



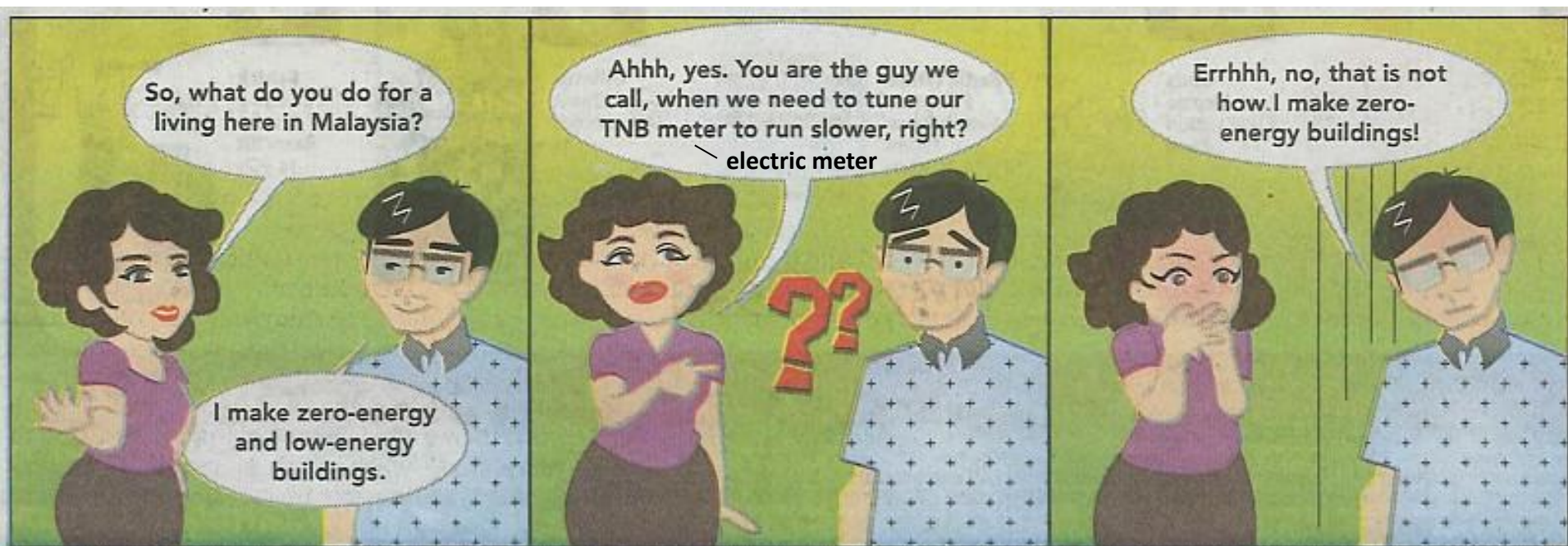
ZEB Renovation for existing buildings

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People want ZERO Energy Buildings but lack of awareness & misconceptions

Cartoon of a real conversation
I had when explaining my job as Energy Efficiency Consultant



Courtesy of Gregers Reimann/IEN Consultants Sdn Bhd / Illustration by Rachel Chen Ruiqi

The Star newspaper, Malaysia, 16 August 2013

Post Malaysia Stamp Series for Energy Efficient Buildings

We were the energy efficiency consultants for all three buildings
and call them our “stamps of approval”



....but how do we make energy efficient buildings common place?

How to Accelerate Energy Efficiency?



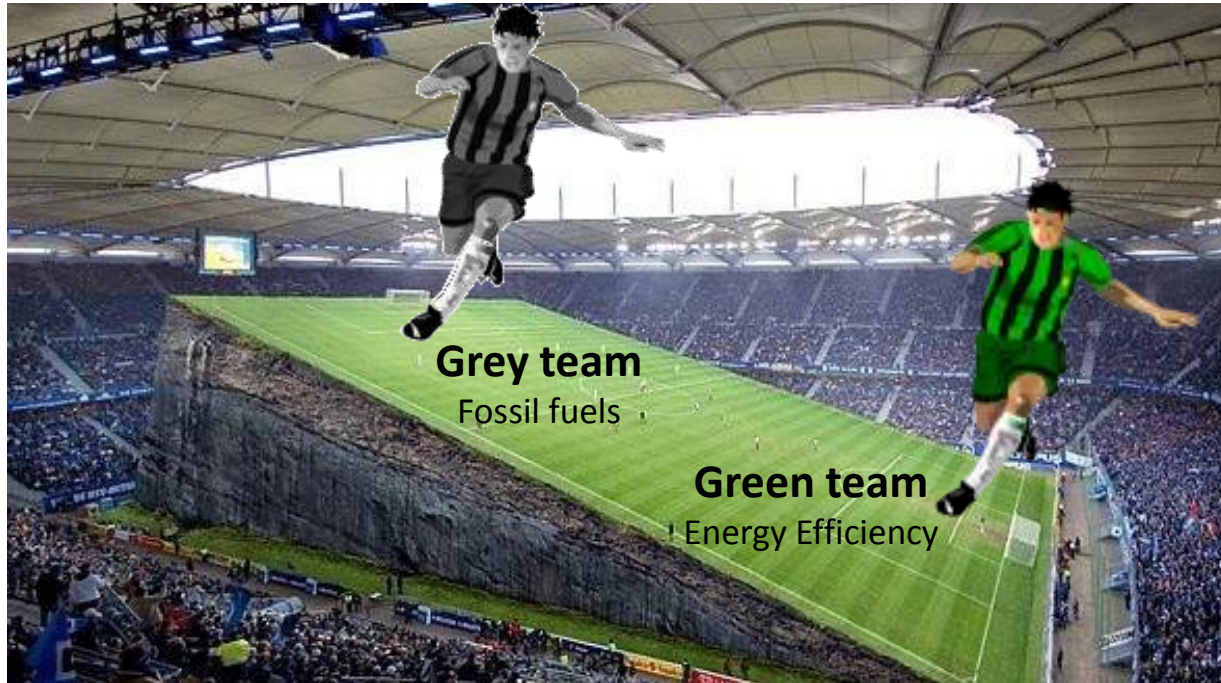
We need to talk about the Elephant in the Room: Energy Pricing

ENERGY EFFICIENCY

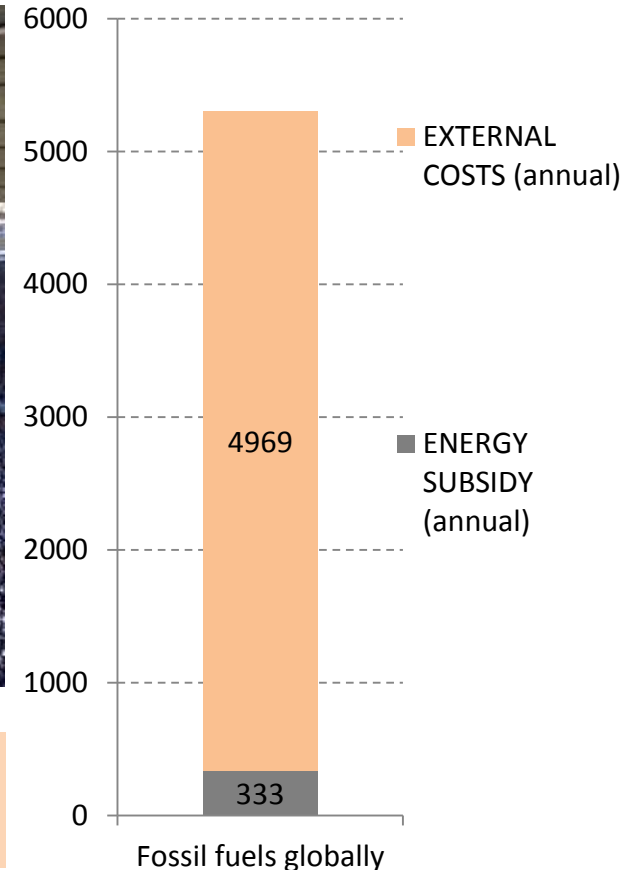
The playing field is NOT level

Fossil fuels are subsidized and underpriced. In fact, the annual cost of fossil is USD5.3 trillion – or 6.5% of the global GDP (Source: IMF, 2015)

LEVEL PLAYING FIELD?



Billion USD/year

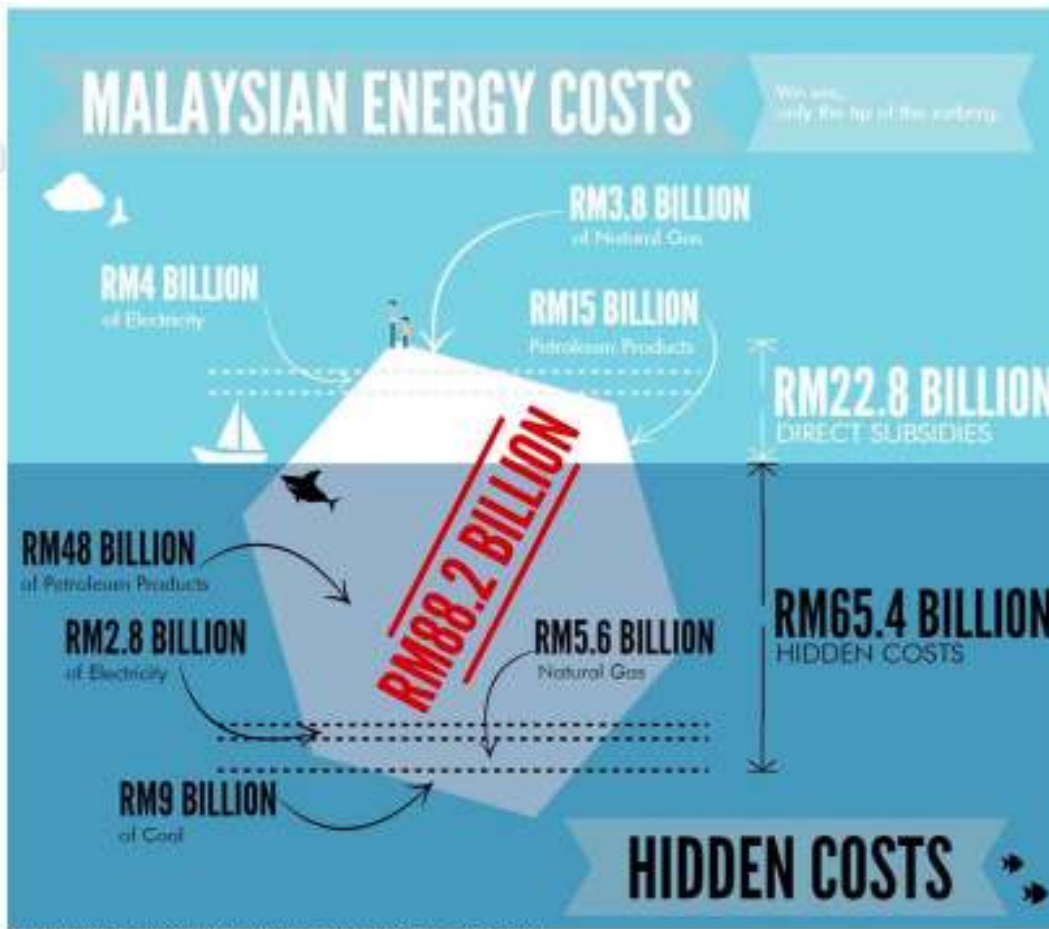


EXTERNAL COST break-down:

19% (Traffic congestion), 26% (Extreme weather) and 55% (Air Pollution Health Costs)

IMF Energy Figures for Malaysia

“Energy Subsidy Reform: Lessons and Implications”



Source: IMF, "Energy Subsidy Reform: Lessons and Implications", 2013

10 **ecowatch**

Hidden costs of fossil fuels

New studies shed light on the substantial external costs of fossil fuels, arising mostly from air pollution.

By **ANDREW HARRISON**

1997 was estimated at \$200 billion, mostly from loss to productivity and decline in tourism. The study notes that a major obstacle has been that this category in the pollution charge account for the cost of energy in Malaysia.

The IMF study from 2013 showed that the second cost to Malaysia is from fossil fuels. From 2007, the cost in MYR, which is the unit used in the study, rose to RM15 billion in 2011. This is a significant increase from the RM5 billion in 2007. The study also notes that the cost of fossil fuels is not just from direct subsidies but also from hidden costs. The IMF study found that the cost of fossil fuels is not just from direct subsidies but also from hidden costs. The IMF study found that the cost of fossil fuels is not just from direct subsidies but also from hidden costs.

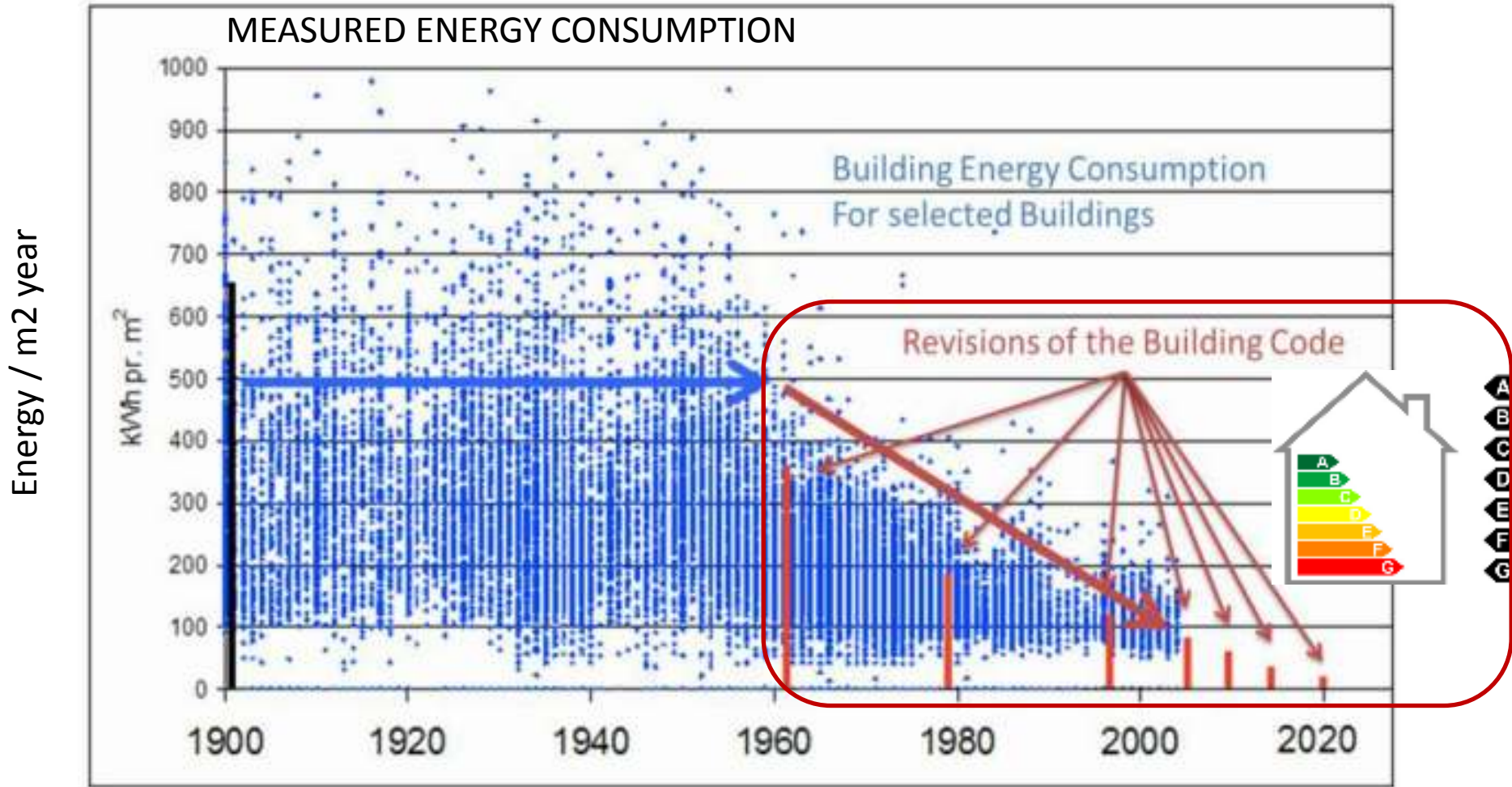
Localised impact

The IMF study also found that the cost of fossil fuels is not just from direct subsidies but also from hidden costs. The IMF study found that the cost of fossil fuels is not just from direct subsidies but also from hidden costs.

The Star newspaper, 5 Oct 2015

Energy Efficient Retrofit of Existing Building Stock in Denmark

50% Measured Energy Savings in Danish Buildings



50% reduction in heating per square meter for entire building stock

Let's strive for a similar improvement of the energy efficiency of the Malaysian building stock

Mandatory Energy Label for Buildings

www.nybolig.dk/soegeresultat-boliger?location=Freetext=københavn&postalDistrict=&roadName=&minPrice=-2147483648&maxPrice=2147483647&km

Property Size: 0 m2 - 300+ m2

Lot Size: 0 m2 - 2000+ m2

Number of rooms: 1 - 6+

Year: Before 1900 - 2016

Level: 0 level - 5 plan

Floor: Basement - 8+ floor

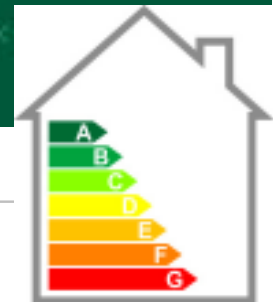
Energy: A - G

length of stay: 0 - 1000+

Show homes: 2,081 homes

All labels

Real estate search for Copenhagen



Mandatory Energy Label for Buildings

www.nybolig.dk/soegeresultat-boliger?locationFreetext=københavn&postalDistrict=&roadName=&minPrice=-2147483648&maxPrice=2147483647&...

Property Size: 0 m² - 300+ m² Lot Size: 0 m² - 7000+ m²

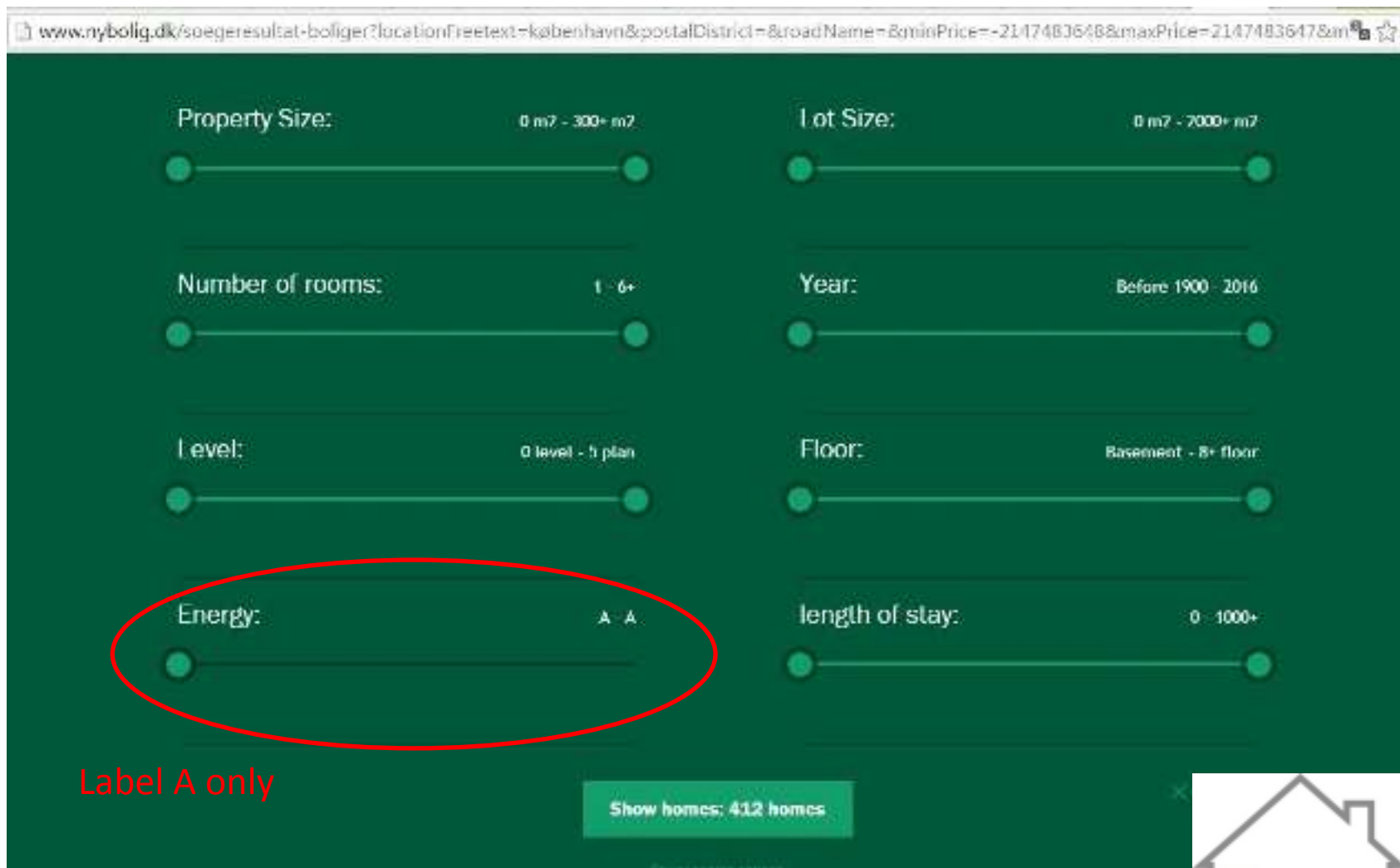
Number of rooms: 1 - 6+ Year: Before 1900 - 2016

Level: 0 level - 1+ plan Floor: Basement - 8+ floor

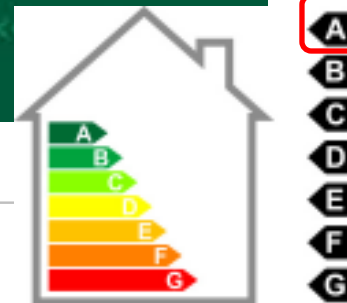
Energy: A - A length of stay: 0 - 1000+

Label A only

Show homes: 412 homes



Real estate search for Copenhagen




412 Energy Efficient Buildings (Label A)

www.nybolig.dk/sogeresultat_boliger?locationFreetext=københavn&postalDistrict=&roadName=&minPrice=2147483648&maxPrice=2147483647&m

Nybolig We have found 412 properties that might be something for you.

Sort by: Select sort




Kålagervej 24,
2300 Copenhagen S

177 m² 6 109 days Save

Type: Villa Cash price: 8,500,000

Nybolig




Strandlodsvej 18 C2
2300 Copenhagen S

127 m² 6 309 days Save

Type: Townhouse Cash: 4795000

Nybolig




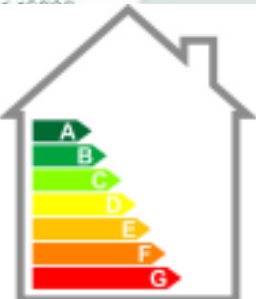
Weidekampsgade 57 5 2
2300 Copenhagen S

79 m² 2 73 days Save

Type: Condo Cash: 3,995,000

Nybolig


Select



Real estate search for Copenhagen

Energy Efficient Home (Label A)

www.nybolig.dk/ejerlejlighed/2300/weidekampsgade/260369/08tm0109



Explore home

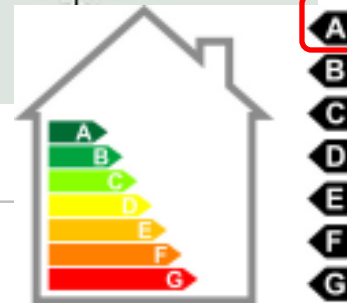
Weidekampsgade 57, 5. 2.
2300 Copenhagen S

type	Apartment
Size	79
cash price	3149000
Owner Per capita spending, ind.	2,213

- > Come out and see the property
- > Make an offer
- ↓ Get the documents
- ♥ Save

Monthly energy bill: kr 2213
Monthly energy bill: RM1307 monthly

79 m² 2 5th floor 2006 **A** -3%



Real estate search for Copenhagen

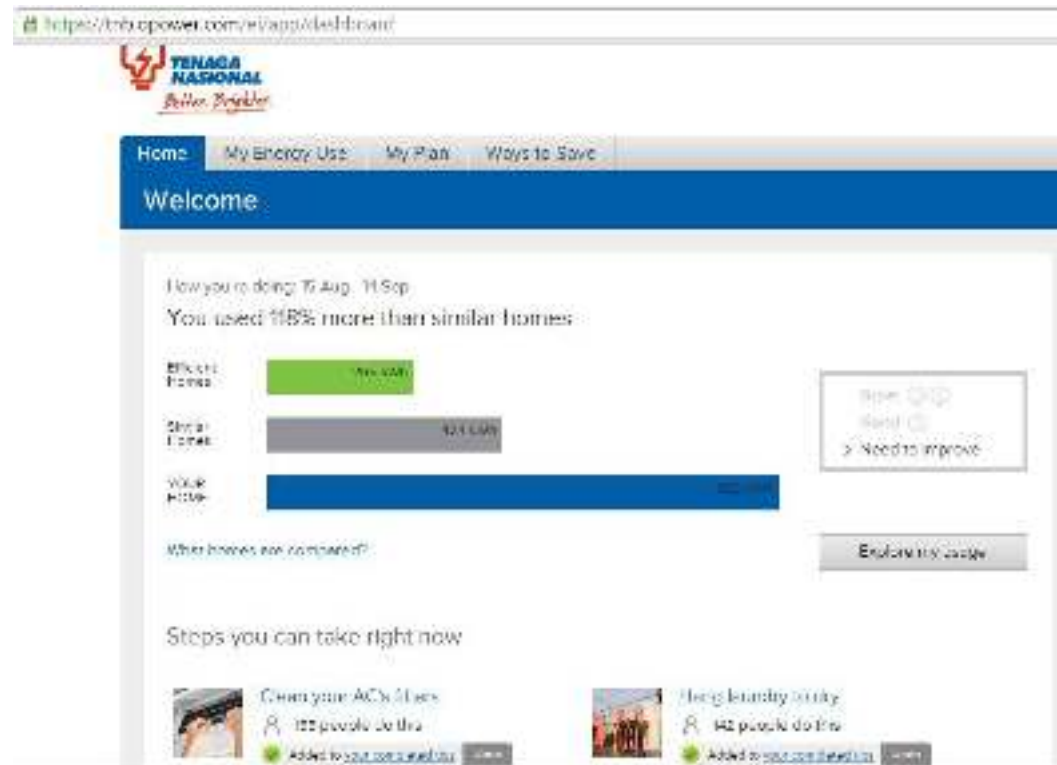
Energy Efficient Building Labelling in Malaysia

Energy Labelling of Buildings in Malaysia in progress

Mandatory energy label for government buildings
(launched 2019)



TNB's Home Energy Report gives comparison of your energy bill to that of your neighbours
(launched 2015)



Energy Efficient Retrofit of Residential Building

Night Ventilation: 2°C lower temperature

real measurements done on houses in Malaysia



Kampung house

No air-con

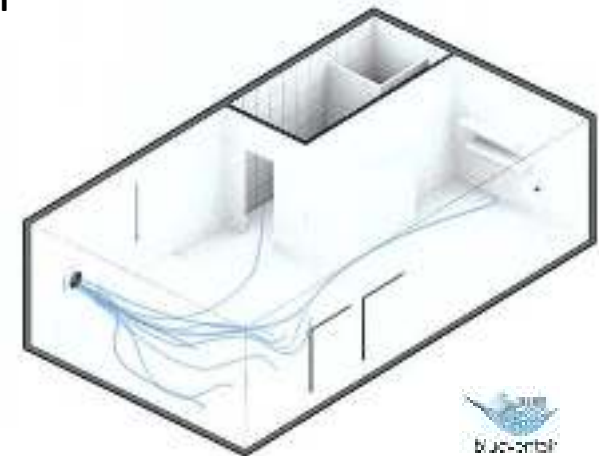
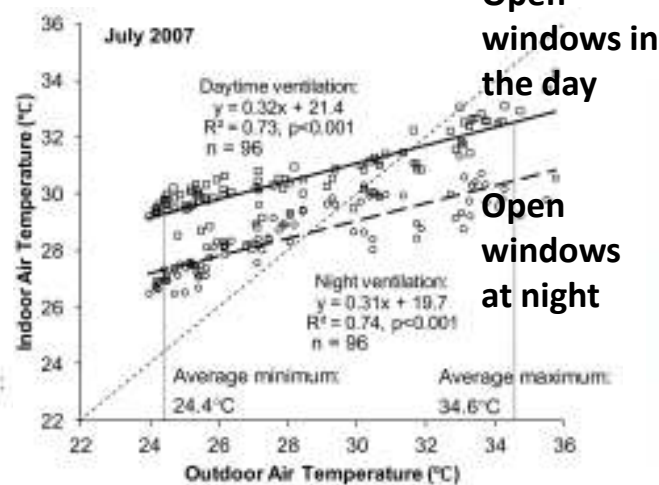
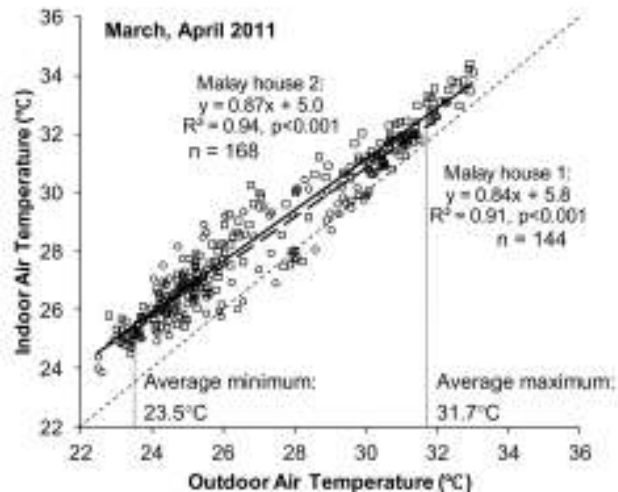


Terraced house

No air-con



Mechanical night time ventilator with mosquito net and/or air filter for haze



Energy Efficient Retrofit of Air-conditioned building by different approach to Thermal Comfort

New approach to Thermal Comfort: Hybrid Ventilation

Predicted Mean Vote (PMV)

6 Factors

- Garment Insulation
- Activity Metabolic Rate
- Air Speed
- Air Temperature
- Radiant Temperature
- Humidity

HYBRID VENTILATION:
Air-con with fans



*Air and Radiant Temperature can be represented by a single value called Operative Temperature.

Thermal Comfort Input Parameters For Hybrid Spaces

CLO Level

- Briefs + Socks + Long-sleeve Shirt + Trousers = 0.56 (Conservative)
- Briefs + Socks + Short-sleeve Shirt + Trousers = 0.50 (Realistic)

Activity Level

- Office: Typing = 1.1
- Studio: Standing = 1.4

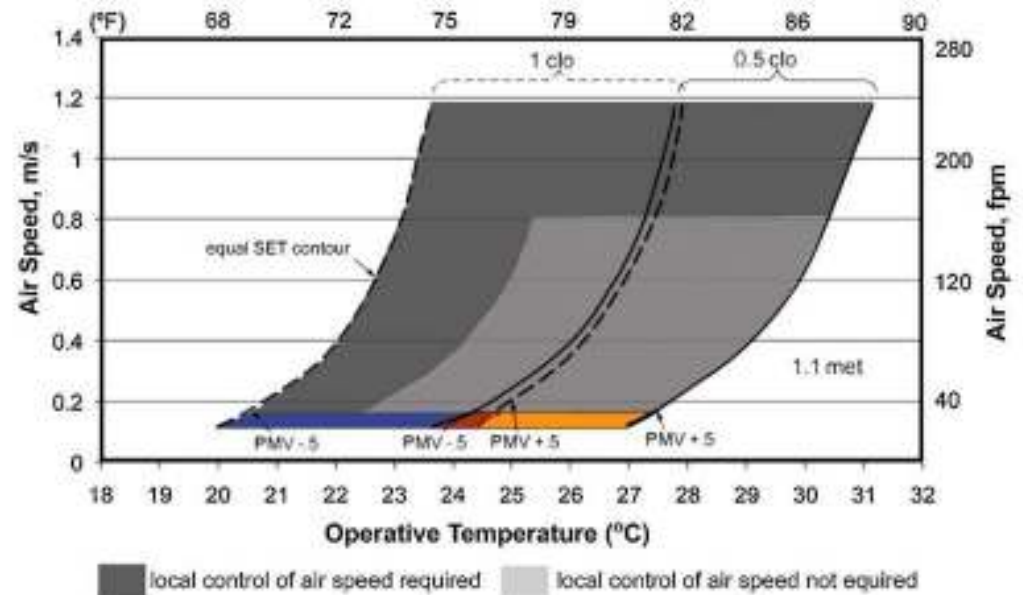


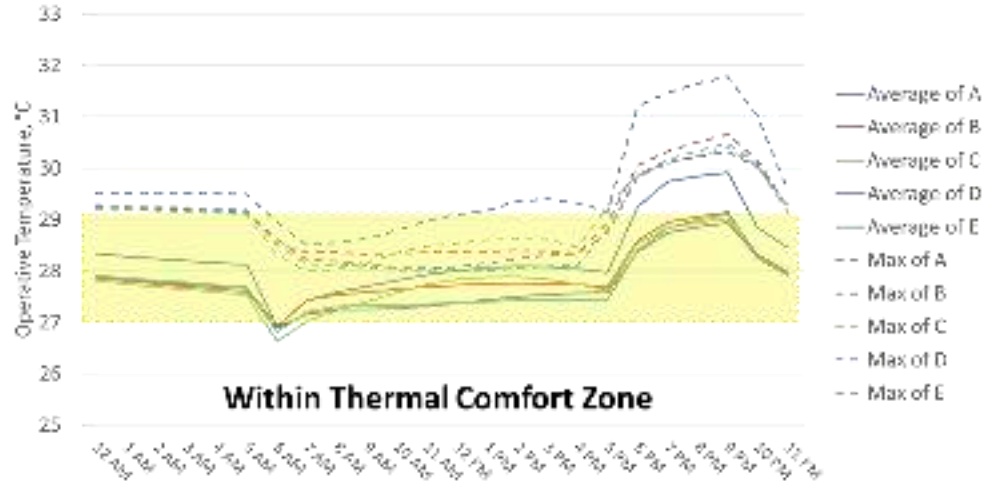
Fig. 5. Acceptable ranges of operative temperature and air speeds, reproduced from [24].

Thermal Comfort

(annual simulation for hybrid ventilation space)



L2 Knuckle Operative Temperature, °C vs Time

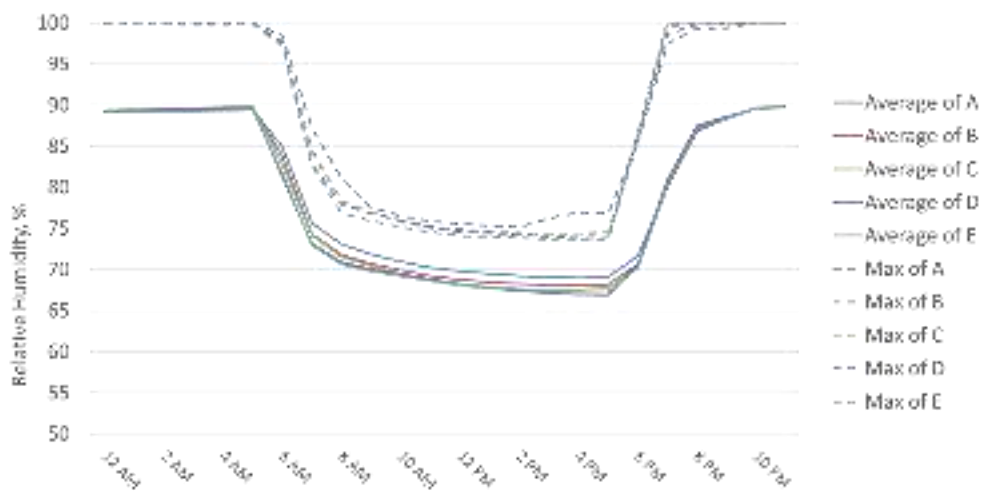


Design Air Temperature Rang

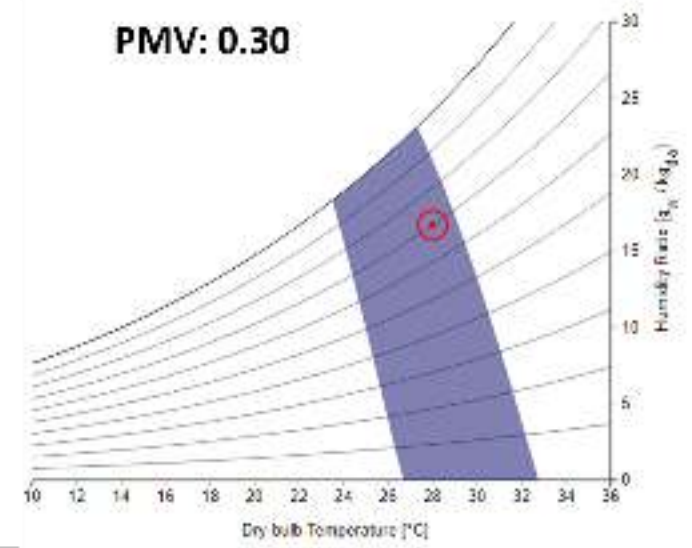
Thermal Comfort Zone Based on
 MET: 1.2
 CLO: 0.56

Operative Temperature: 28°C
 Relative Humidity 70%
 Air Speed: 0.7 m/s

L2 Knuckle Relative Humidity, % vs Time

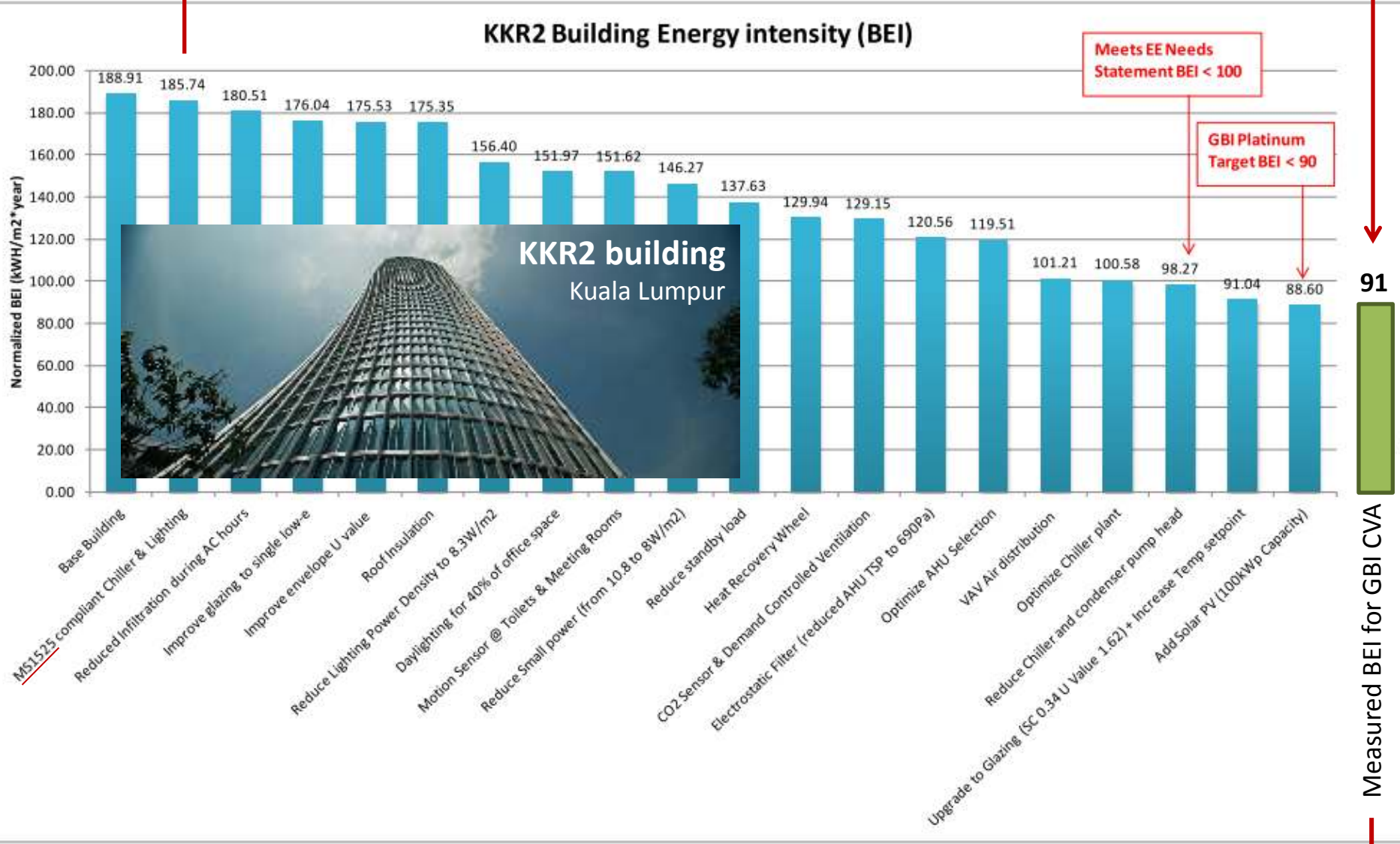


PMV: 0.30



Energy Efficient Office Building
51% more energy efficient
than the MS1525 standard

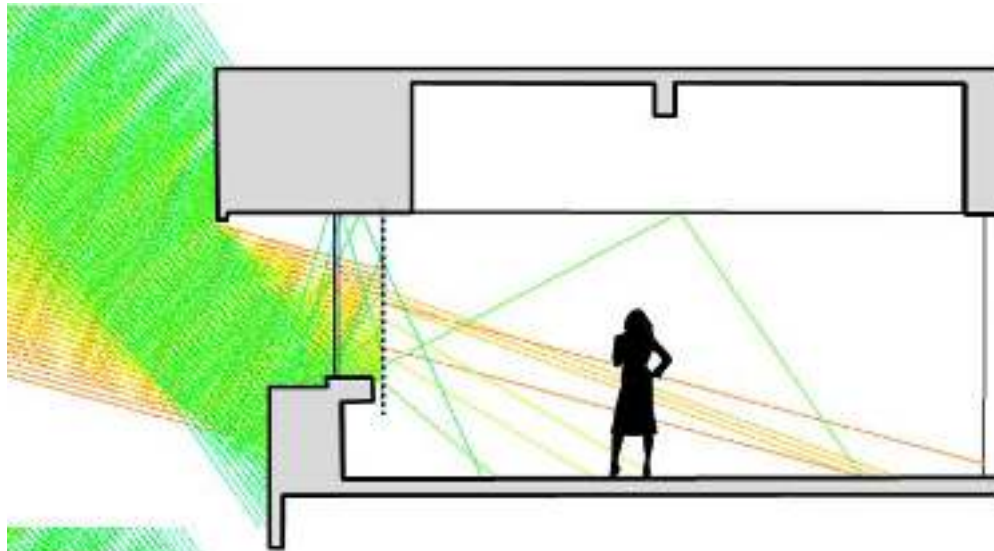
51% lower energy consumption than MS1525



Annual energy savings of RM2.4 million

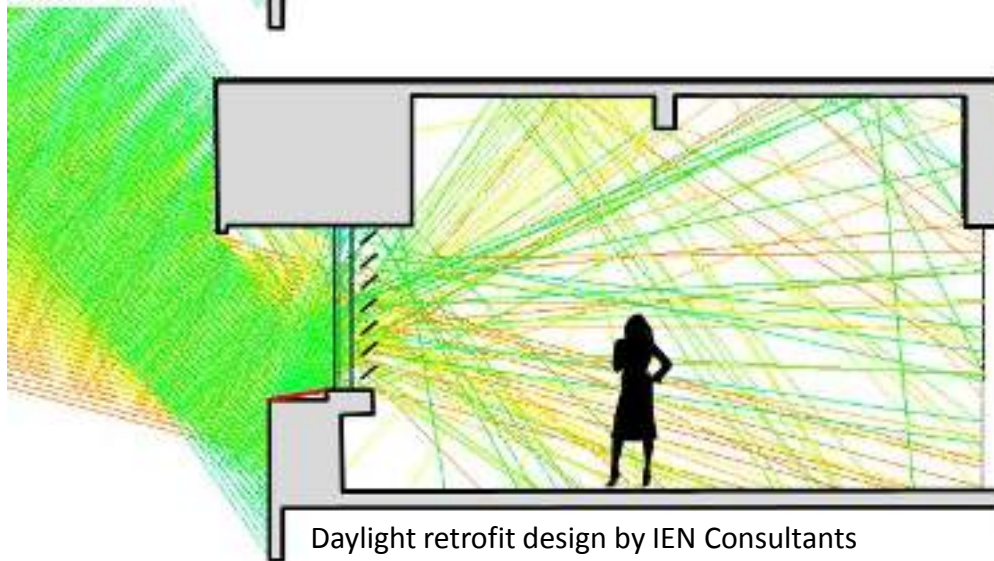
**Energy Efficient Retrofit
of
office building
(53% measured energy savings)**

Retrofit & Improved Thermal Comfort



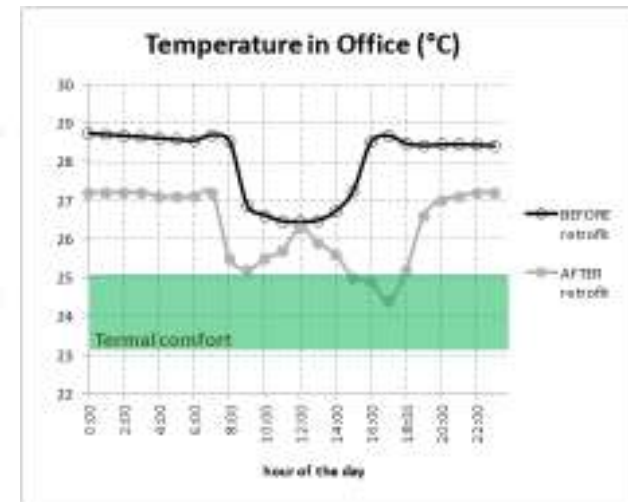
BEFORE RETROFIT

- Vertical blinds blocking most of the daylight
- Suspended ceiling



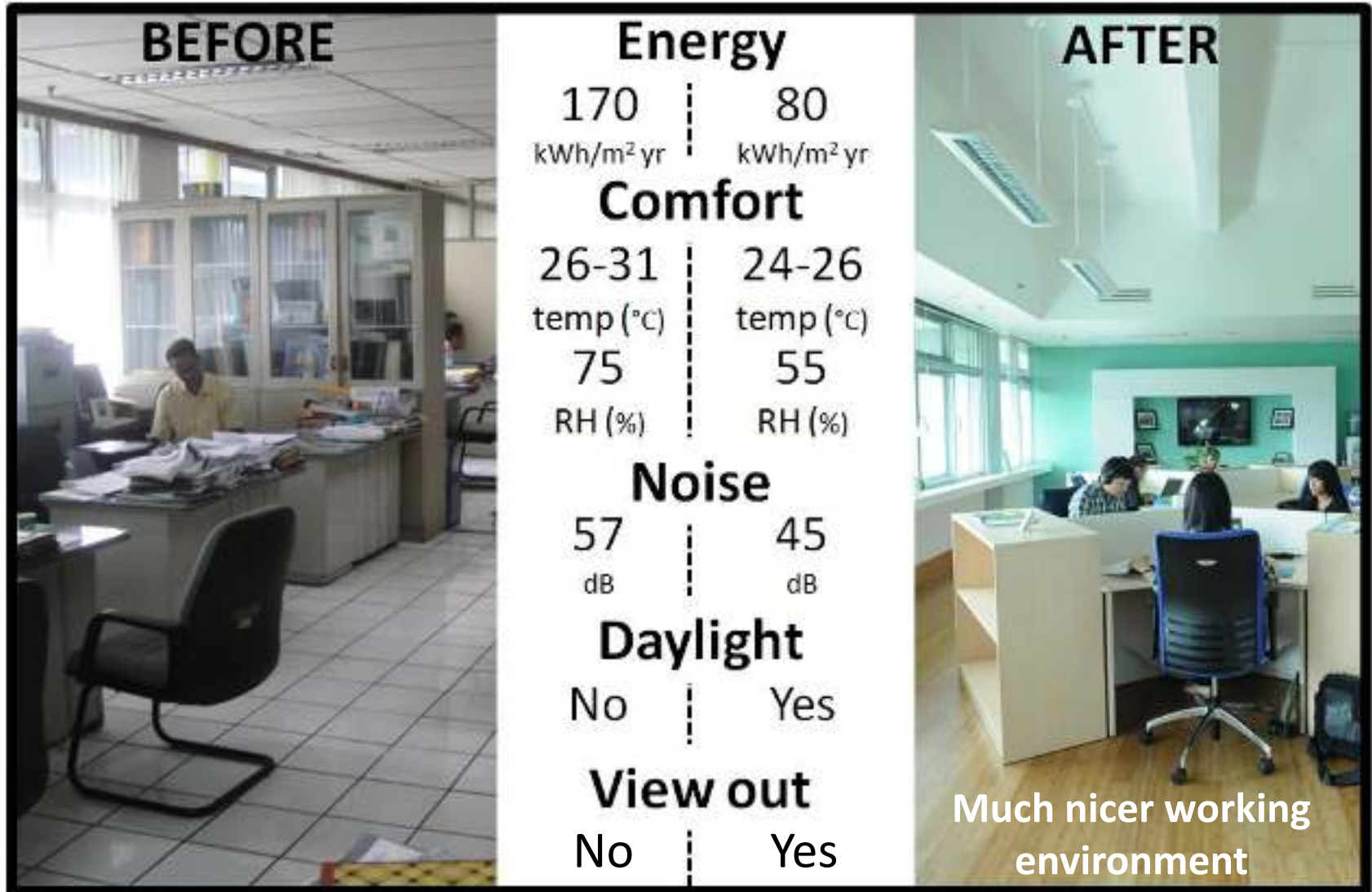
AFTER RETROFIT

- Mirror lightshelf on external ledge reflecting diffuse daylight onto the high ceiling (suspended ceiling removed)
- Perforate venetian blinds
- Extra window pane



- MEP retrofit: Energy Efficient chiller (VRF) and demand side ventilation with CO₂ sensors

53% Measured Energy Savings



53% Measured Energy Savings



Malaysian Office Workers: Unproductive 66 days per year!

Amount of time that average Malaysian worker is either absent or suffering from presenteeism

NB. The UK figure is only 30 days per year

**MOST EMPLOYERS DO NOT REALISE THAT
HEALTH IS WEALTH...**



**EMPLOYEES UNDER-PERFORMING IN POOR WORKING ENVIRONMENT DESPITE
81% OF COST ARE GOING TO SALARIES**

In Conclusion:

Buildings are like a leaky bucket with lots of unnecessary wastages

ENERGY SUPPLY
(renewable) energy



ENERGY STORAGE
electric cars/batteries/thermal

ENERGY DEMAND

**ENERGY
WASTAGE**

Let's plug the holes!

And make buildings more healthy!



Thank you



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IEN Consultants Expert Staff



IEN Consultants

Hover the cursor over a person's head to see a short presentation and click to see a detailed personal description or click on a name in the list below.

We are a diverse group of individuals

5 different degrees
6 different nationalities
4 LEED AP
8 GBI Facilitators

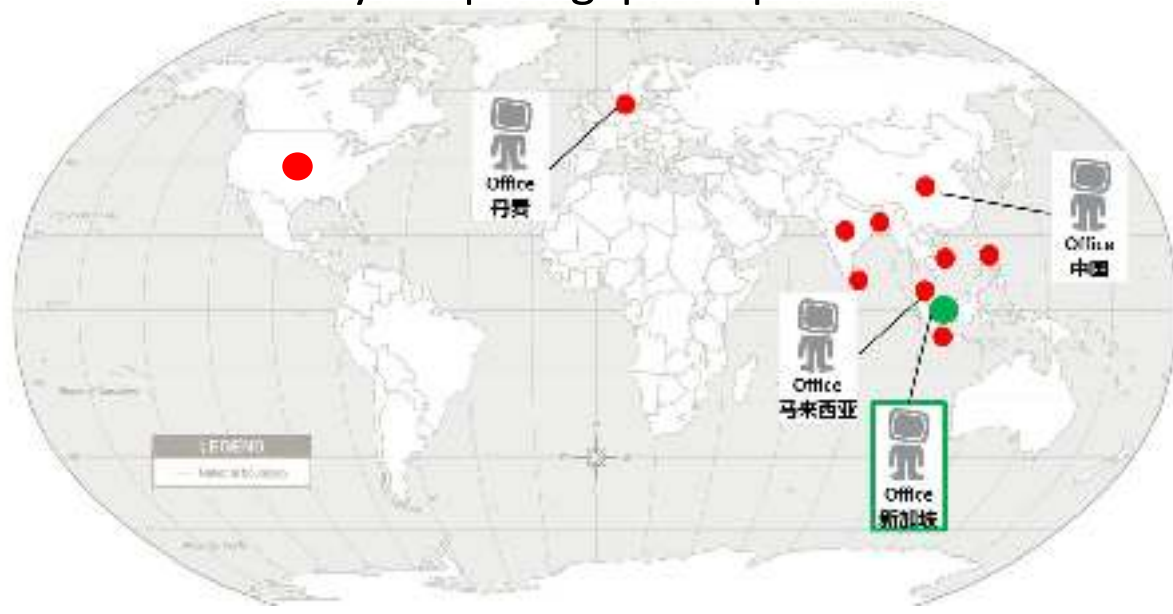
IEN Consultants

Malaysia | Singapore | China

3.2 million square meters
of green building space



Gregers (MD) Poul (Founder)



OFFICES 	DEVELOPMENTS 	RETAIL 	EDUCATIONAL 	FACTORIES & R&D
HOTELS 	HEALTHCARE & BIOTECH 	OFFICE RETROFITS 	AIRPORTS 	RESIDENTIAL