Expensive
not to go green

powering positive change

Gregers Reimann

Managing director, IEN Consultants

www.ien-consultants.com

Singapore | Malaysia | China

Contents

I. Three fundamental observations

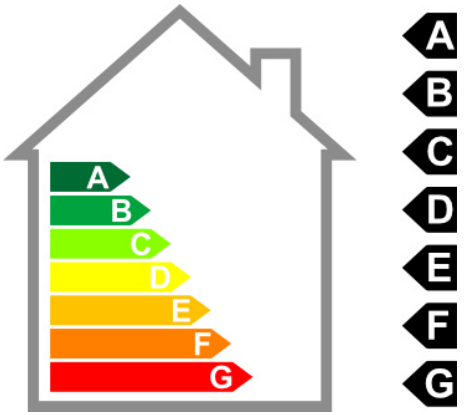
II. The economic argument for energy efficiency

III. Energy efficient and daylight solutions for new & retrofitted buildings

IV. Energy Efficient Building Case Studies & Innovations

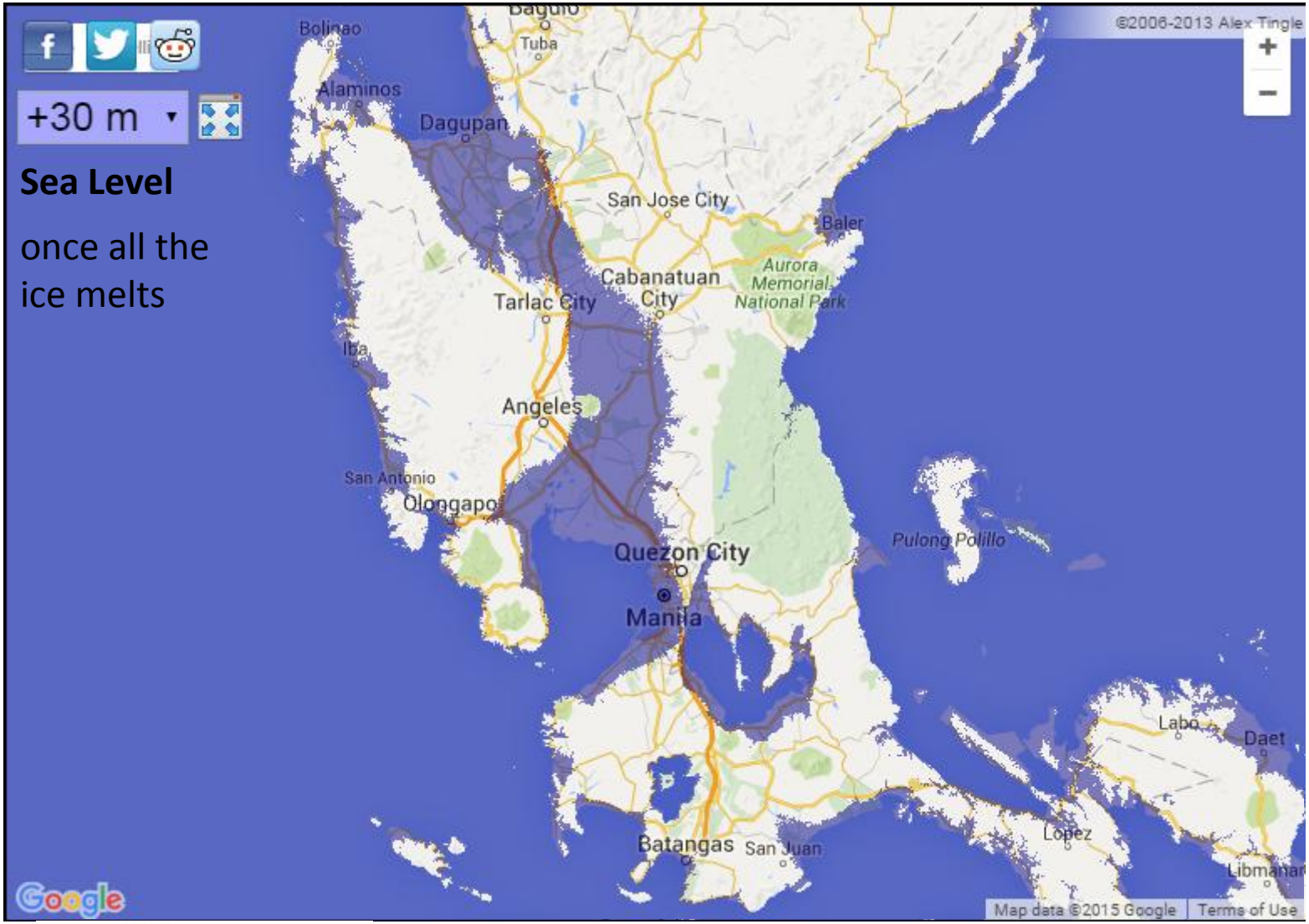
”If you’re involved in a new project and you are not making it as green and low energy as possible, it will be functionally obsolete the day it opens and economically disadvantaged for its entire lifetime”

Mr. Jerry Yudelson (2008)
national board member
US Green Building Council



PHILIPPINES – a nation of 7000 islands?

not anymore if climate change and sea level rise are not solved!



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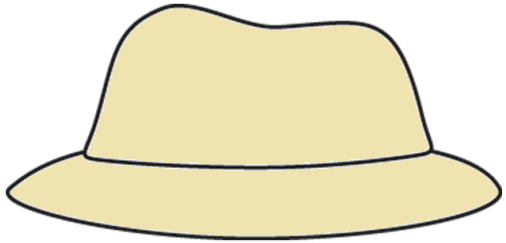
ENERGY EFFICIENCY

Three Fundamental Observations

GET A HAT

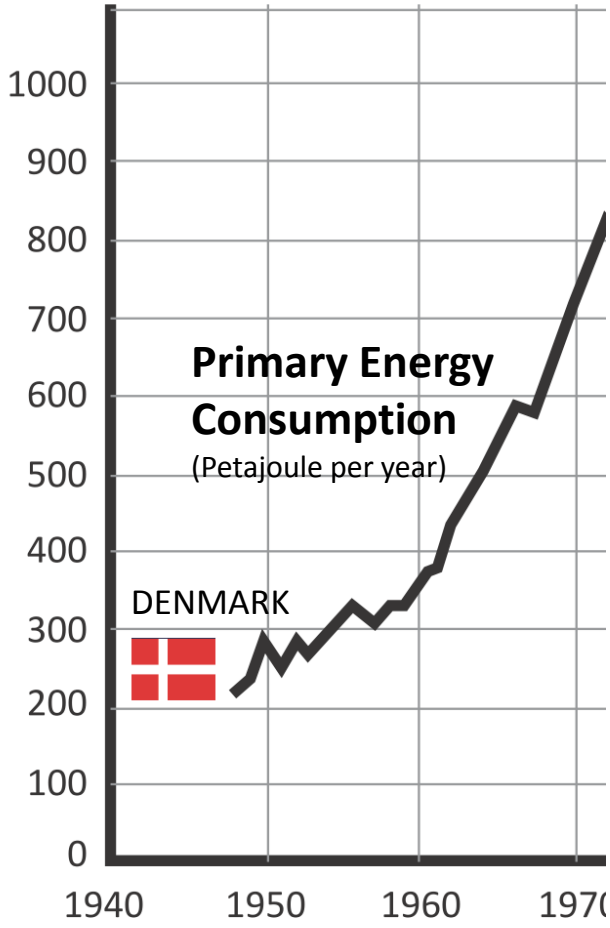


LOCAL SOLUTIONS

DON'T OVER-PACK

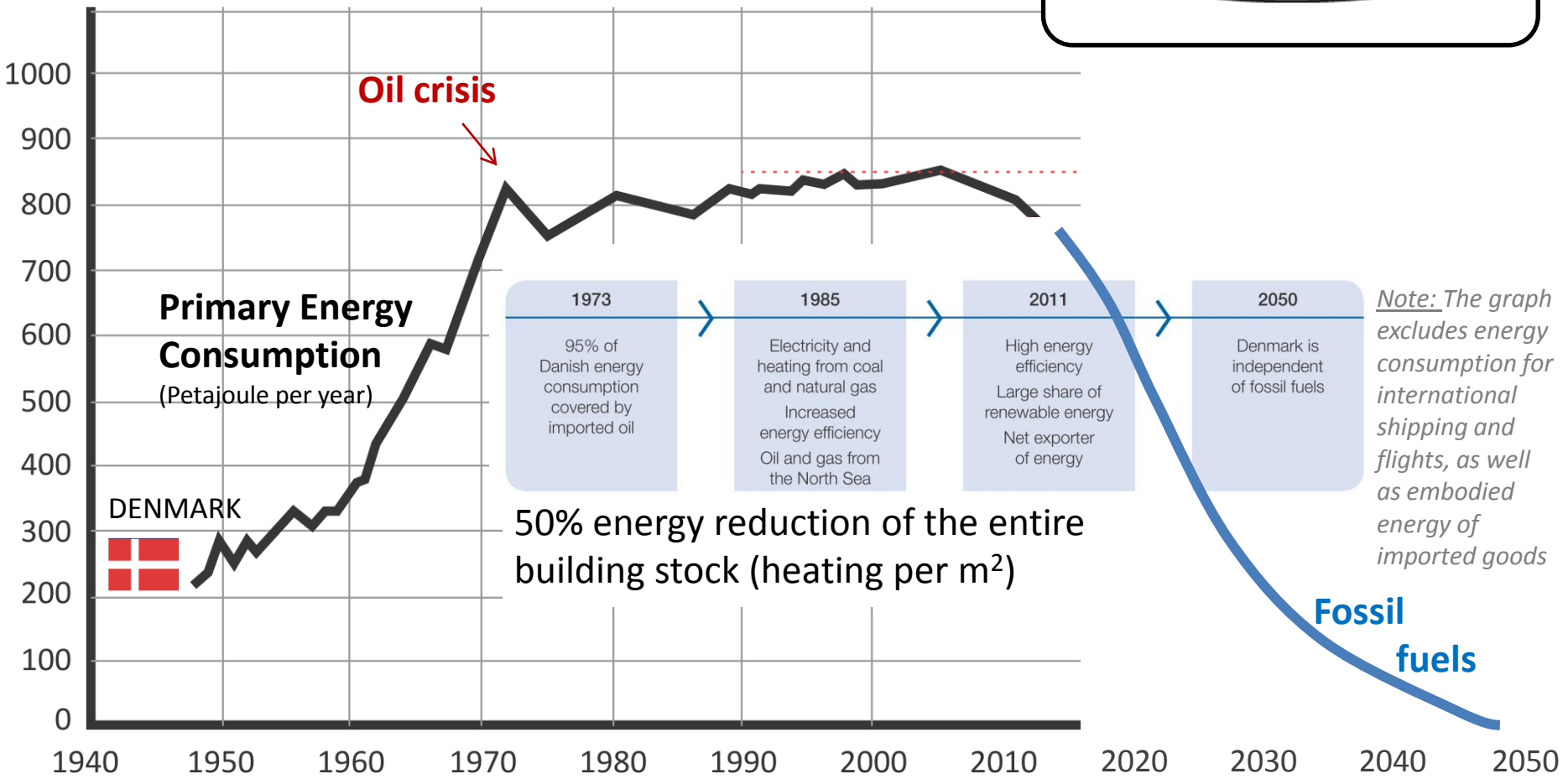
ENERGY EFFICIENCY

Three Fundamental Observations



ENERGY EFFICIENCY

Three Fundamental Observations

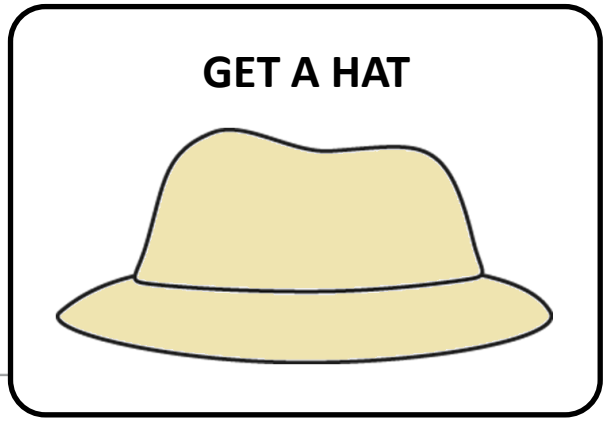


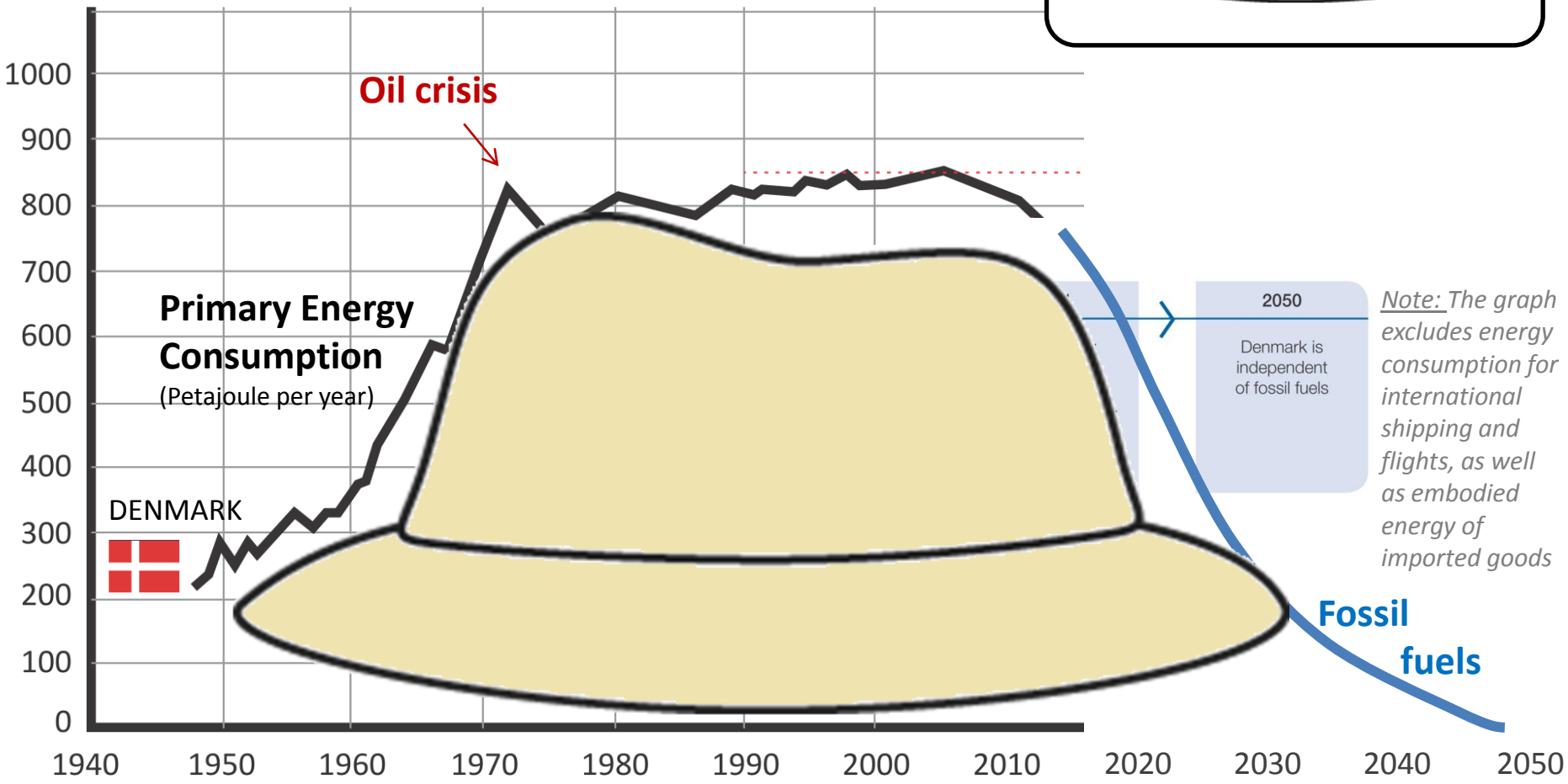
Note: The graph excludes energy consumption for international shipping and flights, as well as embodied energy of imported goods

Fossil fuel fraction: **97%** **80%** **0%**

ENERGY EFFICIENCY

Three Fundamental Observations





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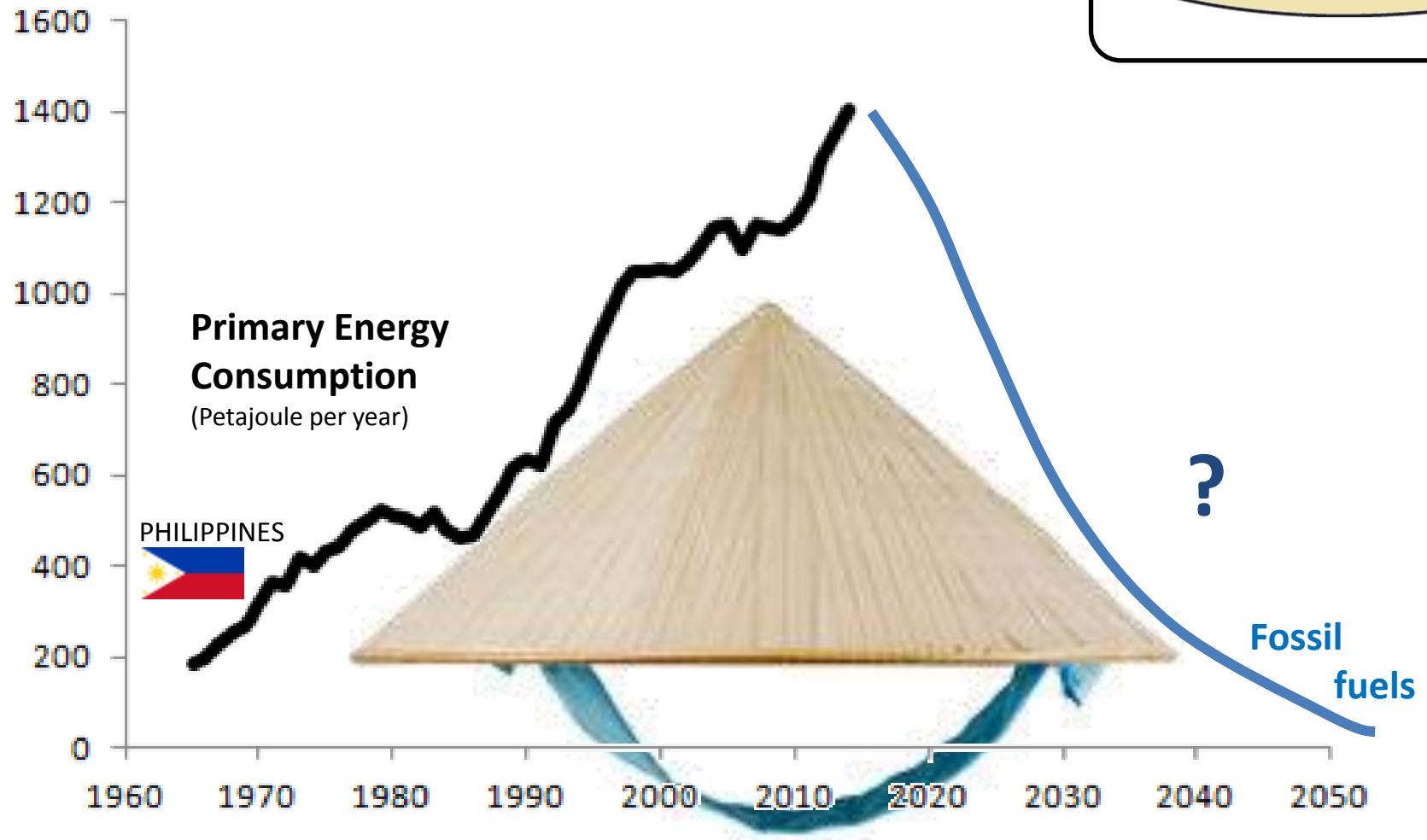
ENERGY EFFICIENCY

Three Fundamental Observations



ENERGY EFFICIENCY

Three Fundamental Observations

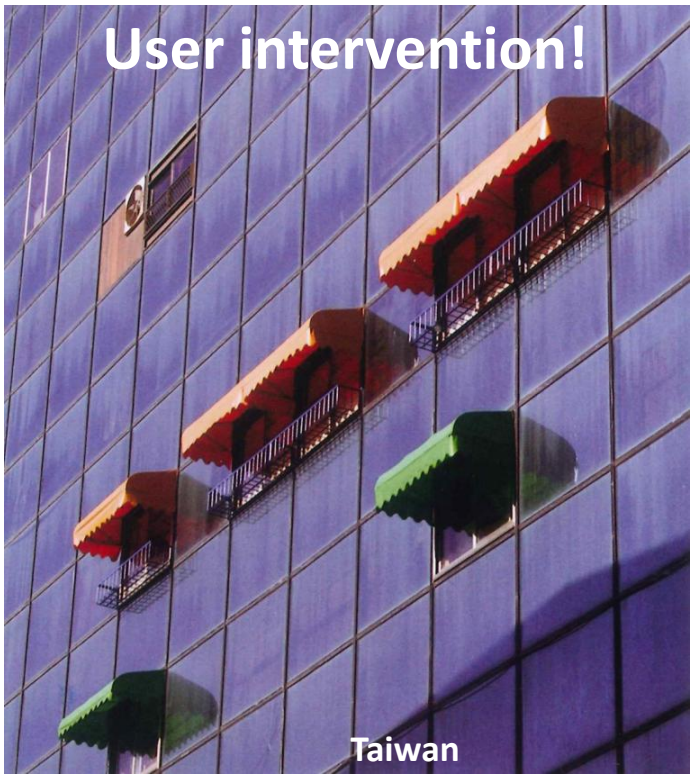
Full height glass

Wonderful design!?

Glary & hot

Blinds everywhere

LOCAL SOLUTIONS



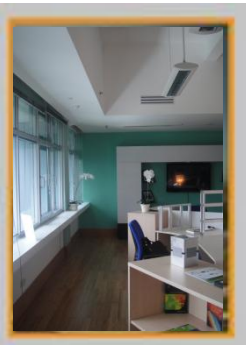
Energy Efficient Buildings with Good Payback time

Case studies from the South East Asian countries

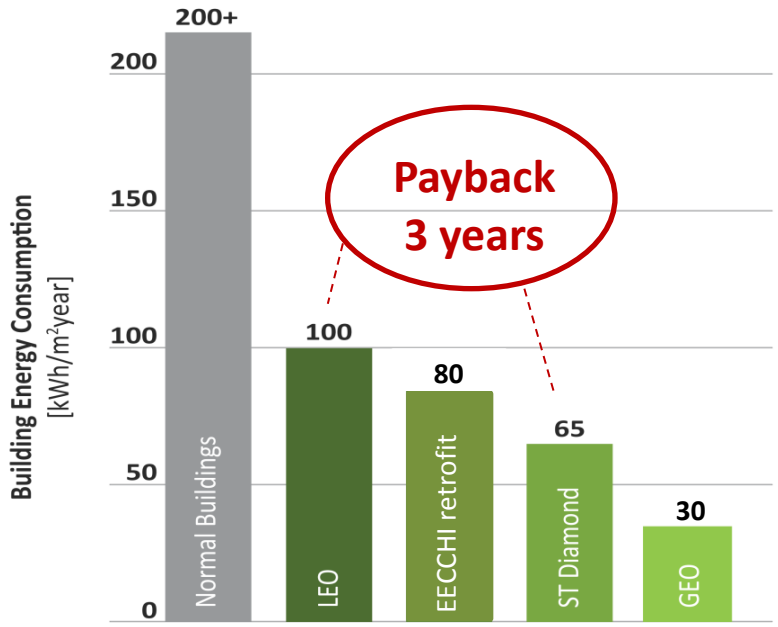
LEO Building

GEO Building

ST Diamond Building



EECCHI retrofit



Energy Consumption of Green Office Buildings

Measured data for New and Retrofitted Buildings by IEN Consultants

Completion year	-	2004	2010	2010	2007

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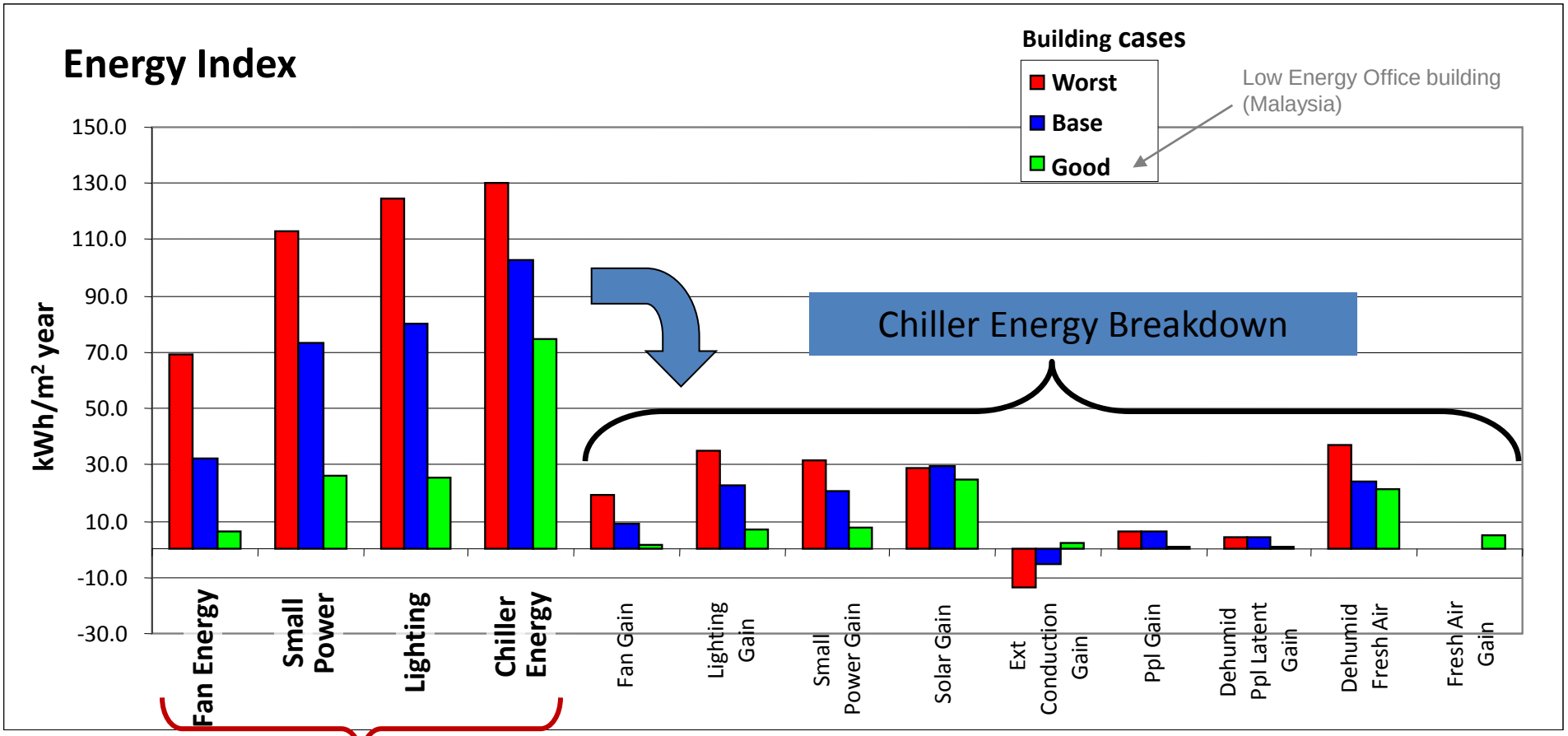
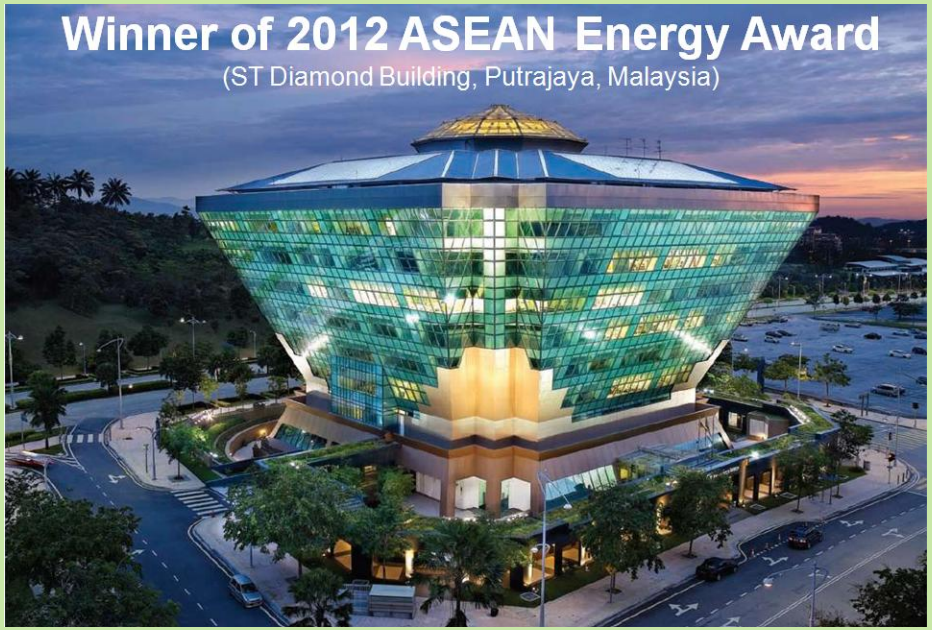
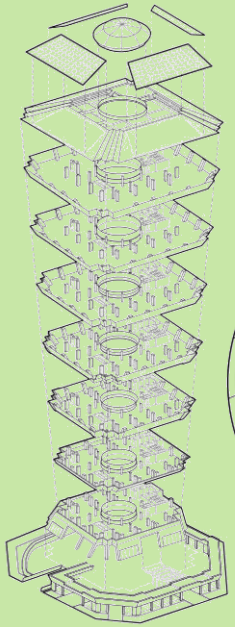
BUILDING ENERGY BREAK-DOWN

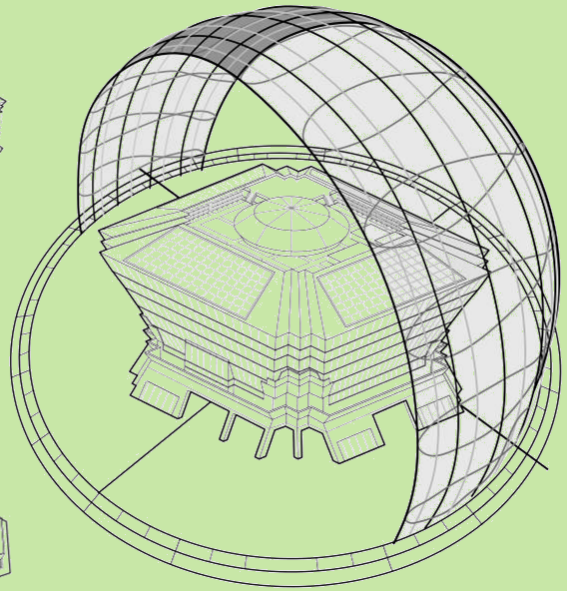
Understanding why the air-conditioner has to run in the first place



Case study no. 1







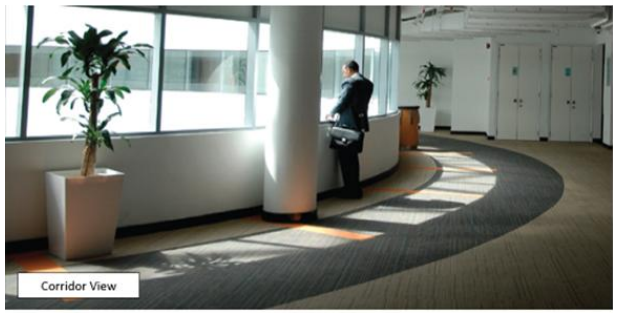
Energy Efficient Office case study

DIAMOND BUILDING

(SURUHANGJAYA TENAGA, 2010)

1/3 Energy Consumption

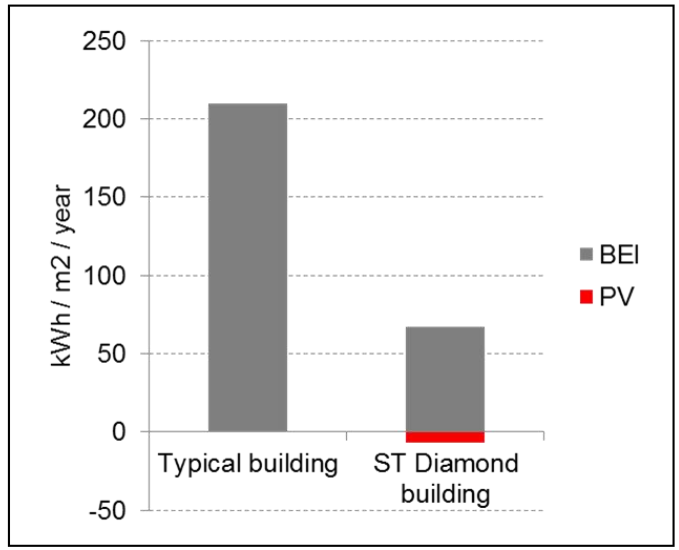
ST Diamond Building



Key Data
Gross Floor Are: 14,000sqm
Year of Completion: 2010
Building Energy Intensity: 69kWh/m2*year
Total Construction Cost: RM60mil
Additional EE Cost: 3.2%
Payback Period: **< 3years**
IRR: 34% (based on 7year Lease Term)

GBI **Platinum**

Green Mark **Platinum**



AWARDS:

2012 ASEAN energy award **Winner**

&

2013 ASHRAE Technology Award (2nd place)

DIAMOND BUILDING similar design with Sarawak Longhouse

(in the book “The Cooperation”, 2012)

Malaysia and Denmark's, commitment to the field of

Green Energy in Architecture

as well as in cooperation and capacity building within the field, can be illustrated by the mutually beneficial involvement of IEN Consultants with the development of this field in Malaysia over the years. IEN Consultants was originally a proprietorship established by a Danish Chief Technical Advisor involved in the identification of energy projects in Malaysia. When the company took on the LEO Building projects it gained recognition in Malaysia and IEN Consultants managed to build up a team of consultants, most of them Malaysian, who with their experience on the LEO Building, became known further afield. This helped gain further commissions on such projects as the Green Tech Building and what has become known as The Diamond Building in Putrajaya.

“Green Buildings” are perceived to be expensive, both because of the costs of employing the expertise necessary to develop and refine the building and system designs, and because of the relatively high capital costs of green technology items. It takes time for reduced operating costs, which come with reduced energy usage, to counterbalance the increased capital investment and this has been a significant brake on development worldwide. However, given that approximately 40% of worldwide carbon emissions come from buildings, it is clear that the there is a need for the “greening” of buildings to make a significant contribution to carbon reductions.

As a result much effort has gone into the dissemination of green ideas to the Malaysian building industry, including the idea that the advantages of reduction of whole life costs of buildings as opposed to just capital costs are worthwhile. The fact that some “green” input to building design in Malaysia has moved from a subsidised base, using for example Danish funding for the LEO Building and European Union funding for the Green tech Office Building, to a fully Malaysia funded base in the case of the so-called “Diamond Building” indicates some success in changing attitudes to operating costs vs capital costs ascribed to “Green Buildings”.

Improved energy efficiency is already recognised by the Malaysian government to be more important than mere certification under the Green Building Index (GBI) scheme. That scheme therefore carries tax and stamp duty benefits to encourage the real application of green ideas in the design and operation of buildings.

Beyond this, IEN Consultants is now involved with a UNDP funded project, with the Ministry of Works, to promote low carbon buildings in Malaysia. It is hoped, amongst other things that it will lead to a building code by 2015 specifying much lower carbon footprints even than the LEO Building or the Diamond Building.

Modern sunshade
Diamond Building in festive season lighting

Traditional sunshade
Rungus Longhouse, Sabah

Another major area of involvement was in

Capacity Building for Malaysian Industry and Academia in EE Building design.

The objective of the scheme, which was implemented by the Ministry of Energy, Communications and Multimedia (now Ministry of Energy, Green Technology and Water), was to develop capacity in the optimisation of energy efficient building design. This was done through training sessions, seminars, specific analysis of existing buildings and design development of new buildings. A key partner in this endeavour was the Public Works Department (JKR) and there was close cooperation with Schools Division and Healthcare Division, so the lessons learned were comprehensive, and the dissemination of the results widespread.

The project produced reports outlining design strategies for new buildings, making lessons learned from the LEO Building described above available to practitioners and academics across Malaysia. The project also produced reports on “Energy Efficiency Promotion: Lessons Learned and Future Activities”, and undertook an evaluation of JKR design standards.

The project certainly raised awareness and improved the country's knowledge base regarding energy efficiency in buildings and made recommendations to Ministry of Energy, Green Technology and Water and JKR to set up demonstration offices, a very successful example of which was in Wisma Damansara.

Result of many <u>SIMULATIONS</u>

Result of many <u>GENERATIONS</u>

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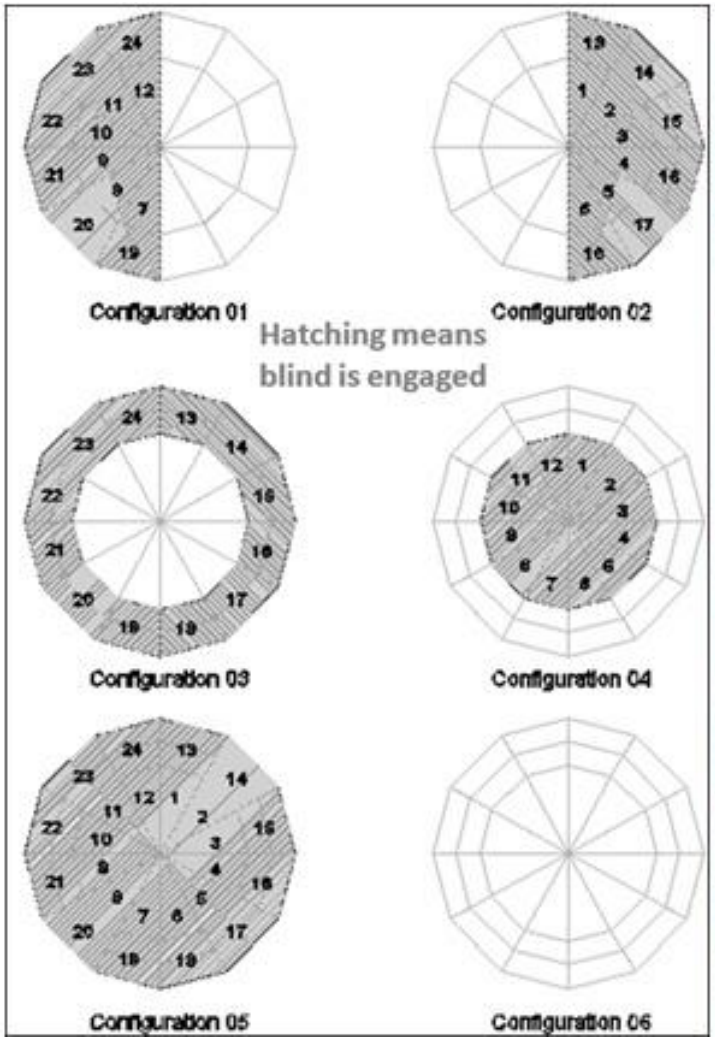
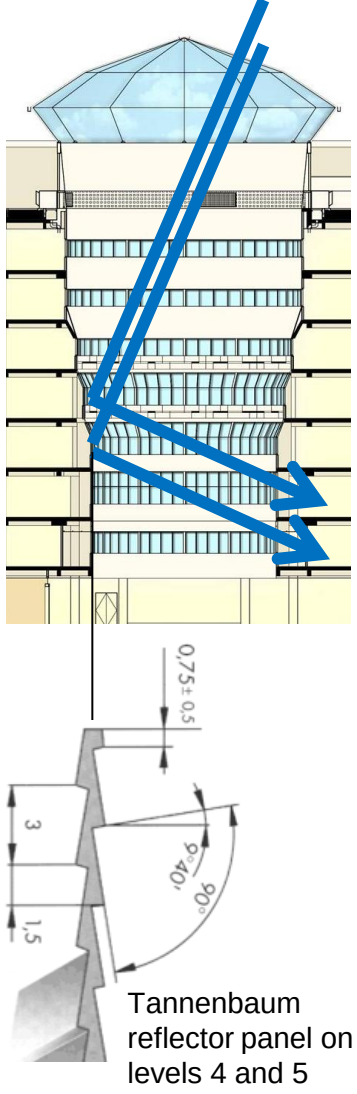
Book available free online:

http://um.dk/da/~/media/Malaysia/Documents/Other/Book%20Finalist%20LR.ashx





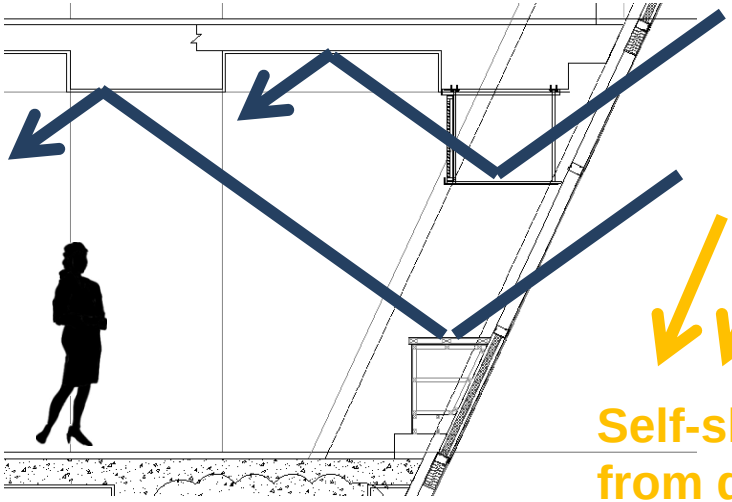
Tannenbaum reflector panel on levels 4 and 5

Atrium Daylight Design

The atrium has been carefully designed optimize daylight utilization for each floor employing the combination of the following three strategies:

1. Automated blind with six different configuration to maintain the appropriate daylighting levels at all times. The blinds with 30% light transmittance are adjusted every 15 minutes and follow a three different control strategies for morning, mid-day and evening
2. The windows size becomes larger deeper into the atrium to cater for lower daylight levels
3. A band of Tannenbaum reflector panels are applied to 4th and 5th floor to deflect daylight across the atrium to 1st and 2nd floor where daylight levels are the lowest. The 'christmas tree' profile reflectors have an inclination of 10° and reflect about 85% of the light in semi-diffuse manner, hence, avoiding visual glare issues for the building occupants.

FACADE

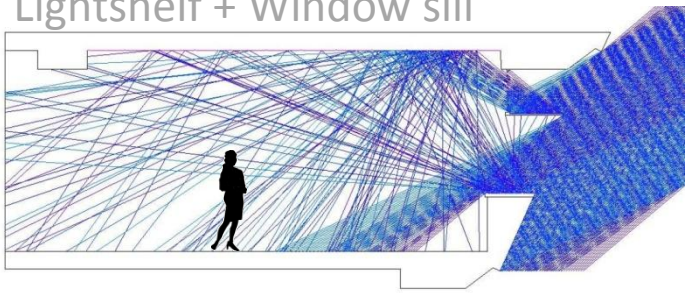


Diffuse light deflected into room by lightshelf and window sill

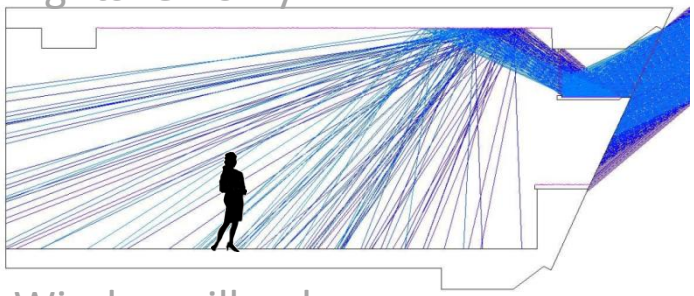
Self-shaded facade from direct sun

LIGHT REFLECTIONS FROM:

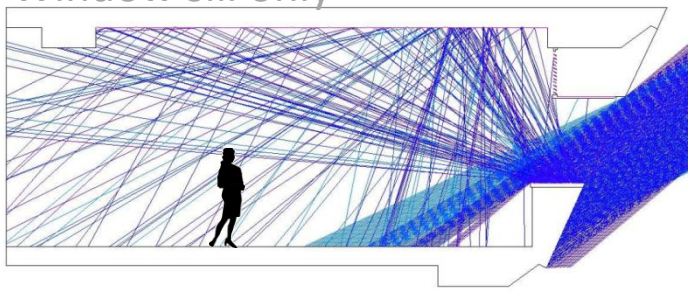
Lightshelf + Window sill



Lightshelf only



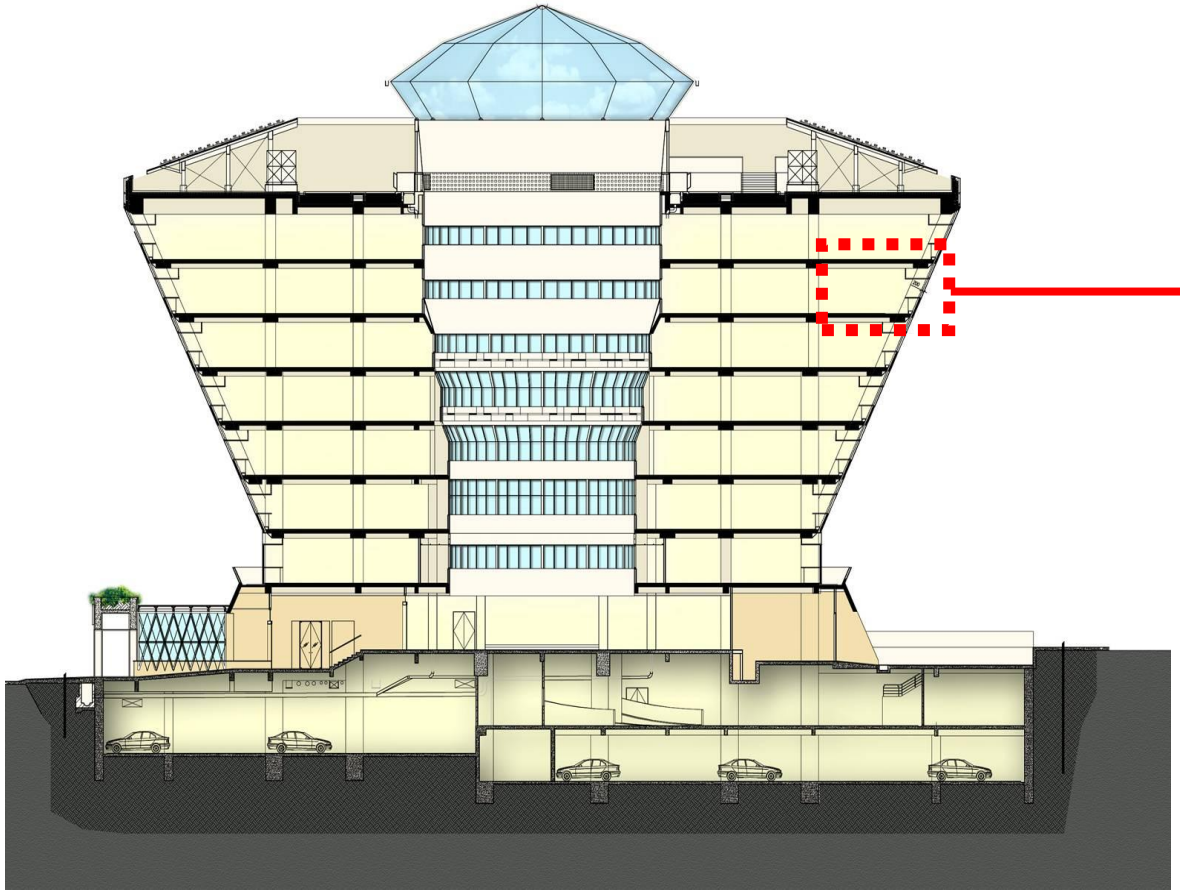
Window sill only



Façade Daylight Design

The building is 50% daylit. The façade daylighting system consists of a mirror lightshelf and a white painted window sill. Both deflect daylight onto the white ceiling for improved daylight distribution until 5 meters from the façade + 2 additional meters of corridor space. Installed office lighting is 8.4 W/m2, but 1-year measurements show consumption of only **0.9 W/m2** showing high reliance on daylighting

Day-Lighting- Office



Mirror lightshelf

Fixed blinds for glare control

Daylight reflected onto ceiling

Floor Slab Cooling in Diamond Building

Floor slab cooling system embedded in RC slab

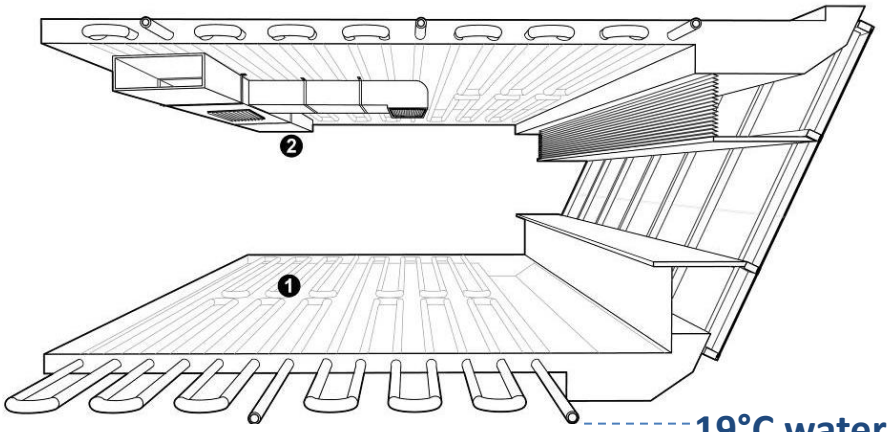
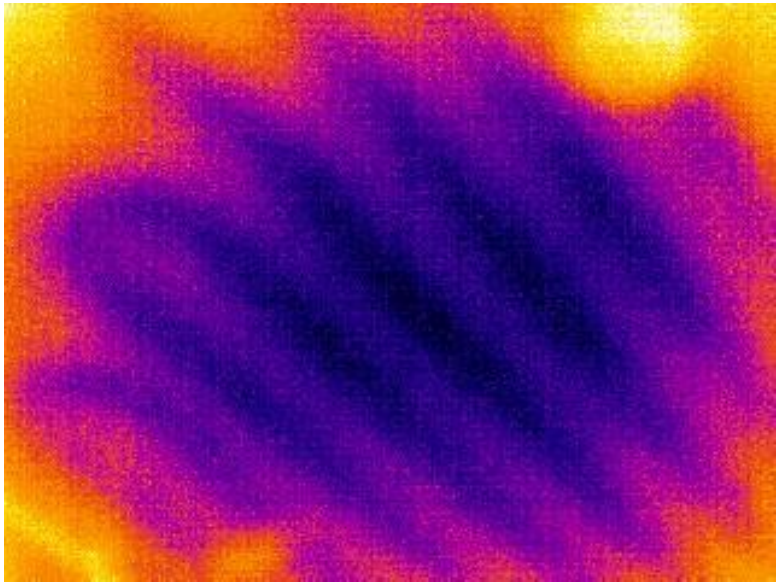
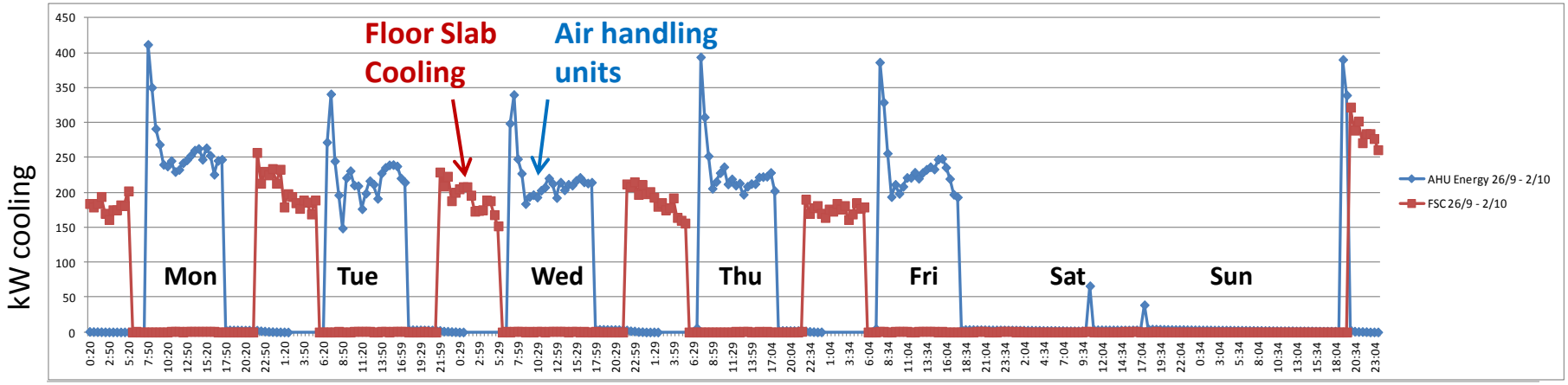


Illustration courtesy of:
Greening Asia – Emerging Principles for Sustainable Architecture.
Copyright: Nirmal Kishnani, 2012. Publisher: FuturArc



Thermographic image of floor slab cooling in ST Diamond
Picture courtesy of: PS Soong, Pureaire



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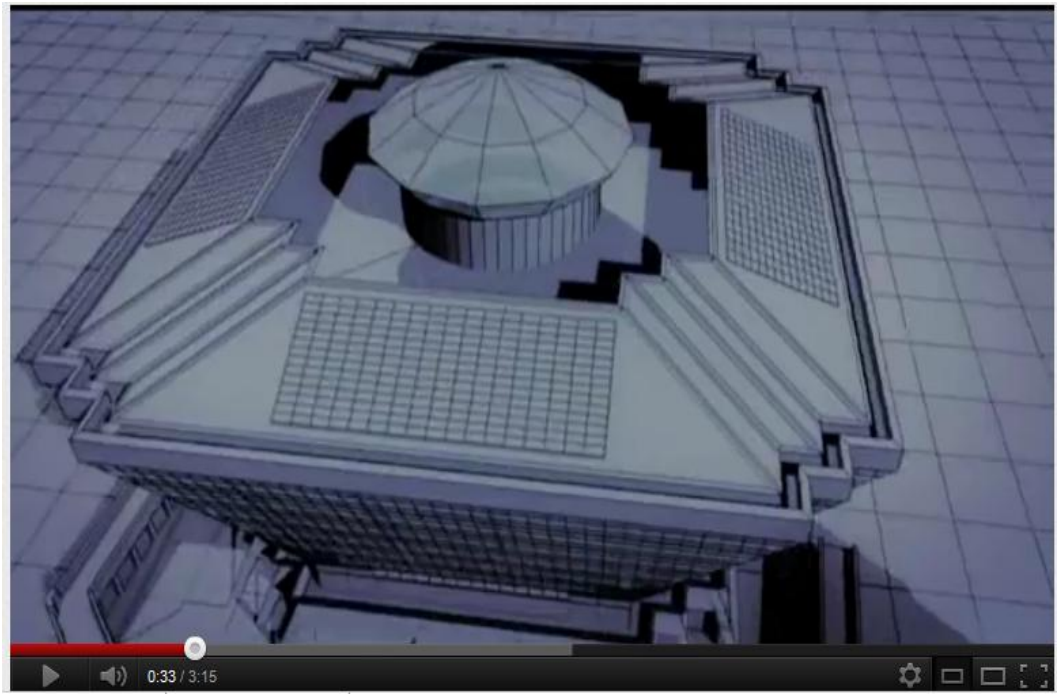
3-minute video



Sustainable Features of ST Diamond Building available at Youtube:

http://www.youtube.com/watch?v=3H_sXCtDayc

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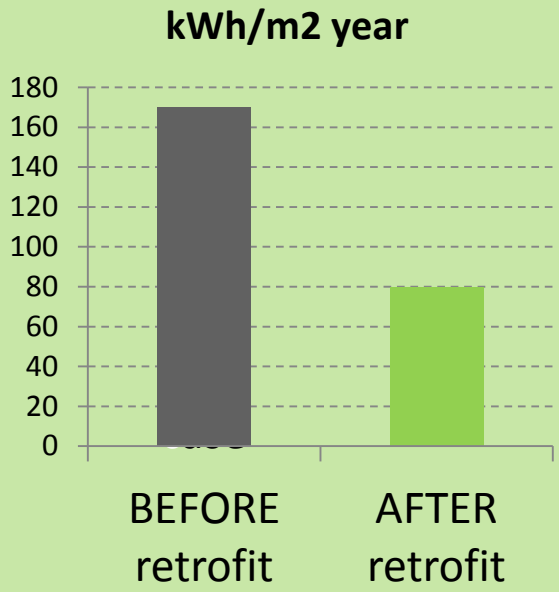
Case study no. 2



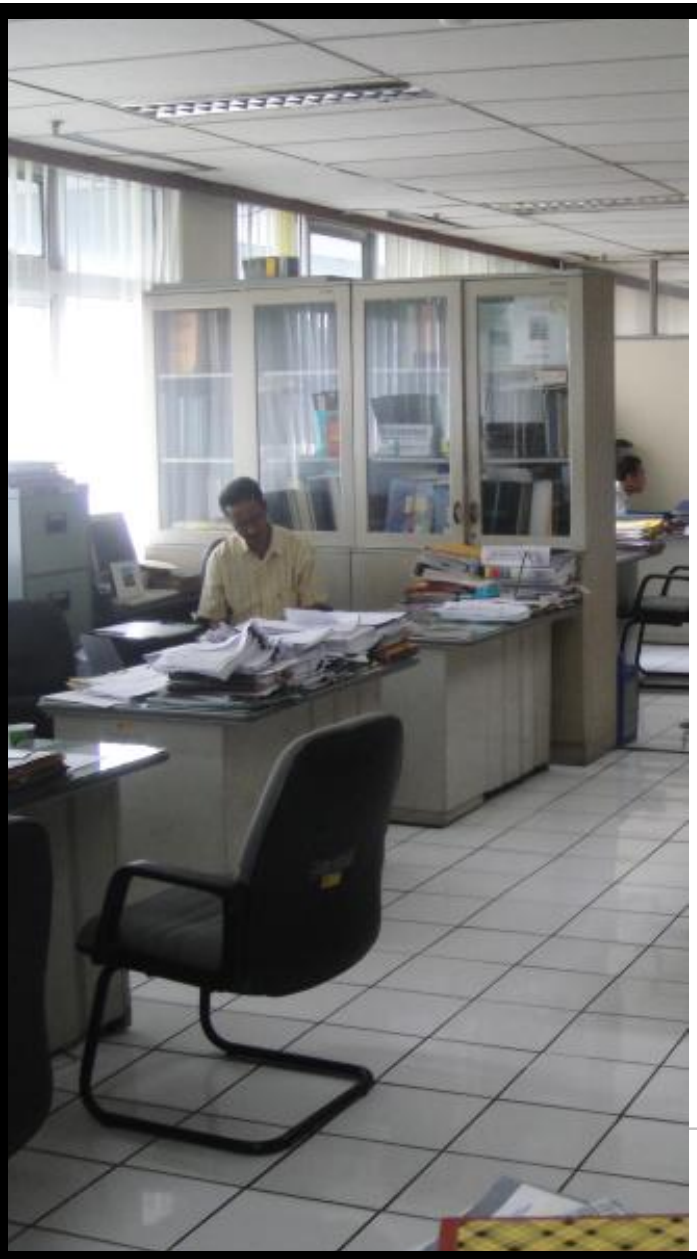
Energy Efficient Retrofit case study

EECCHI OFFICE RETROFIT

(JAKARTA, 2011)

BEFORE

AFTER



Energy

170	80
kWh/m² yr	kWh/m² yr

Comfort

26-31	24-26
temp (°C)	temp (°C)
75	55
RH (%)	RH (%)

Noise

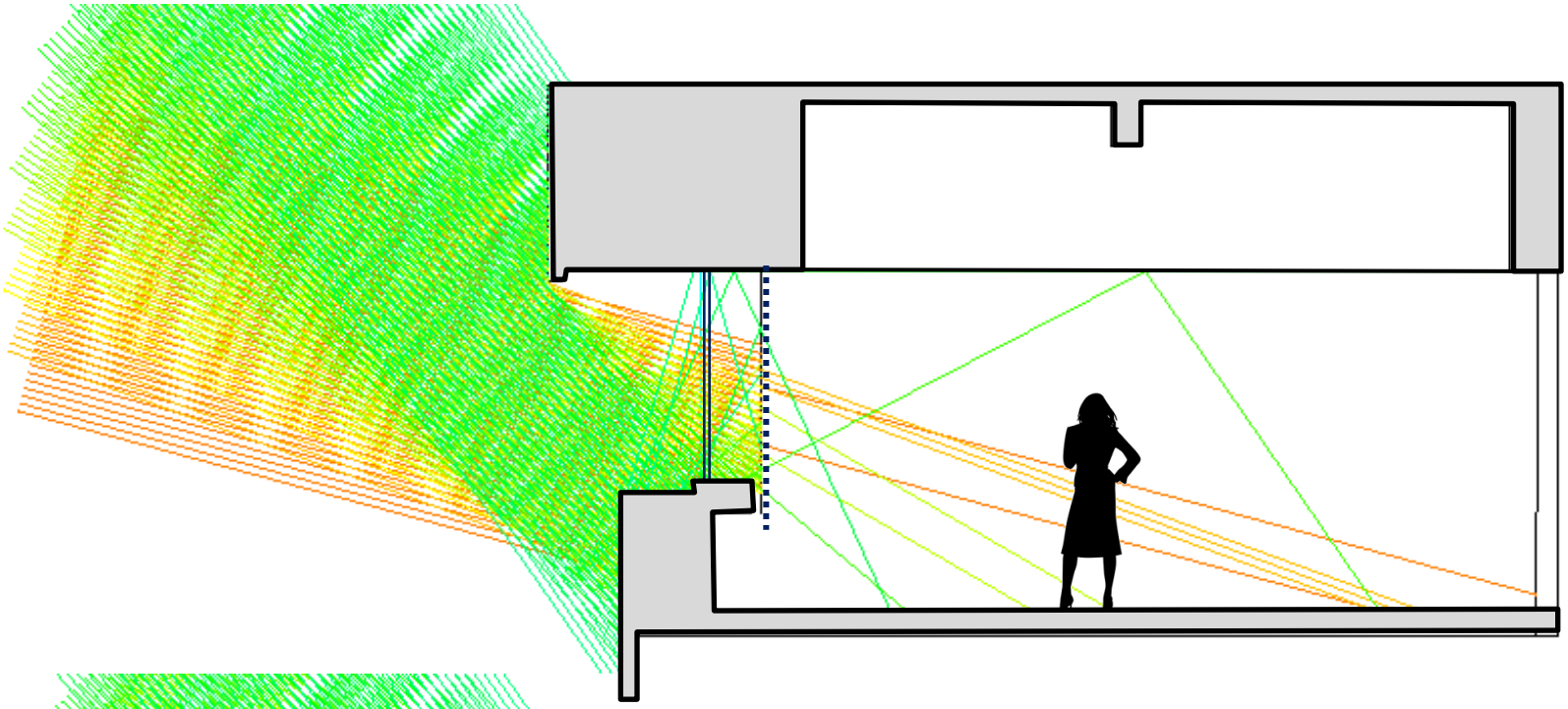
57	53
dB	dB

Daylight

No	Yes

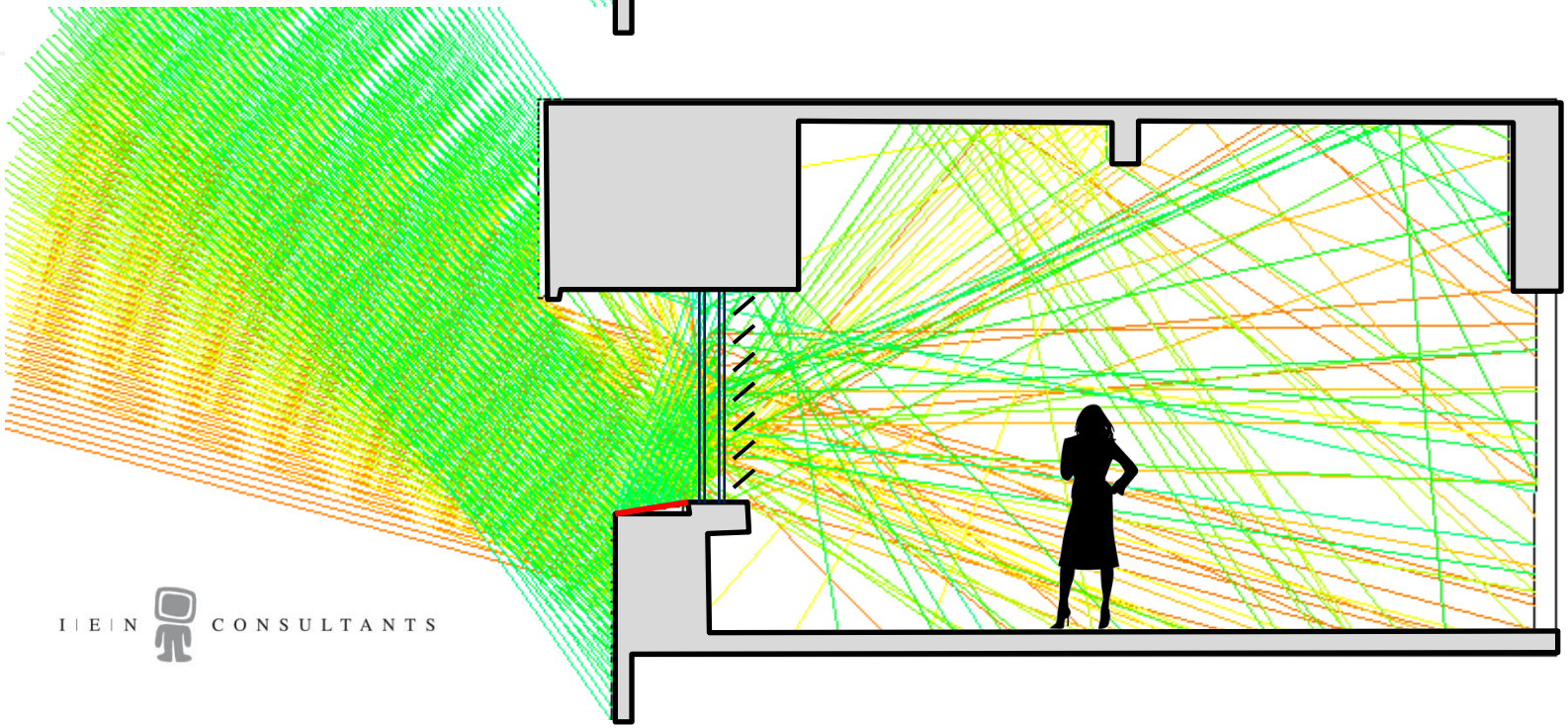
View out

No	Yes



BEFORE RETROFIT

- Vertical blinds blocking most of the daylight
- Suspended ceiling
- Central air-conditioning
- Leaky windows



AFTER RETROFIT

- Mirror lightshelf on external ledge reflecting diffuse daylight onto the high ceiling (suspended ceiling removed)
- Perforate venetian blinds
- Extra window pane
- VRF air-con with CO_2 sensor

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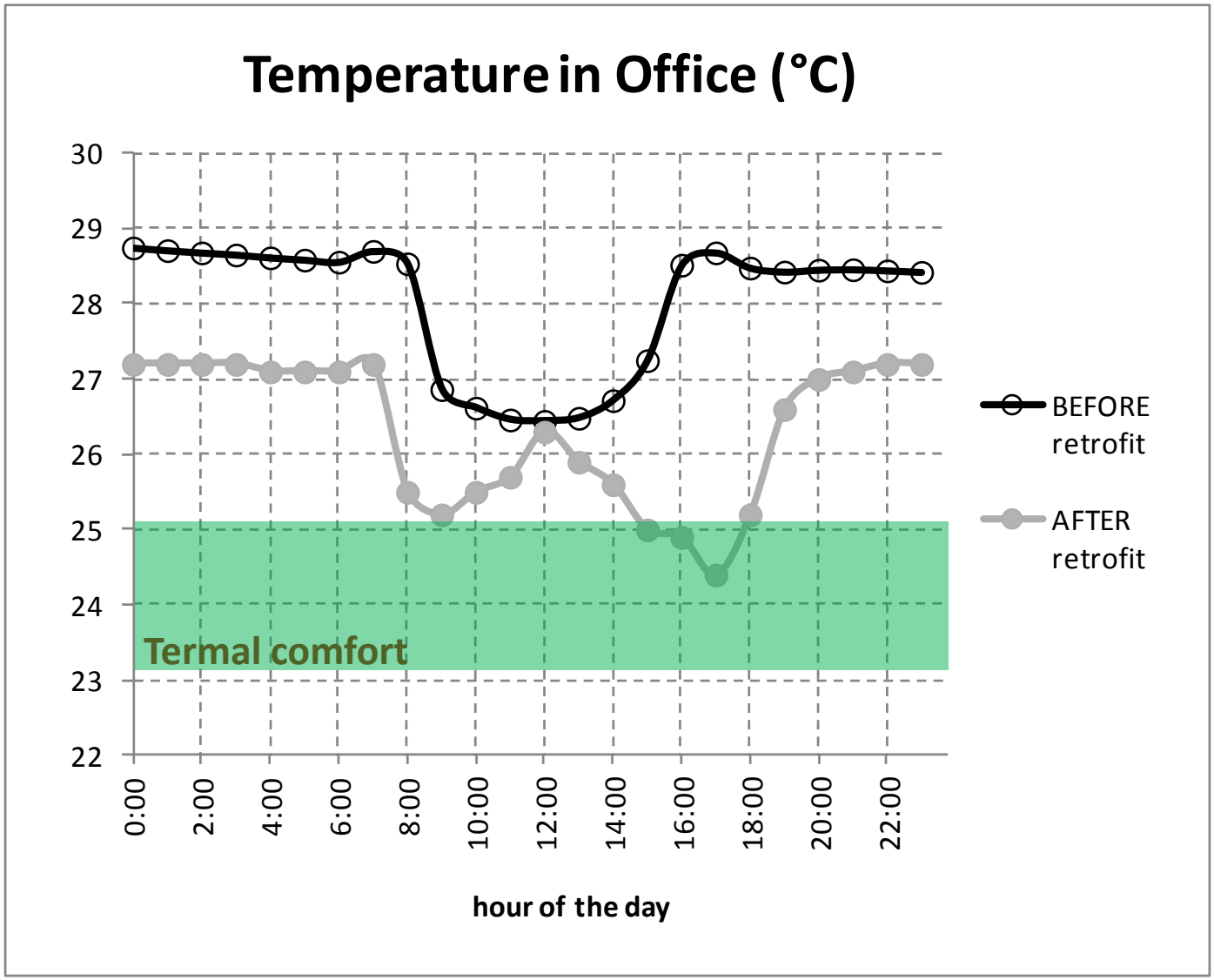
Measured indoor climate: Before vs. After



Case study no. 3

ZERO Energy Bungalow

EARTH BERM HOUSE

(KUALA LUMPUR, 2015)

INNOVATION: Night Sky Cooling

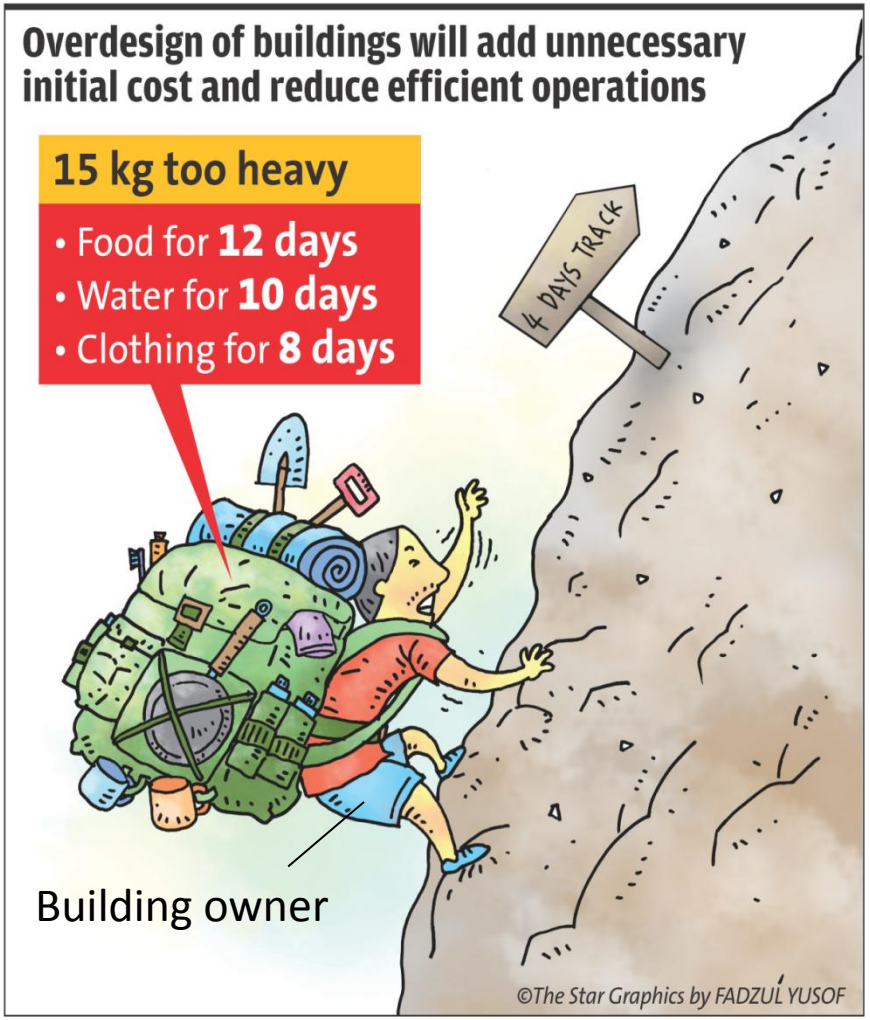
Bungalow 100% natural cooling, no air-conditioning

To be completed end of 2016

Similar design by Design Unit Sdn. Bhd.

ENERGY EFFICIENCY

Three Fundamental Observations



DON'T OVER-PACK

Building owners get double-penalty of:

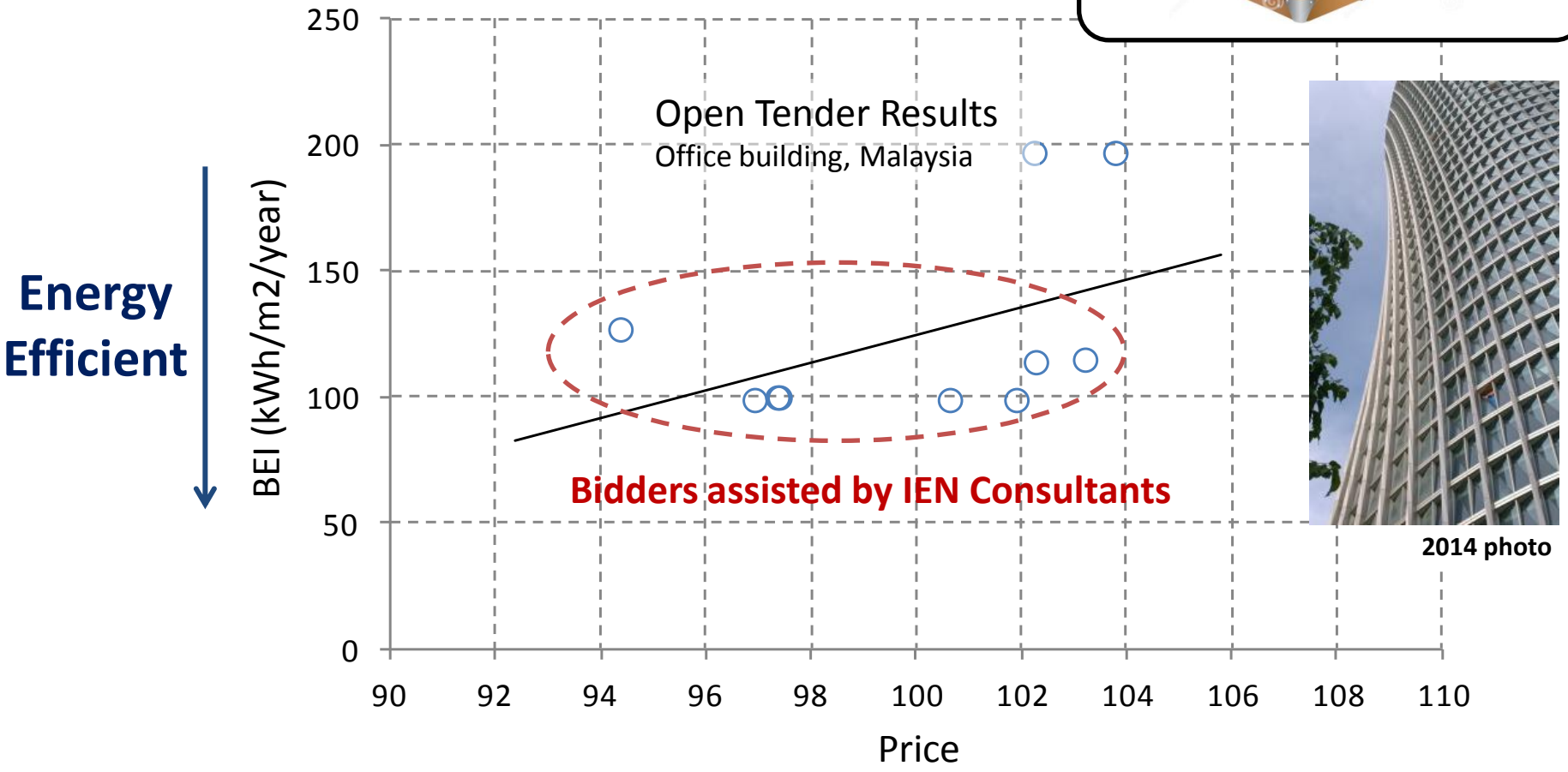
- Higher CAPEX
  (higher construction cost)
- Higher OPEX
  (higher operating cost)

Cartoon by IEN Consultants. The Star newspaper (2014)

Lowest construction cost

Energy Efficient Office Building also the Cheapest

DON'T OVER-PACK



2014 photo

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CONCLUSION

”Expensive not to go green”

Buildings are
Like a Leaky Bucket

with lots of
unnecessary wastages

Plug the holes, and you are well on the way to a green energy efficient inexpensive building

Thank you

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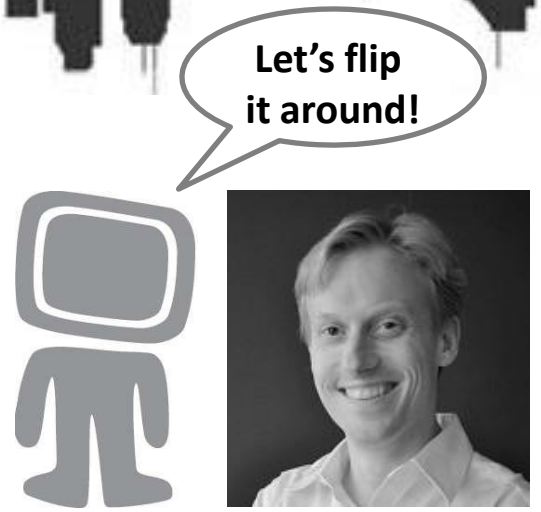
Singapore | Malaysia | China

Thank you

How I commute in Kuala Lumpur
(video link)



Gregers Reimann

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Singapore | Malaysia | China

Appendix slides

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

Green Building certification

Senior Consultant curriculum

Nationality: Filipino

Language Skills: EN | PH

Based in: Kuala Lumpur, Malaysia

Education:

•Architect

Nataly HAW

Roles: **Green Building Consultant**

An Architect by profession and later specializing in building environmental design engineering, Nataly Ann Haw has worked with WSP Environmental in London for 3 years working with both Energy and BREEAM team.

Her Involvement with the teams was mainly to provide building thermal performance assessment and analysis, SAP (Standard Assessment Procedure), microclimate analysis and energy assessments using the London Renewable toolkit and BREEAM (Building Research Establishment Environmental Assessment Method) design advice and certification.

Her expertise is in designing energy efficient buildings in the tropics and facilitating with the LEED (Leadership in Energy & Environmental Design) and GBI (Green Building Index) process and certification in several projects locally. Highlights include the KL ECO City project, a 324,000 m^2 mix-development in Malaysia, as well as the refurbishment of the former railway building in Yangon, Myanmar, into a hotel with green certification.

Energy Efficiency consultancy

Senior Consultant curriculum

Nationality: Danish
Language Skills: EN | DA
Based in: Kuala Lumpur, Malaysia

Education:
•MSc Energy Engineering (Technical University of Denmark)

Gregers REIMANN

Roles: **Energy Efficiency Consultant**

Gregers is the managing director of IEN Consultants, the pioneering green building consultancy in Malaysia, with offices in Singapore as well as China. He specialises in building designs that have good daylighting, are highly energy efficient and have excellent thermal and visual comfort.

Key project references during his 10 years of working in Asia include the Setia City Mall (first green certified shopping mall in Malaysia), the new IKEA in Kuala Lumpur (ongoing), ST Diamond Building (2012 ASEAN Energy Award winner) and the GEO Building designed to be a zero energy office building. Other green projects include the KLIA2 airport terminal, the KL Eco City, the Pertamina Energy Tower – the first skyscraper designed to be ZERO energy – and energy efficiency building retrofit works incl. daylight retrofitting of the Asian Development Bank in Manila.

Gregers has also been a technical reviewer for the EU Energy-Efficiency Buildings project and is newly appointed Chairman of the “Energy Efficient Buildings” committee under the EU-Malaysian Chambers of Commerce and Industries (EUMCCI).

Gregers regularly contributes to green building articles and frequently guest lectures at universities internationally. He has a keen interest to pursue innovative and integrated design solutions bridging the gap between architects and engineers. Gregers is also ‘walking the talk’ with respect to green living habits, which includes commuting to work by a foldable electric bicycle that combines easily with public transport.

Green Building consultancy

Senior Consultant curriculum

Nationality: American
Language Skills: EN | FR
Based in: Singapore

Education:
• MCP in Urban Planning (MIT)
• MA in Urban History (Columbia University)

Kevin SULLIVAN

Roles: **Green Building Consultant**

Kevin has been a carpenter, community organizer, educator, and environmental entrepreneur. Since 2008 he has founded and led two leading sustainability consulting firms in India and Singapore. Kevin has been a design consultant on more than one hundred building projects across the United States, Middle East, India and Asia.

An expert on green schools, Kevin has developed energy-efficiency strategies and educational tools to teach and engage students in green design concepts for top international K-12 schools across Asia. In 2006 he served as a Fulbright Scholar at India's premier environmental think tank, The Energy and Resources Institute in New Delhi. Before moving to India, Kevin was a Policy and Project Director for one of the largest US community-based housing NGOs, where he pioneered the first low-cost urban green homes. Kevin was an Adjunct Professor in the Urban Environment at Queens College as the City University of New York.

Kevin is trained as an architect and urban planner and writes and speaks widely on urban and environmental issues. He has an MCP in Urban Planning from the Massachusetts Institute of Technology and an MA in Urban History from Columbia University. He lives with his family in Singapore.