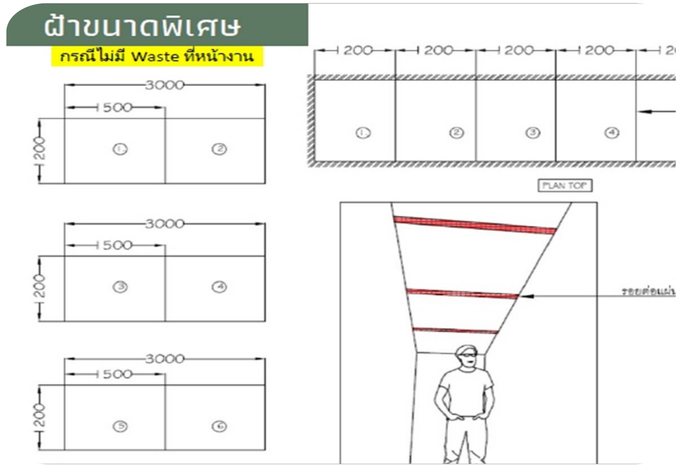


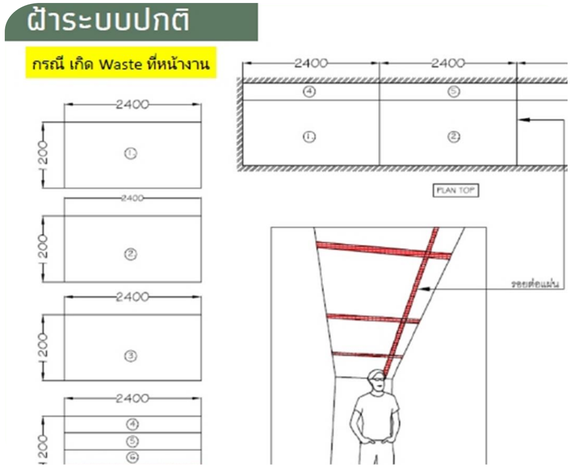
Solution 1. Mass study concept

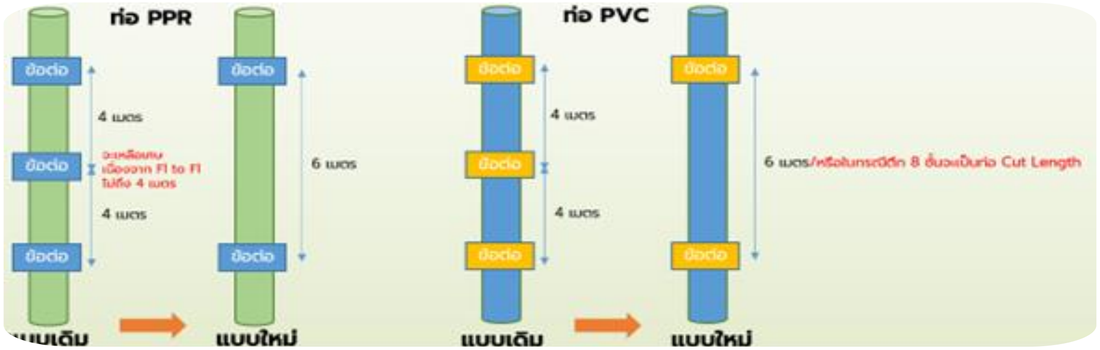
Focus point : ออกแบบรูปทรงอาคารให้มีฐานกว้างและลดขนาดความกว้างของตัวอาคารในชั้นที่สูงขึ้นไป พร้อมกับการปรับขอบอาคารให้มีลักษณะมน การเพิ่มช่องผ่านของลม เพื่อลดแรงต้านของลมต่อตัวอาคาร ทำให้สามารถลดขนาดของโครงสร้างอาคาร

Use Circular Model

Minimize waste. Particularly in wood-framed residential projects, designing in modules can minimize waste. Think in common sizes for common materials like 4x8 plywood, 12-foot gypsum boards, 2-foot increments for wood framing, and pre-cut structural members.



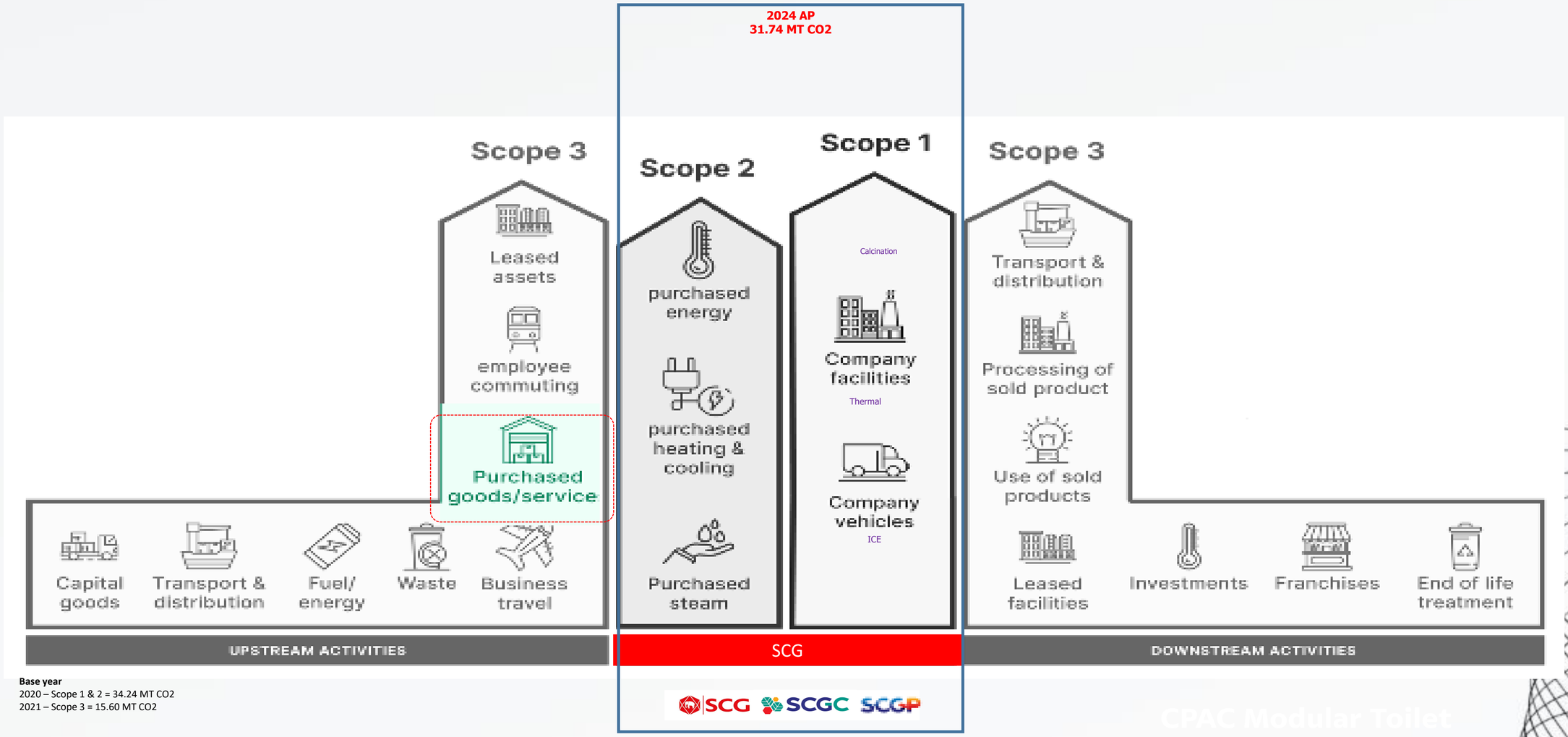




- เศษท่อลดลงประมาณ 80-90%
- ลดปริมาณข้อต่อประมาณ 20-25% โดยการลดปริมาณข้อต่อลดลง ช่วยลดโอกาสการเกิดการรั่วซึมบริเวณข้อต่อ และ การลดข้อต่อทำให้ไม่สูญเสียความดัน
- การมีท่อหลายขนาด ทำให้การเคลียร์แบบงานระบบสุขาภิบาล

Embracing Challenges to Build Low Carbon Society

SCG Decarbonization



Base year
2020 – Scope 1 & 2 = 34.24 MT CO2
2021 – Scope 3 = 15.60 MT CO2

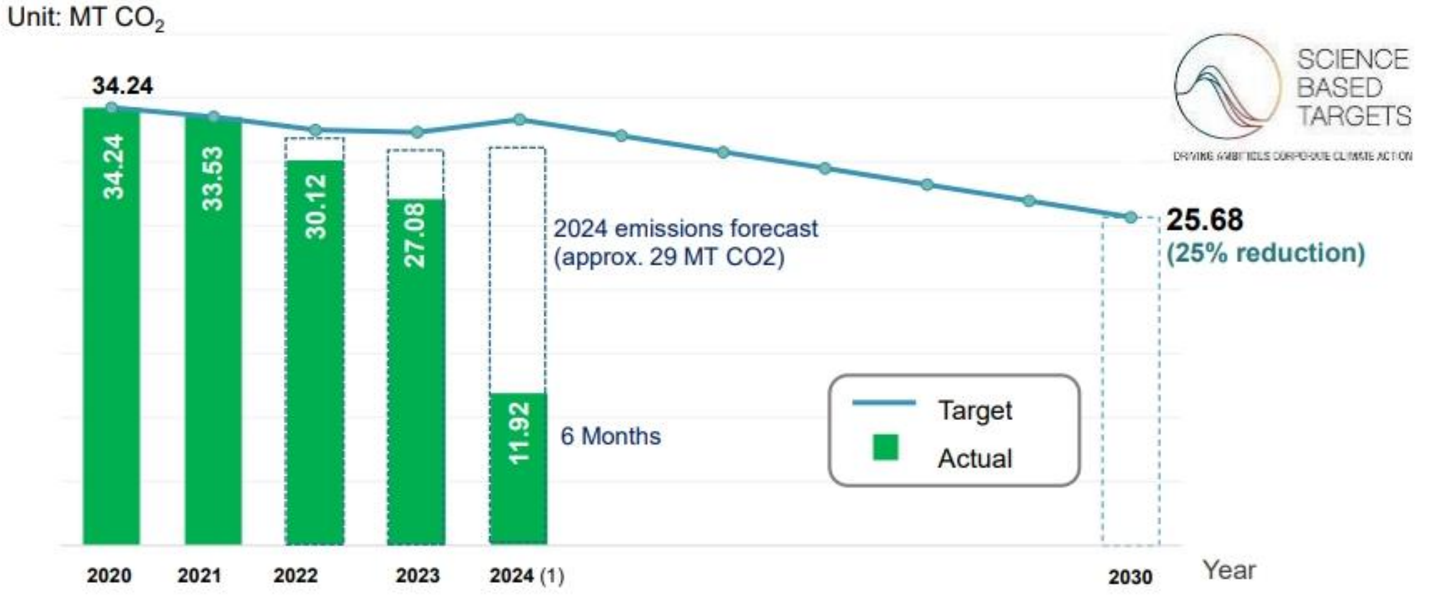
CPAC Modular Toilet

SCG Decarbonization

SCG 2050 Net Zero Roadmap and Progress

SCG GHG Scope 1 & 2 reduction is on track with SBTi targeting to achieve achieving 25% reduction in 2030.

GHG Emissions (Scope 1+2)



Note:

1) Q1-Q2/2024 is the actual of Jan-May and estimate Jun.

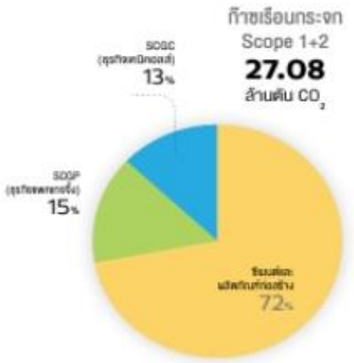
Energy Efficiency
By using the best available technologies with energy efficiency

Renewable Energy
By increasing the share of biomass, renewable energy

Low Carbon Products
By innovating the products with circular economy principle and low carbon in value chain

CCUS
By networking with national and international to scale up carbon capture, utilization and storage (CCUS) technologies

Natural Climate Solution
By collaborating with communities and authorities to forestation and rehabilitation as carbon sink



SCG

Supply Chain Decarbonization

3. Scope 3 – Suppliers

- Segment suppliers : High impact suppliers, strategic suppliers
- Set up the supplier engagement plan

Hotspot

- Purchased goods 5,036,763 ton CO2
- Fuel & energy 1,878,089 ton CO2

BU	High Impact	Strategic	Total
CPO	2	2	4
SCGC	9	2	11
Smart Living	3	1	4
SCG Décor	5	0	5
CGS	58	4	62
SCGP	*17*	*11*	28
SCG	**94**	**20**	**114**

SCG Supplier Segmentation
จำนวนทั้งหมด **114** ราย คิดเป็น **526,450** tCO_2
(**9%** of total cat.1&3)

Base year
2020 – Scope 1 & 2 = 34.24 MT CO2
2021 – Scope 3 = 15.60 MT CO2

High Impact : Engagement Program

- Step 1: Overview (Objective) with Owner suppliers
- Step 2: Data requirement & process flow
- Step 3: GHG Calculation: Data Collection
- Step 4: GHG Calculation: Data Calculation
- Step 5: GHG Calculation: Data Reporting
- Step 6: GHG Reduction Project
- Step 7: Closing & Next Step

The construction of new buildings is projected to double by 2060. Still, only a tiny percentage – 3% of new construction falls under green construction or uses bio-based materials that can lock emissions for decades.