PERBADANAN PUTRAJAYA

Sustainable Energy Development

SUSTAINABLE ENERGY DEVELOPMENT AUTHORITY (SEDA MALAYSIA) INITIATIVES

& FACILITATION ON LOW CARBON BUILDING PROGRAM FOR LOCAL AUTHORITIES & GOVERNMENT AGENCIES

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WHO IS SEDA MALAYSIA?

Sustainable Energy Development Authority or Pihak Berkuasa Pembangunan Tenaga Lestari Malaysia (SEDA Malaysia)

- **Statutory Body Agency under Kementerian Tenaga, Teknologi Hijau & Air (KeTTHA);**
- **Established on 1 September 2011 ;**
- **Function: to promote, stimulate, facilitate and develop sustainable energy (Renewable Energy & Energy Efficiency)**

Background

STATUTORY BODY AGENCY UNDER MINISTRY

Background on Energy Efficiency

- in 2011, Assisting KeTTHA / Government on National Energy Efficiency Master Plan (2011-2012) *(Until Sept 2012)*.
- Assisting Government on the development of the Energy Efficiency & Conservation Act (until Sept 2012).
- Responsible for KeTTHA's KPI related on EE implementation;
- Retrofitting government buildings.
- Provide EE facilitation and advisory services.

Government Lead By Examples

- RM2.7 bil electricity bill for gov't building was recorded in 2010-2011
- 105 gov't building are energy guzzler (EMEER 2008) (used more than 3 mil kWh for 6 consecutive months)
- Implementation of no cost saving measures: eg:,
  - Set office temperature at 24^{o}C;
  - Rescheduling air conditioned & lighting system ;
  - Energy efficiency practices/behaviour

12 Ministry buildings achieved **10.4%** energy savings (**11 m kWh, 7800 tonnes of CO_2** emission avoided

48 achieved the **3%** electricity savings (savings of **122 m kWh; 83,000 tonnes of CO_2** emission avoided)

Retrofit Gov't Buildings

EA Finding Analysis Aug 2011 → Project Engagement Sept 2011 → Tender Process Oct –Dis 2011 → Project started Jan 2012 → Project Completed Jun 2012

- Replace with T5 lighting technology
- Rescheduling lighting system
- Retrofit the BCS including the controlled & Sensors (VSDs, VAVs, CO2,
- Value added on Energy monitoring system
- Temperature set at 24°C

	Savings		
	Electrical (kWh)	Thermal (RTH)	CO_2(ton)
NRE	314,163 (12.6%)	130,136 (10.3%)	213.6
MAMPU	147,278 (19%)	118,166 (26%)	100
Total	461,441	248,302	313.6

Our Program & Technical Facilitation

Low Carbon Program by SEDA Malaysia

- **SEDA's Low Carbon equation;**

Low Carbon

= Sustainable Energy X Operational Carbon factor (0.741 kgCO2/kwh)

- Skop low carbon building **hanya yang melibatkan program pengurusan tenaga lestari.** *E-waste, recycling, product labelling, pengurusan sisa tidak termasuk.*

FAKTA : Setiap 1kWj tenaga elektrik yang diguna akan menyebabkan sebanyak 0.747kg karbon dioksida dibebaskan semasa penjanaan tenaga tersebut di loji penjanakuasa.

Sustainable Low Carbon Building Method - By SEDA Malaysia

- Developed based on series of R&D, pilot projects, studies and continuos actual building performance monitoring since 2002.

- The Sustainable Low Carbon Building Performance are mostly refer to the technology, applications and management that has impact to the Energy and Environment related to building operation & services

a) Design : Sustainable Energy (Energy Efficiency & Renewable Energy) & Water Management.

b) Office appliances

c) Operation: Energy & Environment management in the O&M.

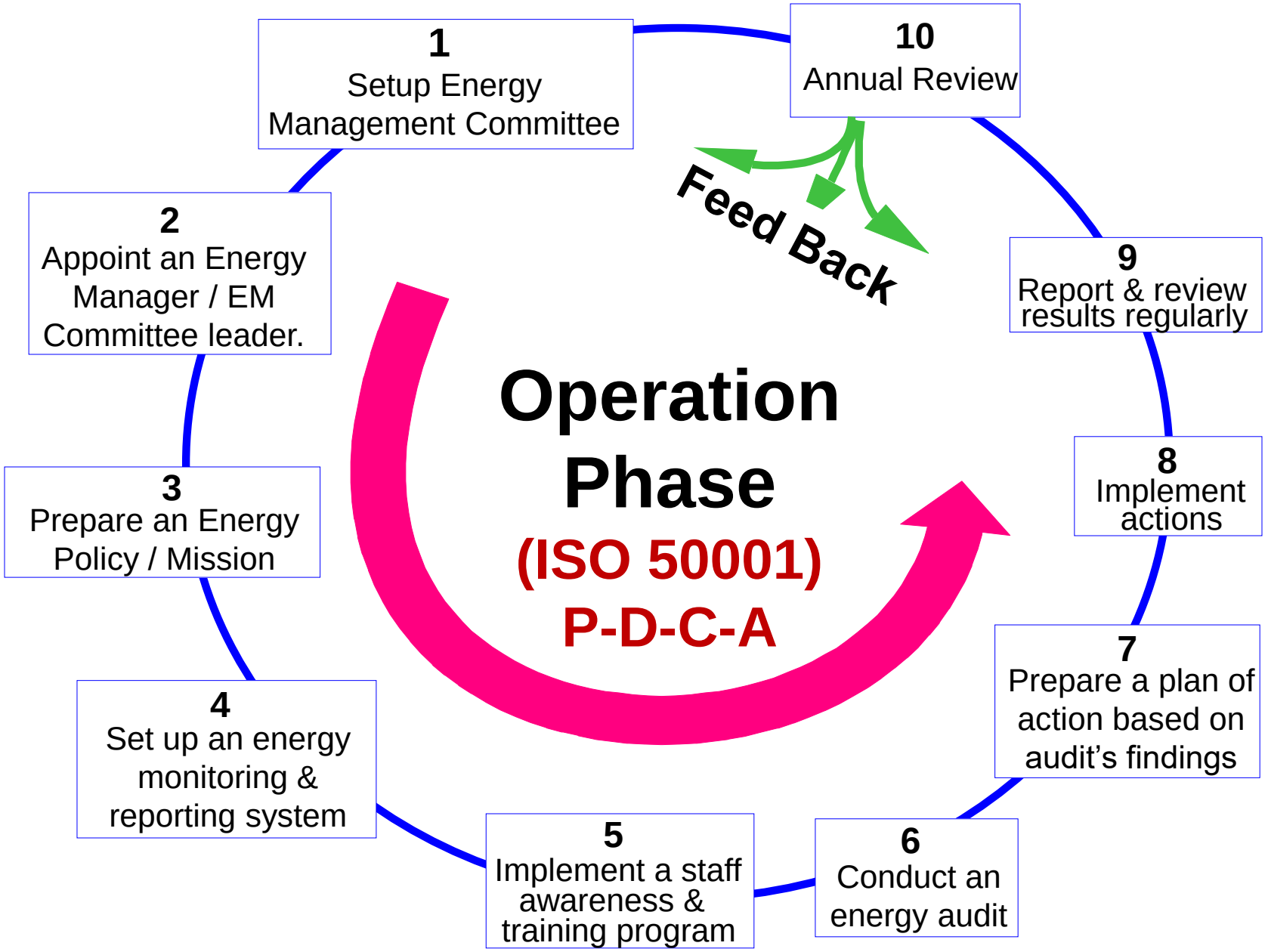
d) Renovation / retrofits

e) Other
- Paper and water recycling
- Indoor air quality.
- Solid waste management / separation

f) End users awareness

PRACTICAL SOLUTION TO ACHIEVE EE LOW CARBON BUILDING

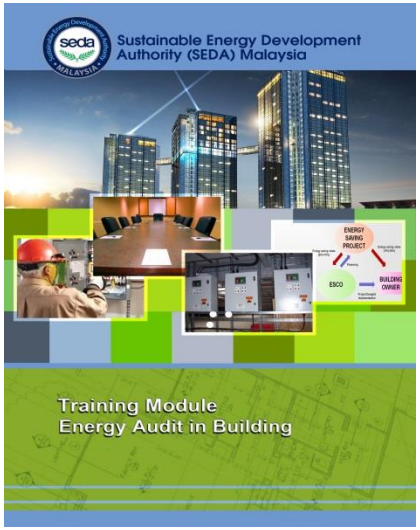
Sustainable Energy Management System

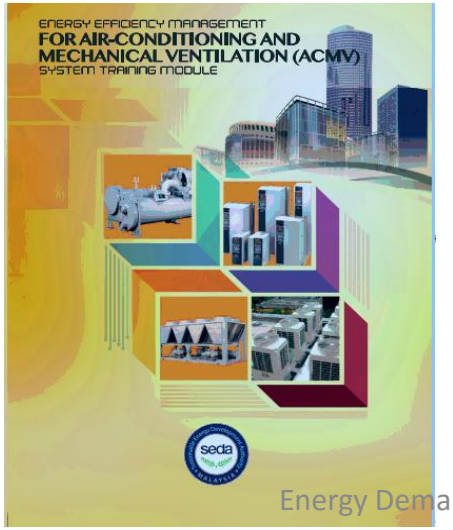


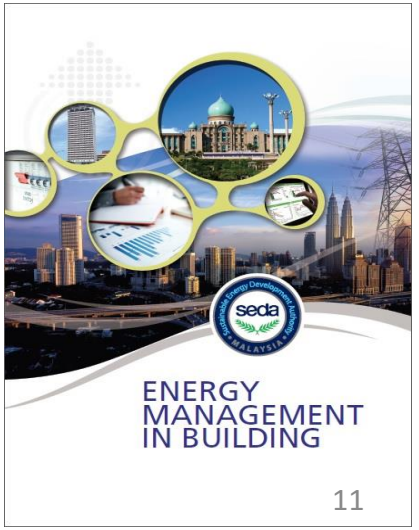
Increase Local Expertise In Energy Management Through Capacity Building

We provide energy management-related training

- Energy Management in Gov't Building
- Energy Efficient Management in ACMV System
- Principal & Application in Compliance to MS1525
- Energy Audit in Building







Sustainable Energy Low Carbon Building Facilitation to State Gov., Local Authorities & any Gov Agency

- Appointed as technical advisor for energy management program in Gov't agencies/IPTA
- Provide training & awareness campaign.
- Facilitation, Advisory, Technical Assistance & Consultancy.
- Energy Auditing & Retrofitting.
- Project Management .
- Monitoring & Verification.
- **Assessment** and Reporting.

UMS
UNIVERSITI MALAYSIA SABAH

MARDI

- UPEN / SUK Negeri Sembilan, Johor & Melaka.
- PBT : DBKL (current). In-future:- Perbadanan Putrajaya, MBPJ, MPSeremban, MPSepang, MPHTJ Melaka, ISKANDAR Malaysia, etc

Low Carbon ICT for Gov't Building

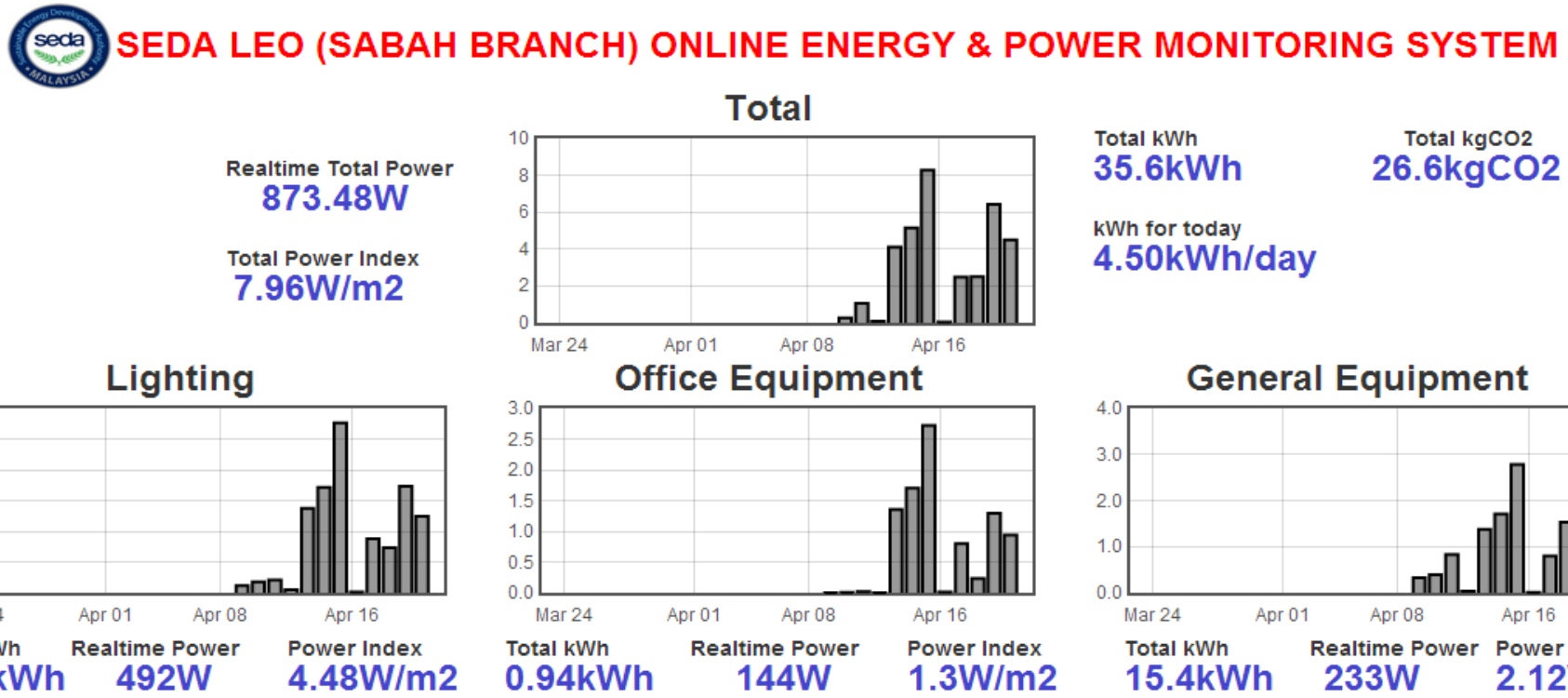
Energy efficient ICT System

Development of Green Data Centre Guideline

2 main field studies (10 Gov't Buildings).

- Baseline Study on Energy efficient Data Centre System in Gov't Buildings;
- Study on Consumption & Carbon Emission for TELCO Sector in Malaysia

Development of Affordable Online Energy Monitoring for Building Owner



Log to see the sample of online system at

www.monitoring.damansara.net

SUSTAINABLE LOW CARBON BUILDING ASSESSMENT

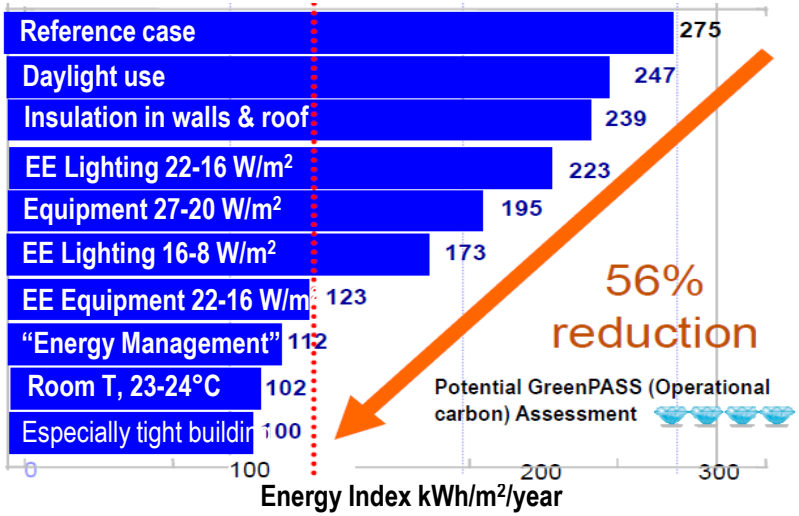
(Under the Low Carbon Building Facilitation Program)

- A voluntary & industry driven initiatives by SEDA.
- The assessment using UNEP-SBCI Common Carbon Metric, MS 1525 & CIDB's CIS20-GreenPASS.

Objective ??

- ✓ To support the low carbon cities development.
- ✓ To provide national consistency and a common language around the definition of low carbon building.
- ✓ To provide systematic assessment to encourage energy efficiency in building implementation.
- ✓ As platform for building owners to declare the performance of the buildings.
- ✓ To support government initiatives (RMK-11, LCCF, NEEAP, Energy Audit Program).
- ✓ To provide a basis for ongoing assessment and evaluation of low carbon building.
- ✓ As alternative platform towards achieving Green Building Certification (MyCREST, GBI, etc.)
- ✓ To facilitate local authorities to develop Common Carbon Metric for various building typologies.

NEW BUILDING: Example of CO_2 Reduction for LEO Building:



Carbon Reduction in Existing Building:

MEASURES	ANNUAL SAVING Electrical	
	kWh/yr	RM/yr
No cost Measures		
De-lamping office lighting	13,476	3,153.38
Low cost measures		
Use timer controller for temperature and operate silo ventilation	687,760	160,935.84
Use of daylight in warehouse	19,943	4,666.66
Replace normal EXIT signage to LED	2,208	516.67
Awareness campaigns	703,931	164,719.85
High Cost Measures		
Replace the Metal Halide lamps to T5HO lamps	957,012	223,940.81
Lighting zoning	498,584	116,668,66
TOTAL	2,882,914	674,602

Actual Cost Reduction 50%

Potential GreenPASS (Operational carbon) Assessment

Low Carbon Building Assessment System - GreenPASS by CIDB (CIS 20 : 2012)

GreenPASS is a Performance Based **Assessment** System for Building

Green PASS assessment is **100% based on actual carbon emission** from building construction and / or operations

Applied for :

1) Building Construction;
2) Building Operations

Recognised as one of the sustainable building tools together with PH (JKR) and GBI under RMK11

GreenPASS Carbon Reduction Assessment System

Level of Achievement (% of CO_2e Reduction)	Assessment Scheme for existing buildings (without bonus)	Assessment Scheme for new buildings *(with bonus)
100% Carbon Neutral	6	6 +
≥ 70 to < 100	5	5 +
≥ 50 to < 70	4	4 +
≥ 30 to < 50	3	3 +
≥ 10 to < 30	2	2 +
≥ 1 to < 10	1	1 +

* Bonus ONLY applicable for Building Construction Category – 70% IBS Score, 3 Star SHASSIC Rating, 70% QLASSIC Score

KeTTHA's Project implemented partialy by SEDA Malaysia

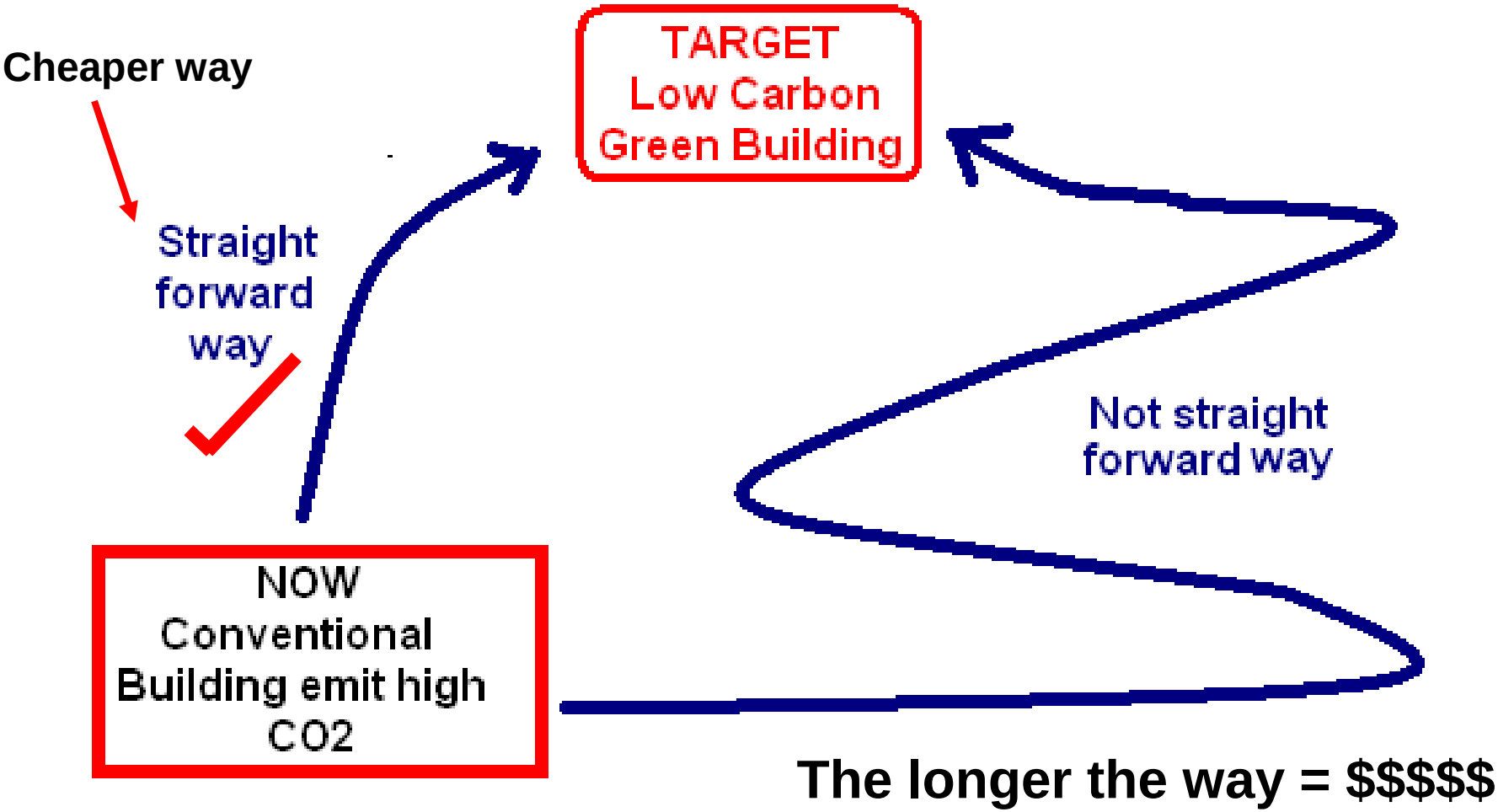
RMK11 Energy Efficiency Project :
Energy Audit at Big Commercial Buildings (that fall under the EMEER 2008)

- **Total number of buildings :** 30 bangunan untuk 2016.
- **Trainings :** 5 trainings & 5 seminar (all regions)

UNDP-GEF : Project management of the *Green Technology Application for Low Carbon Cities (GTALCC)*.
*** Still pending by KeTTHA**

- **Project period :** 5 years (Expected started in 2016).

Why EE / Low Carbon Building using Energy Management approach is Affordable ?



Cost of Implementation of Sustainable Energy Low Carbon Building

Energy management - EE

- **RM0.60 to RM2.00 per kWh reduction**
- **RM 0.80 to RM 2.70 per KgCO2 reduction**

(payback within 3 – 8 years)

** Based on several energy auditing, retrofitting and low carbon buildings at commercial, industries and residential buildings in Malaysia by SEDA Malaysia.*

Renewable Energy – RE (Solar PV)

- **(RM 6.70 to RM 8.40) per kWh reduction**
- **RM 7.30 to RM 11.20 per KgCO2 reduction**

** Based on installation of solar PV on roof pricing (RM6.5k – 10k/kWp)*

Facilitate To PBTs, States and Government Agencies

SEDA Malaysia's Role / offer to Facilitate Local Authorities On Low Carbon Programme

➢ Any activities under the current SEDA's Program, *Low Carbon Building Facilitation Programme*;

- ✓ Energy Efficiency / Energy Management program.
- ✓ Monitoring and Verification (setting target and annual assessment).
- ✓ Development of data collection and online monitoring system .
- ✓ Energy Audit and Retrofitting program.
- ✓ Low carbon green building design input & management (new buildings).
- ✓ Awareness program & promotion.
- ✓ Development of Common Carbon Metric (CCM) for various building topology in Putrajaya.
- ✓ Data repository on carbon emission from building sectors.
- ✓ Building performance assessment using GreenPASS.
- ✓ Development of EE performance based incentive.
- ✓ Potential support to NAMA proposals .

Putrajaya Low Carbon Green City 2025 target

Tahap Pelepasan Karbon Mengikut Sektor

SEKTOR	2007 ($ktCO_2eq$)	2025 BaU ($ktCO_2eq$)	2025 CM ($ktCO_2eq$)
Pejabat Kerajaan	180	363	139
Komersil	65	1,435	769
Kemudahan awam	67	240	112
Perumahan	23	266	150
Pengangkutan Penumpang	161	1,314	368
Pengangkutan Barang	20	156	89
Sisa pepejal	148	414	189
'Carbon sink'	-	-	-35
Jumlah Pelepasan GHG	**664**	**4,186**	**1,780**
Jumlah Penduduk	**49,452**	**347,000**	**347,000**
Pelepasan GHG per kapita	13 tCO_2eq	12 tCO_2eq	5 tCO_2eq

60% reduction target

LCCF

PERFORMANCE CRITERIA

Base on Carbon Footprint

4 Elements for GHG Reductions in Cities and Townships

Urban Environment

- Site Selection
- Urban Form
- Urban Greenery & Air Quality

Urban Transportation

- Shift of Transport Mode
- Green Transport Infrastructure
- Green Vehicles
- Traffic Management

Urban Infrastructure

- Infrastructure Provision
- Waste
- Energy
- Water

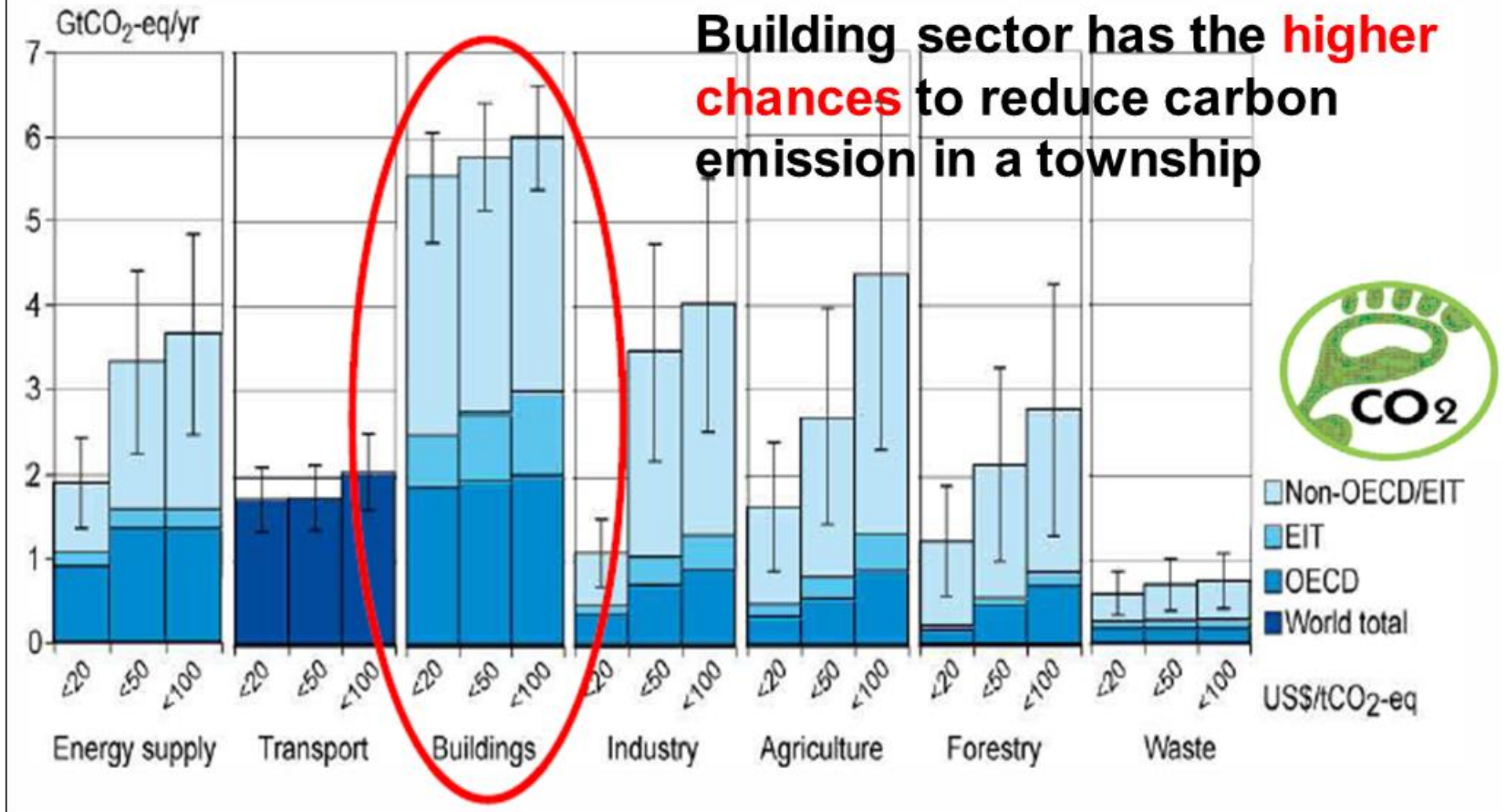
Buildings

- Low Carbon Building
- Community Service

Elements Contribute to GHG emission → 13 Performance Criteria* → 35 Sub Criteria

*Performance Criteria are measurable strategies to reduce carbon emission through:-
Policy control, technological dev., better process & product management, change in procurement system, carbon capture, consumption strategies & others

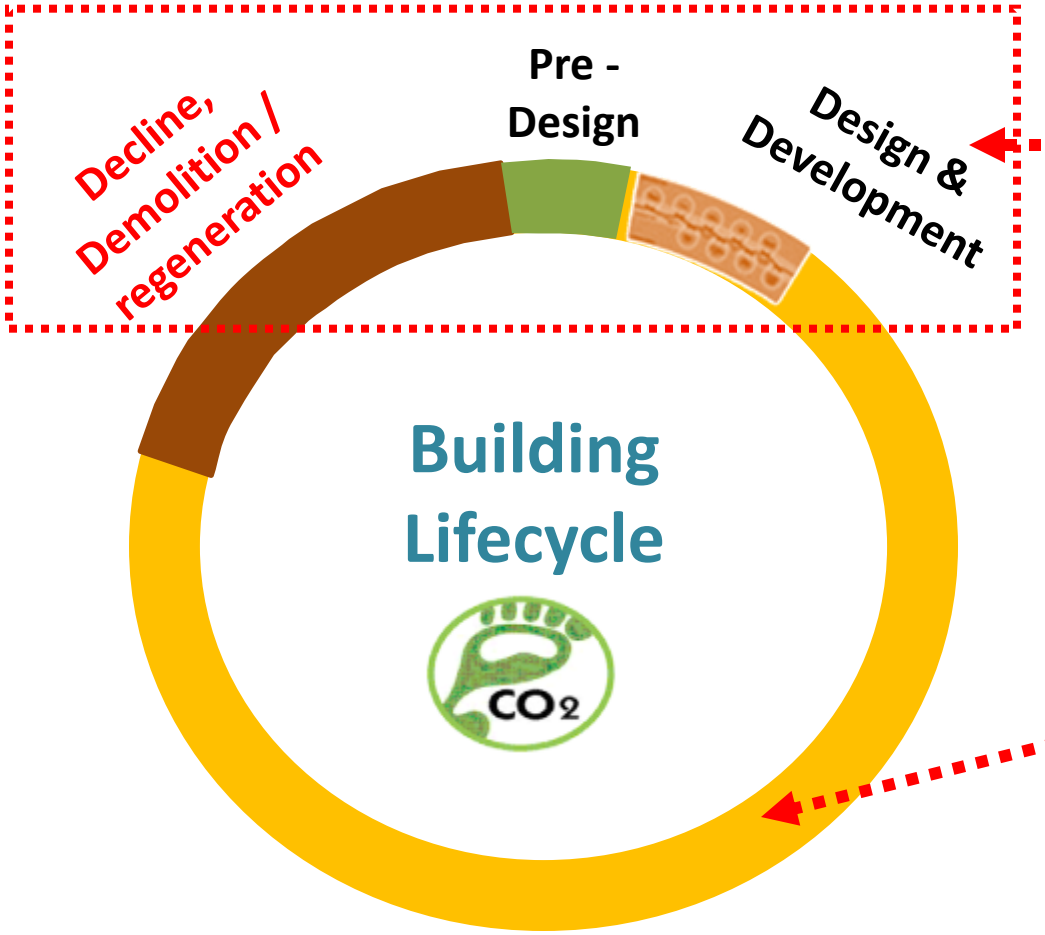
Chances to reduce carbon emission



Building sector has the higher chances to reduce carbon emission in a township

Carbon emission in a life cycle of a building

Important Fact !



Mostly addressed by most conventional Tools
[Embodied CO2 footprint]
~ 20%

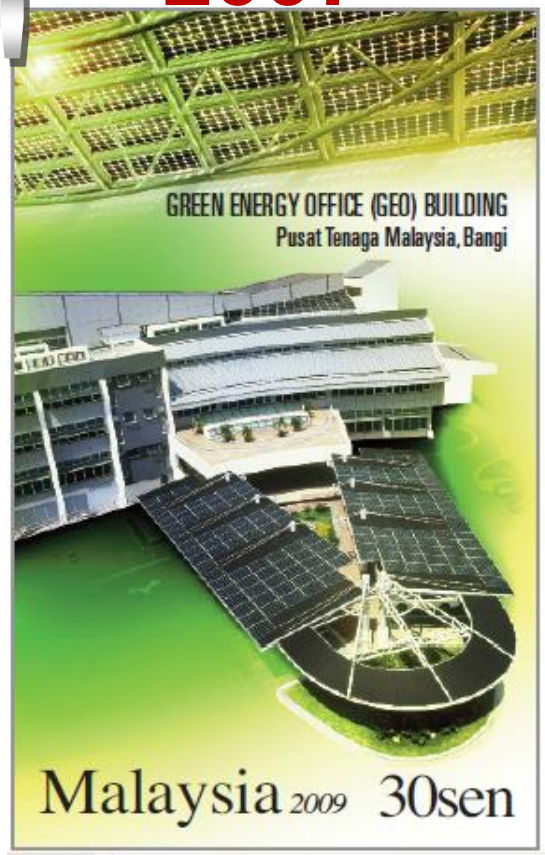
Use, Management & Maintenance
[Higher Operational CO2 footprint]
From Energy Usage !!
80%

FACT! Most of the CO2e emission is during the operation phase !!

SUSTAINABLE ENERGY to tackle the source of the CO2 emission

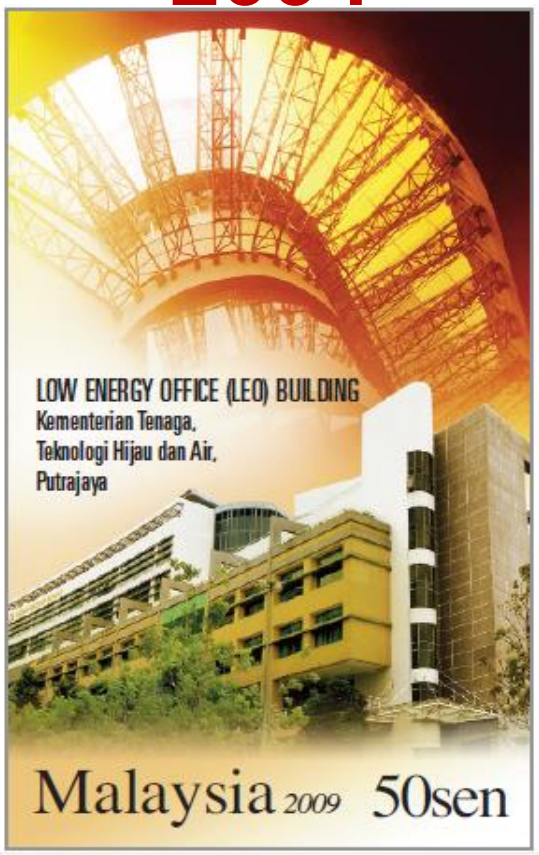
Example of New Low Carbon Buildings

2007



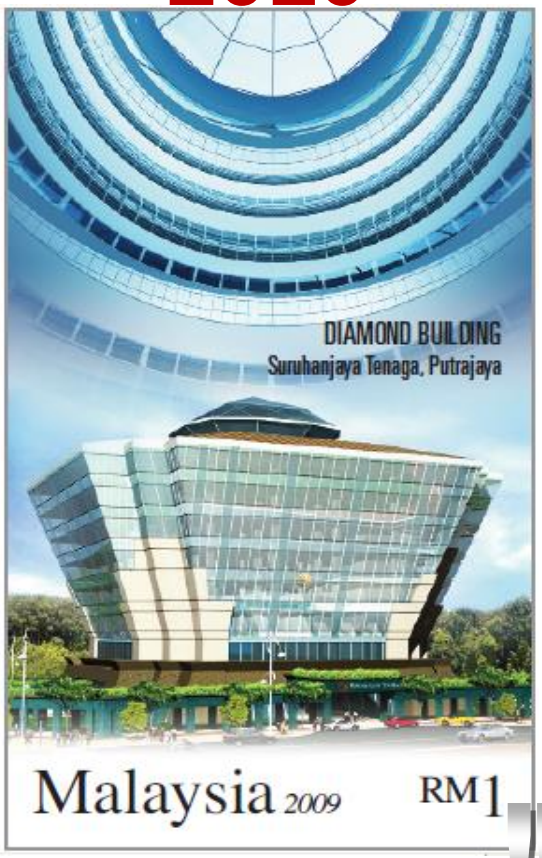
Net BEI = 30 (86% reduce)
65 TonCO2/year
GBI : Certified (2009)
ASEAN EA : 2009/2010/2011

2004



Net BEI = 114 (59% reduce)
1,490 TonCO2/year
GBI : Silver (2011)
ASEAN Energy Award : 2006

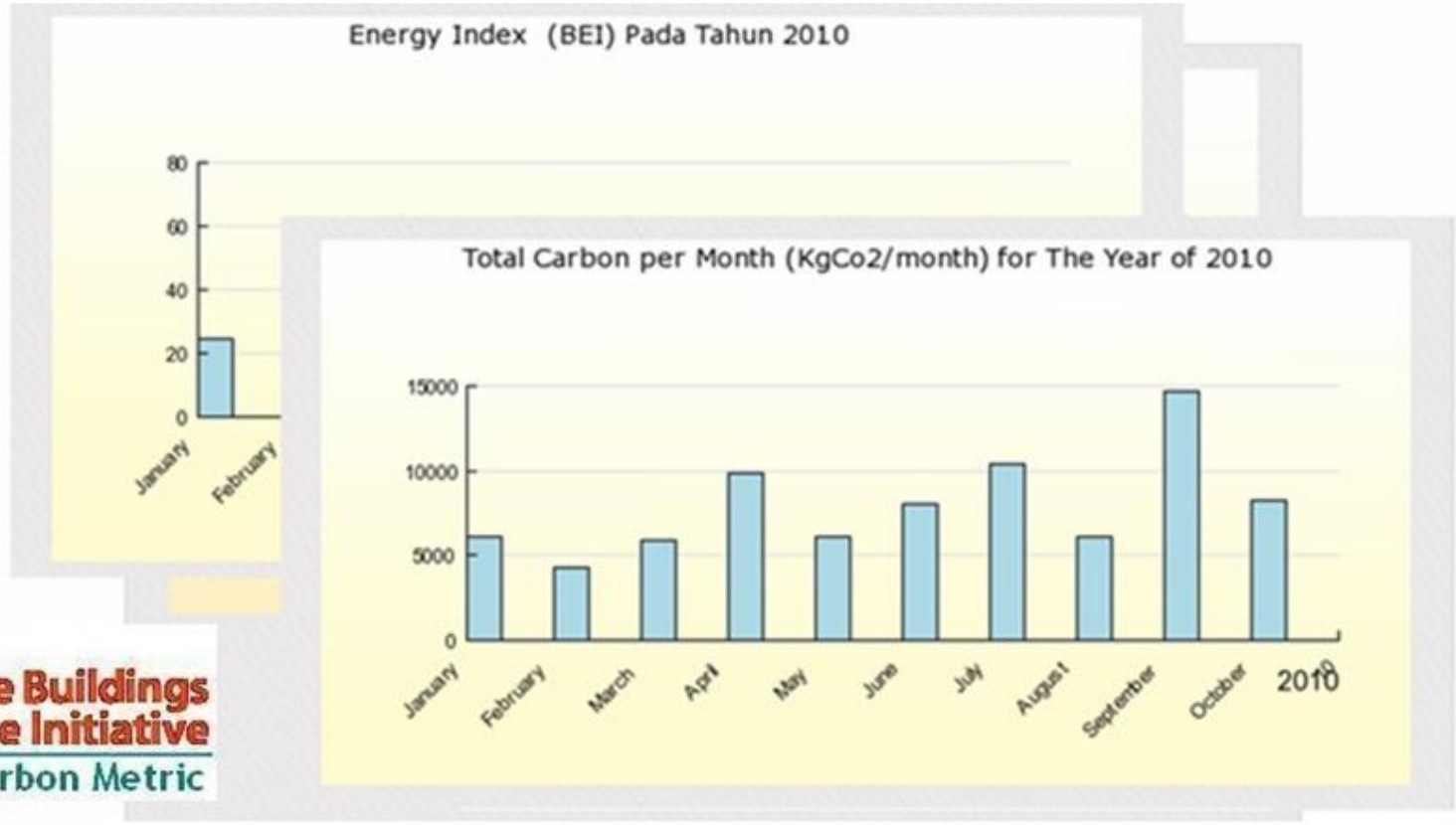
2010



Net BEI = 63 (70% reduce)
637 TonCO2/year (**To verify)
GBI & GreenMark : Platinum (2011)
ASEAN EA : 2012

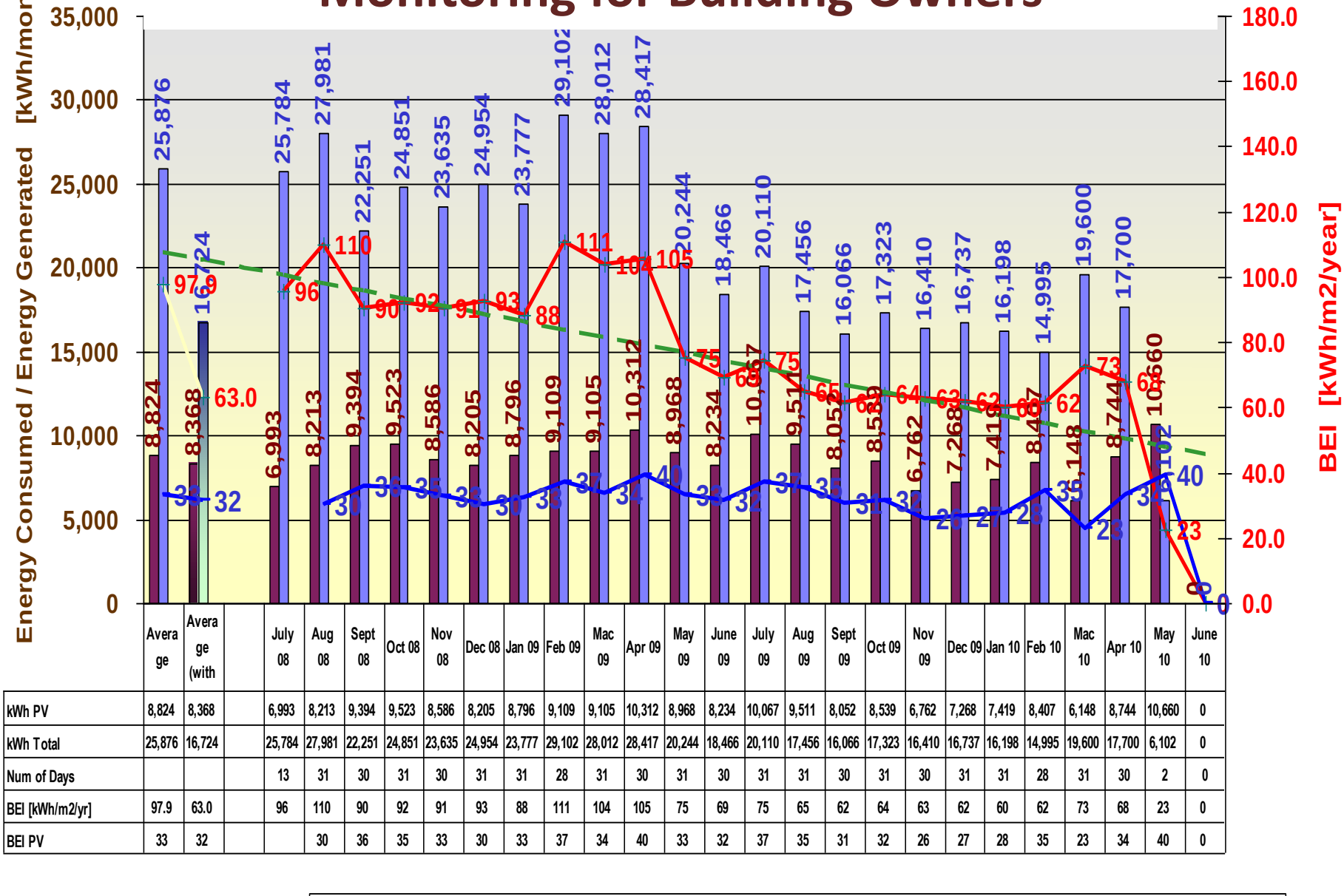
Low Carbon Building Monitoring & Carbon Inventory

Actual building performance using common / universal metric – Energy & Carbon



Sustainable Buildings and Climate Initiative
UNEP Common Carbon Metric

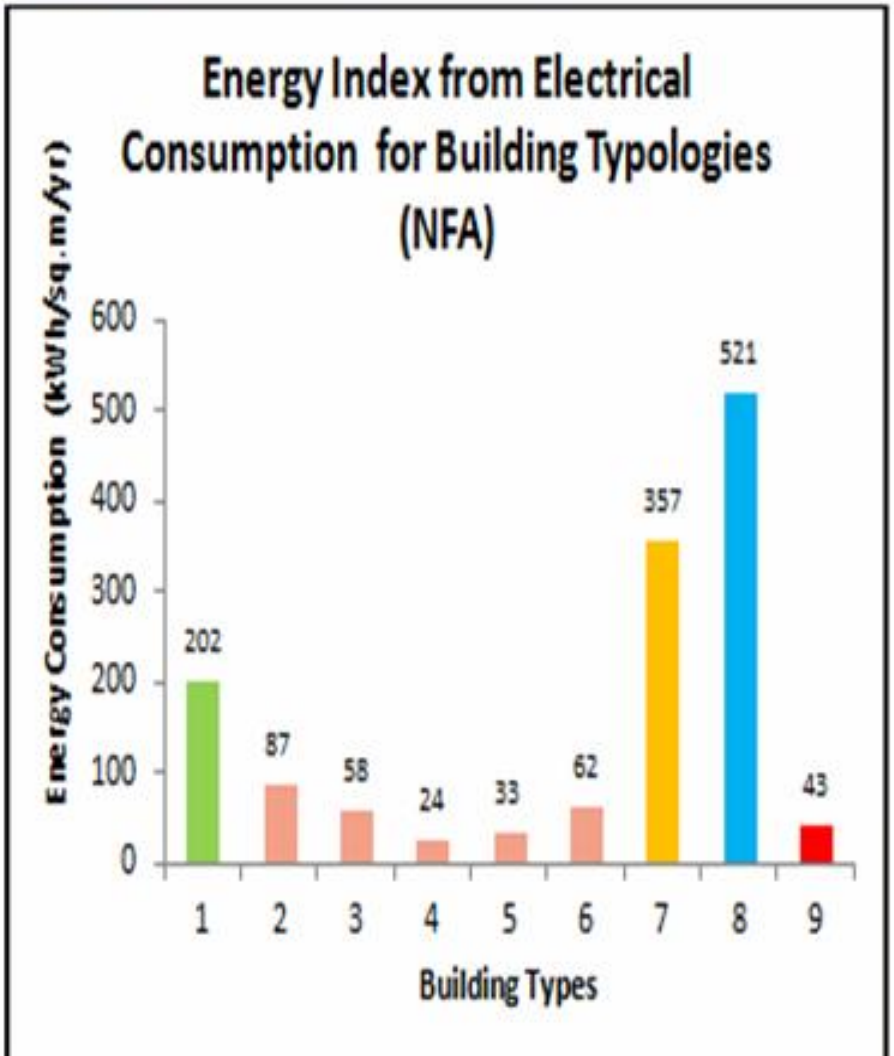
Example – Detail Building Performance Monitoring for Building Owners

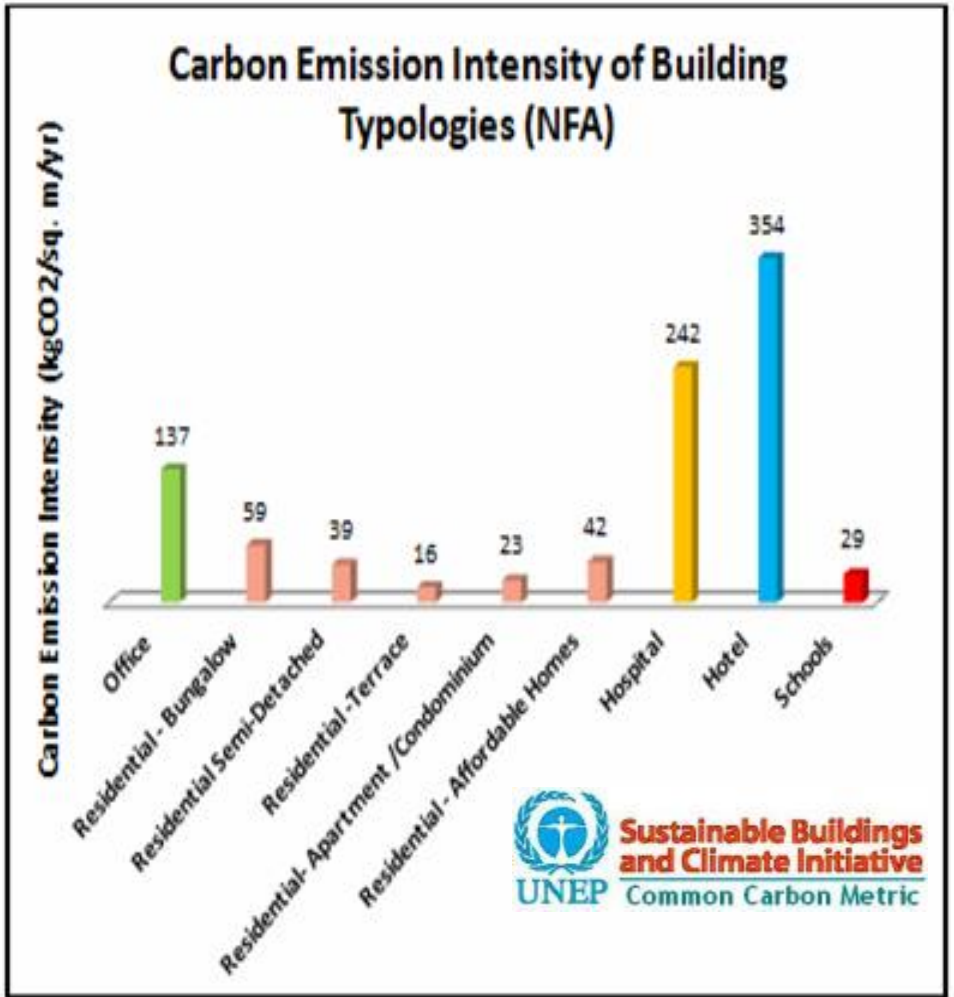


	Average	Average (with		July 08	Aug 08	Sept 08	Oct 08	Nov 08	Dec 08	Jan 09	Feb 09	Mac 09	Apr 09	May 09	June 09	July 09	Aug 09	Sept 09	Oct 09	Nov 09	Dec 09	Jan 10	Feb 10	Mac 10	Apr 10	May 10	June 10
kWh PV	8,824	8,368		6,993	8,213	9,394	9,523	8,586	8,205	8,796	9,109	9,105	10,312	8,968	8,234	10,067	9,511	8,052	8,539	6,762	7,268	7,419	8,407	6,148	8,744	10,660	0
kWh Total	25,876	16,724		25,784	27,981	22,251	24,851	23,635	24,954	23,777	29,102	28,012	28,417	20,244	18,466	20,110	17,456	16,066	17,323	16,410	16,737	16,198	14,995	19,600	17,700	6,102	0
Num of Days				13	31	30	31	30	31	31	28	31	30	31	30	31	31	30	31	30	31	31	28	31	30	2	0
BEI [kWh/m2/yr]	97.9	63.0		96	110	90	92	91	93	88	111	104	105	75	69	75	65	62	64	63	62	60	62	73	68	23	0
BEI PV	33	32			30	36	35	33	30	33	37	34	40	33	32	37	35	31	32	26	27	28	35	23	34	40	0

Building Energy Index and Carbon Emission Intensity for Building Typologies

In PUTRAJAYA





Existing Buildings:
Example - Retrofitted Building with Enhance Energy Management

Measures	Annual Saving	
	Electrical	
	kWh/yr	RM/yr
No Cost Measures		
De-lamping office lighting	13,476	3,153.38
Low Cost Measures		
Use timer controller for temperature and operate silo ventilation	687,760	160,935.84
Use of daylight in warehouse	19,943	4,666.66
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Actual Reduction 50%

Potential GreenPASS (Operational carbon) Assessment

Existing Buildings :
Example of Retroffited Government Buildings

Savings through retrofit projects

Ministries/ Agencies	2011 Finance Ministry	2011 Economic Planning Unit	2012 Malaysian Administrative Modernisation and Mgmt Planning Unit
Average energy consumption (monthly) before retrofit project (kWh)	2,144,835.95	313,434.61	173,408.72
Average energy consumption (monthly) after retrofit project (kWh)	1,790,651.53	254,387.91	153,572.08
Reduction of energy consumption per month (kWh)	354,184.42	59,046.70	19,836.64
Savings (RM/month)	129,277.53	21,552.16	7,240.51
Energy reduction (%)	16.5%	18.8%	11.5%

Source: Energy, Green Technology and Water Ministry

Potential GreenPASS (Operational carbon) Assessment

Existing Buildings:
Example – Small Office Renovation

Sustainable Energy Development

SEDA Low Energy Office @ Kota Kinabalu 2014

Only need 2.5kWp Solar PV to make zero energy office

BEI = 27 kWh/m2/year
CO2 = 16 KgCO2 / m2 / year
= 86.4% reduction

The Energy Efficient Features:

- Maximise use of Daylighting.
- Energy efficient light & appliances.
- Energy efficient Interior Design.
- Low Carbon ICT system
- Awareness and Practice.

Potential GreenPASS (Operational carbon) Assessment

Low Carbon for Residential Buildings

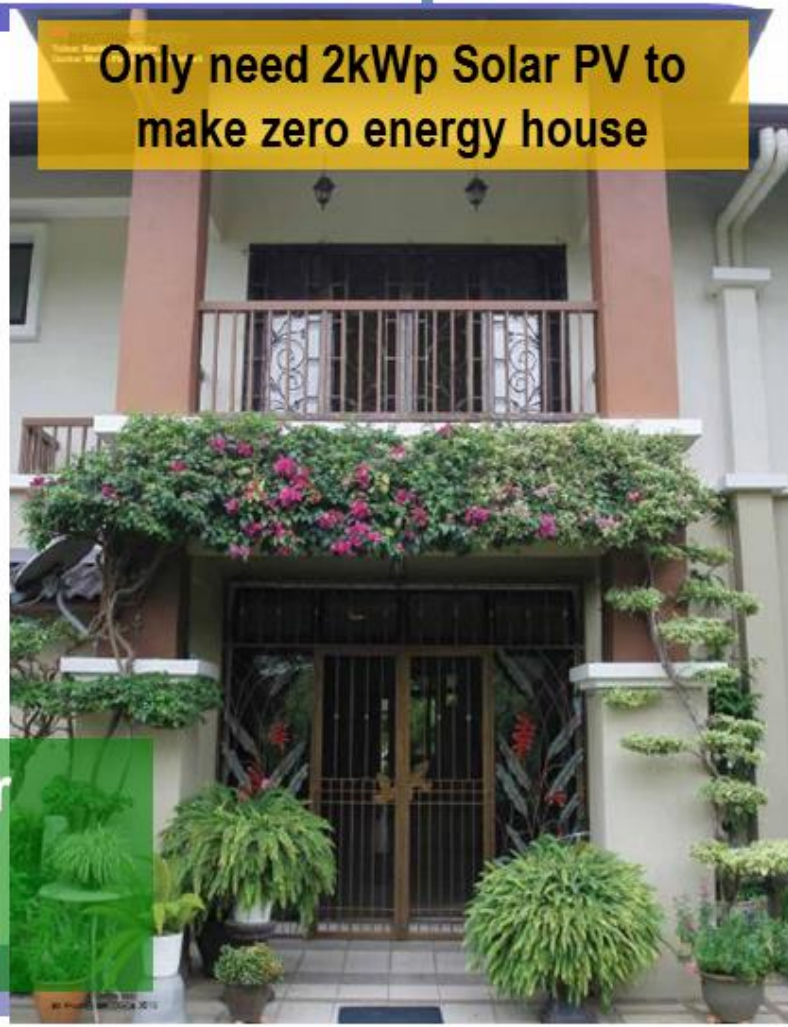
Sustainable Energy Development

Low Carbon House P14 @ Putrajaya

Since 2010

The Green Features:

- East-West building orientation.
- Landscape to absorb heat (IR and UV).
- Natural cross ventilation & Daylighting.
- Energy efficient light & appliances.
- Energy efficient Interior Design.
- Waste management.
- Awareness and Green Practice.



BEI = 8.27 kWh/m2/year
CO2 = 1.7 ton / year
= 61.4% reduction

Potential GreenPASS (Operational carbon) Assessment

Conclusion

- **Energy Efficient Low carbon building approach is practical and affordable for any cities targeting for low carbon development programme (*LCCF, Low carbon society, etc*).**
- **Based on series of R&D, studies & demonstrations shows that energy efficiency (sustainable energy) are the fundamental to reduce operational carbon footprint in building sector … (START WITH ENERGY EFFICIENT BUILDING PROGRAM !!)**
- **High EE building performance can be achieved through energy management process during the design and also operation.**
- **Energy Efficient building is affordable if proper cost cycle analysis been conducted (during design & operation/retrofitting)**

Way Forward

- **Encourage public and industry to participate** in energy management and energy monitoring activities.
- Use CIDB's GreenPASS as **assessment for Energy Efficient buildings based on actual energy reduction** to align with national 40% carbon intensity reduction and global direction towards carbon neutral development
- **Appreciate the Energy Efficient buildings** (same like other certified green buildings) and provide incentives (not necessary in monetary).
- **To develop data repository** for building energy and carbon emission (city level, State and National level).

UNEP Sustainable Buildings and Climate Initiative
Common Carbon Metric

Way Forward

- The government / PBTs are recommended to embark on *Common Carbon Metric (CCM)* for various building topology for monitoring, benchmarking and reporting annual carbon reduction achievement.
- New and retrofit buildings should have operational energy / carbon reduction target in order to support cities of township to become low carbon green city (local authorities may set the reasonable target).

UNEP Sustainable Buildings and Climate Initiative
Common Carbon Metric

Thank you for your attention

NEED HELP ON LOW CARBON BUILDING PROGRAM?

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