

# Cost and Value: Multiple Benefits of Green Commercial Buildings

Phil Jones

Welsh School of Architecture  
Cardiff University

Visiting Research Professor  
University of Hong Kong



Organisers:



International Co-owners:



# Multiple Benefits of Green Commercial Buildings

- A green 'sustainable' building will provide added value
- Difficult to attach an actual financial value to the all benefits of green buildings
- Are they more attractive to tenants and occupiers ?
- Can they attract a financial premium ?
- Are people aware of the full benefits.



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# Are people aware of these benefits ?



**HOUSE**  
CARBON - LOW COST



WP PV ROOF



AIR COLLECTOR

**Why aren't all houses energy + ?**

**SO**  
ENERG



6.9 KWh BATTERY



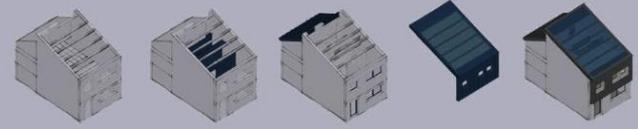
HEATING SYSTEM

Cyngor Cynllido Adrodd  
Uwch Cymru  
Higher Education Funding  
Council for Wales

hefcw



**LCRI** LOW CARBON RESEARCH INSTITUTE



SIPS FRAME    INTERNAL WALLS    BUILDING FABRIC    SYSTEMS    SOLCER HOUSE

# Commercial Buildings

Energy relatively small in relation to overall operating costs - not top priority for operators.

Energy must be considered with other 'green' building attributes.

- Comfort + Health
- Productivity

- Green agenda
- Asset value



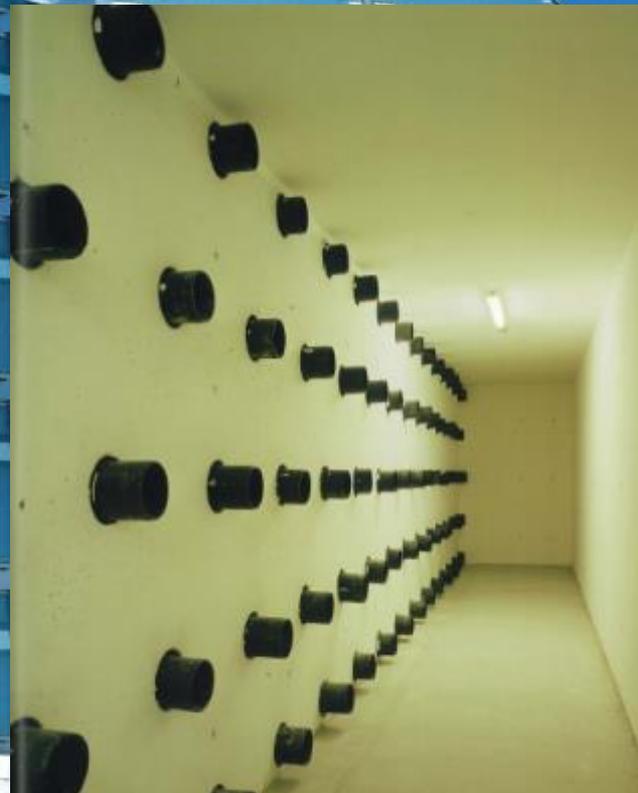
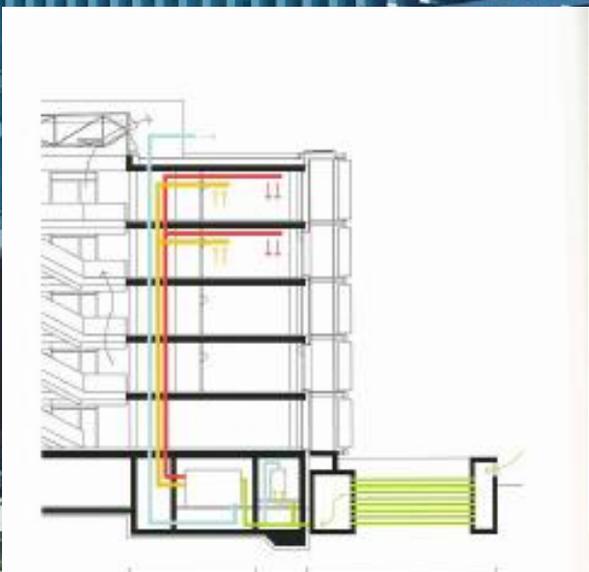
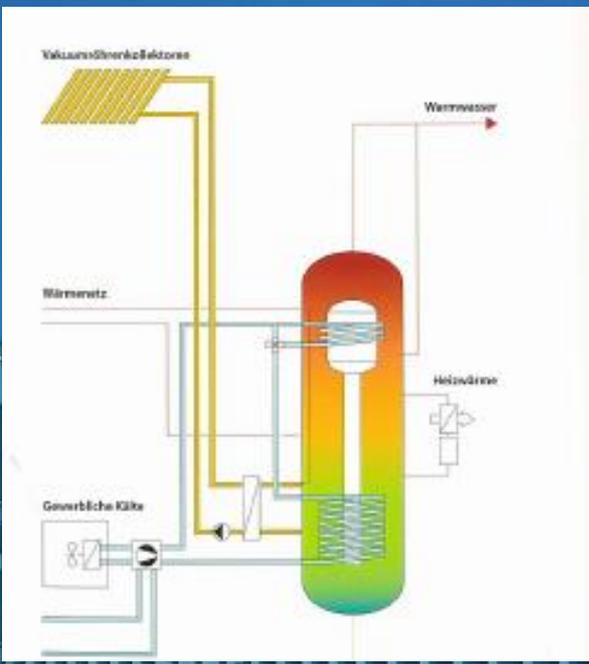
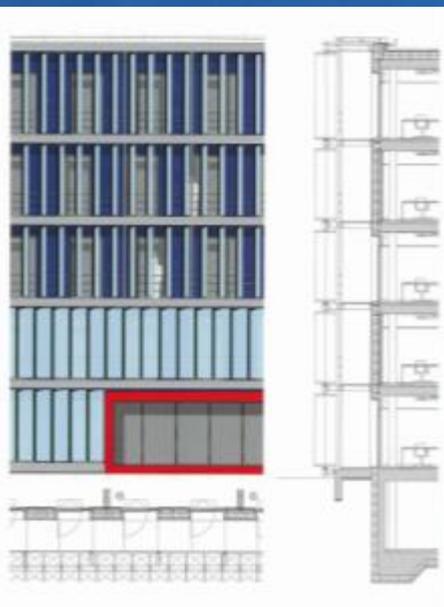
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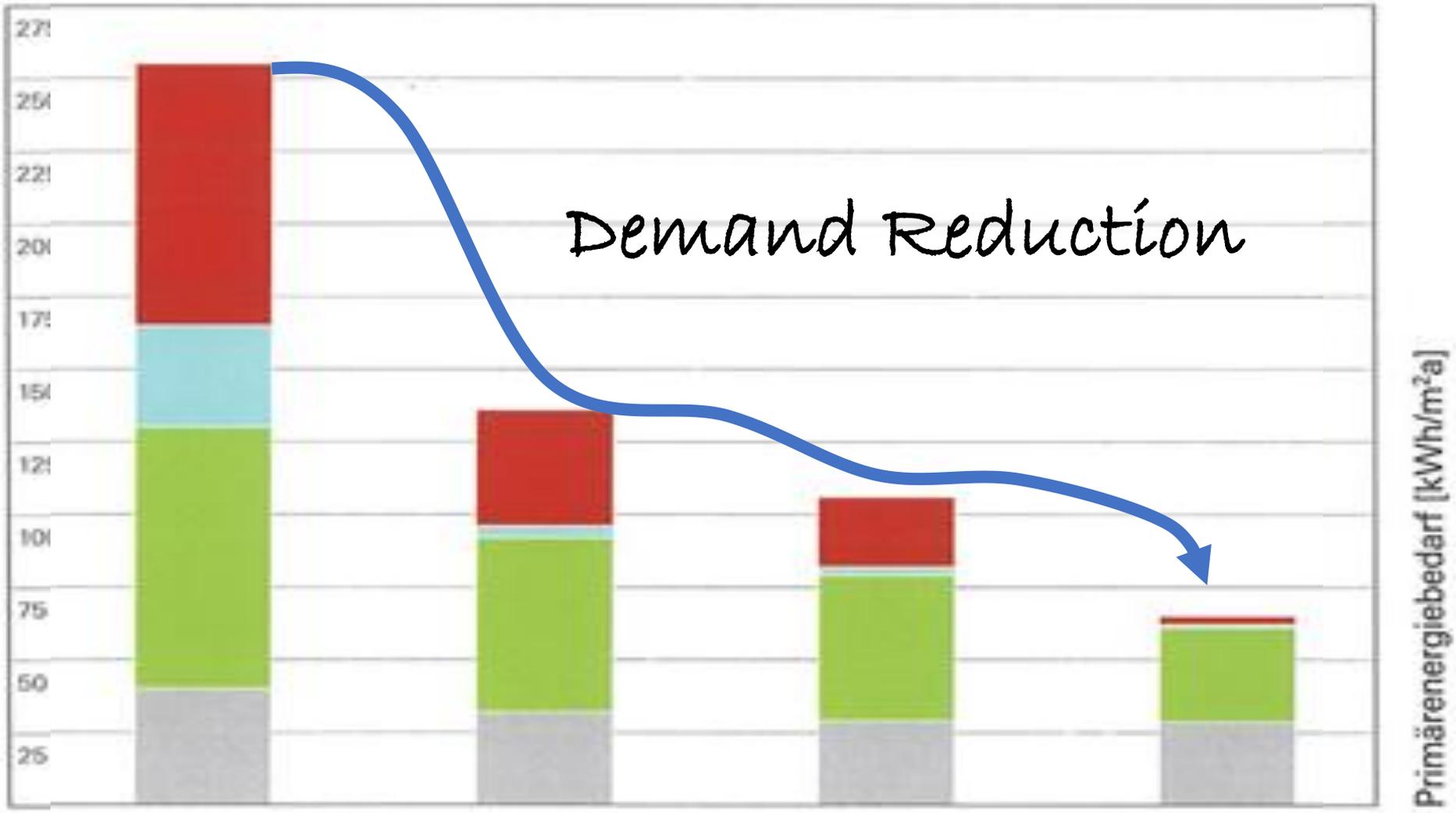


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# EMPA zero carbon office, Zurich





Primärenergiebedarf [kWh/m²a]

Demand Reduction

Standard

Minergie

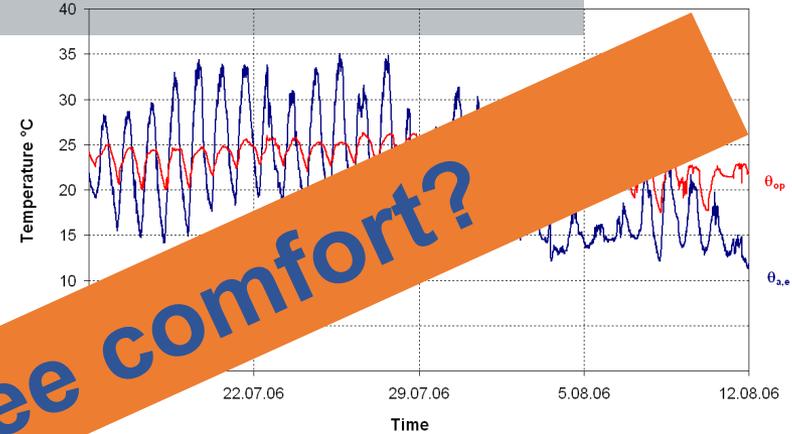
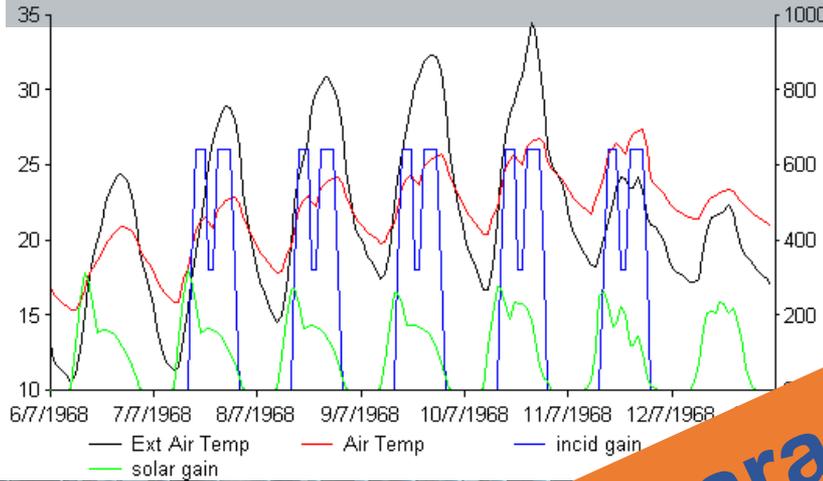
Minergie P

EMPA

- Wärmeenergie Heating energy
- Kühlenergie Cooling energy
- Elektrizität Electricity
- Graue Energie Gray energy (embodied energy)

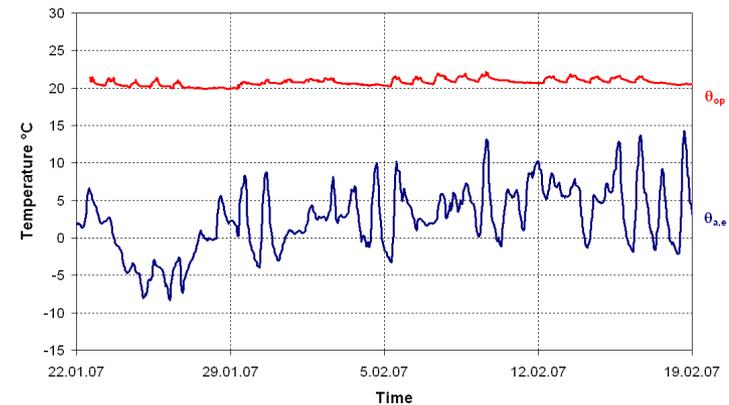
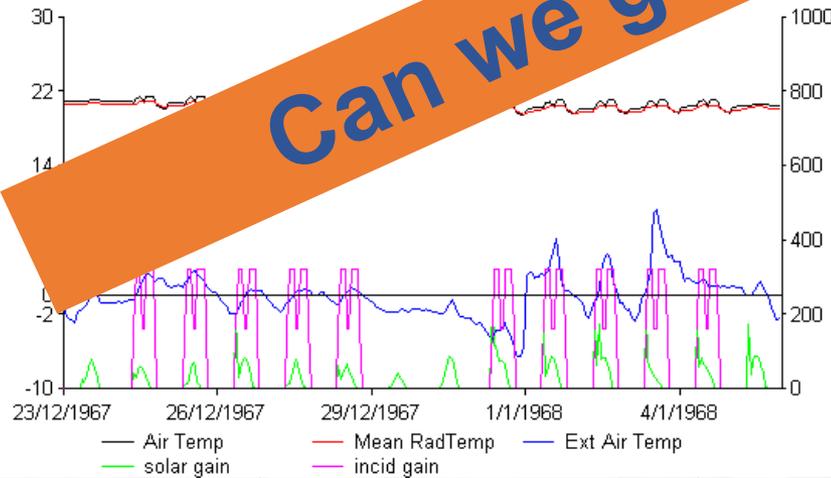
# Predicted

# Measured



Can we guarantee comfort?

# Summer



# Winter

# COST AND VALUE

**Value of a green building is the overall return on investment:**

- quantitative terms, for example, energy saved.
- qualitative nature, such as, improved quality of life, accepting that such qualitative improvements can also result in cost benefits.

**Multiple benefits, include:**

increased occupant satisfaction; longer tenancies and higher lease rates, reduced absenteeism in businesses and an overall higher asset value; future proofed and reduced risk of obsolescence; less need for refurbishment in the future; higher demand from institutional investors and satisfying corporate social responsibilities; and, lower operating and maintenance costs.



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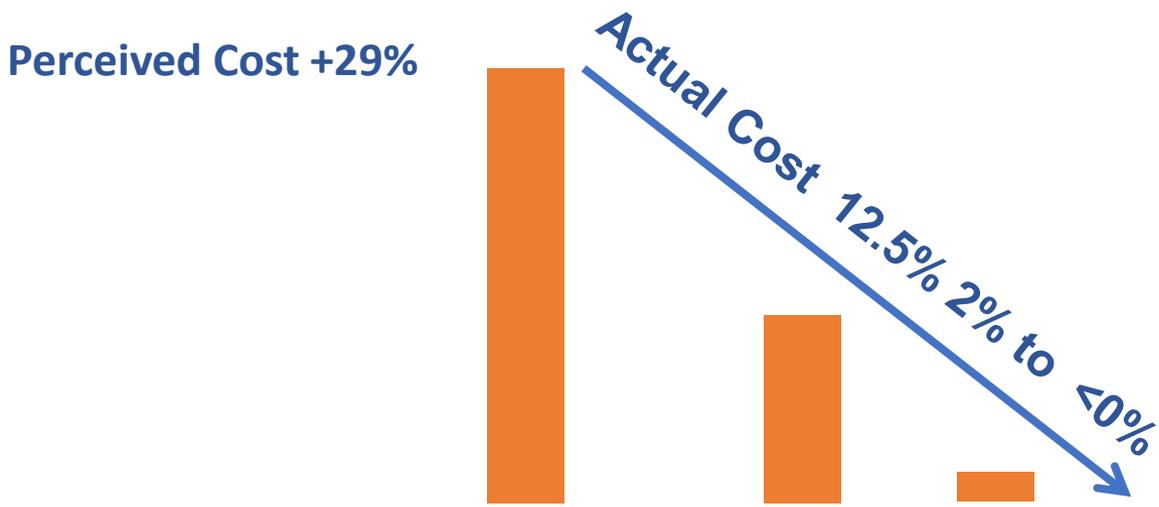


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# Cost of a green building

- Perceived to be as high as 29%
- In practice are less than 12.5%
- Studies have shown around 2%
- Sometimes less than standard costs



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# OVERALL COSTS

**Design/construction costs : O&M costs : business costs**

**1 : 5 : 200** (Evans, R, Haryott, R, Haste, N and Jones, A, 1998)

**1 : 0.4 : 12** (Hughes, WP and Ancell, D and Gruneberg, S and Hirst, L, 2004)

**Energy costs typically 1% of O&M costs**

(Kats G, Leon A, & Adam B, 2003)



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# PRODUCTIVITY, HEALTH AND COMFORT

An estimated average increase in productivity for a green building with a good environment is **4.8%** (Johnson Controls, 2012) to **30%** (Davis Langdon 2007).

## **Productivity gains** (Loftness V, Hartkopf V, Gurtekin B, Hansen, D, Hitchcock R, 2003)

- individual temperature control +3%;
- improved ventilation +11%;
- improved lighting design +23%;
- Natural environment (daylight / openable windows) +18%.

**Reduced absenteeism** (Lucuik M, Trusty W, Larsson N, and Charette R, 2005)  
spaces with higher office ventilation rates -35% .



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# PRODUCTIVITY AND HEALTH

## Sick Building Syndrome

USA, potential annual savings through productivity gains are \$10 to \$30 billion from reduced Sick Building Syndrome symptoms and \$20 to \$60 billion from direct improvements in worker performance that are unrelated to health. (Fisk WJ, 2000)

20% of workers might be affected by SBS symptoms (J. Heerwagen, 2010) . Reducing SBS symptoms can potentially reduce absenteeism, as well as increasing productivity, and creating a more favourable working environment, which in turn can reduce staff churn.



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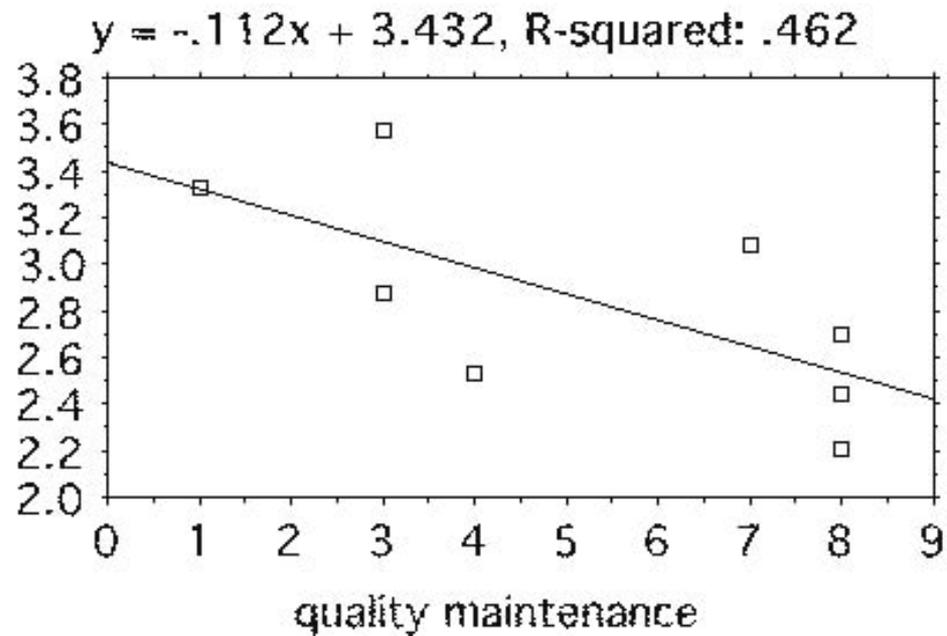
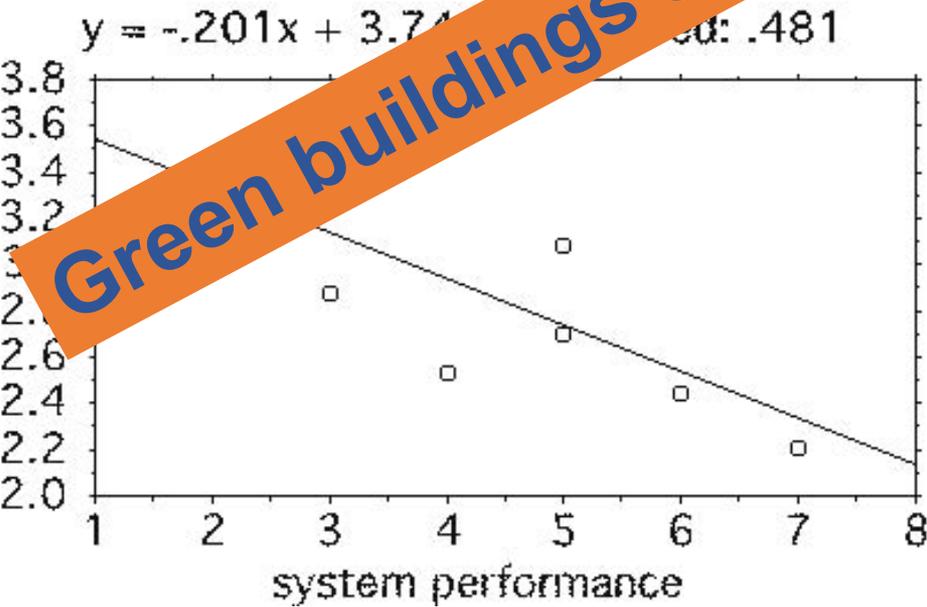


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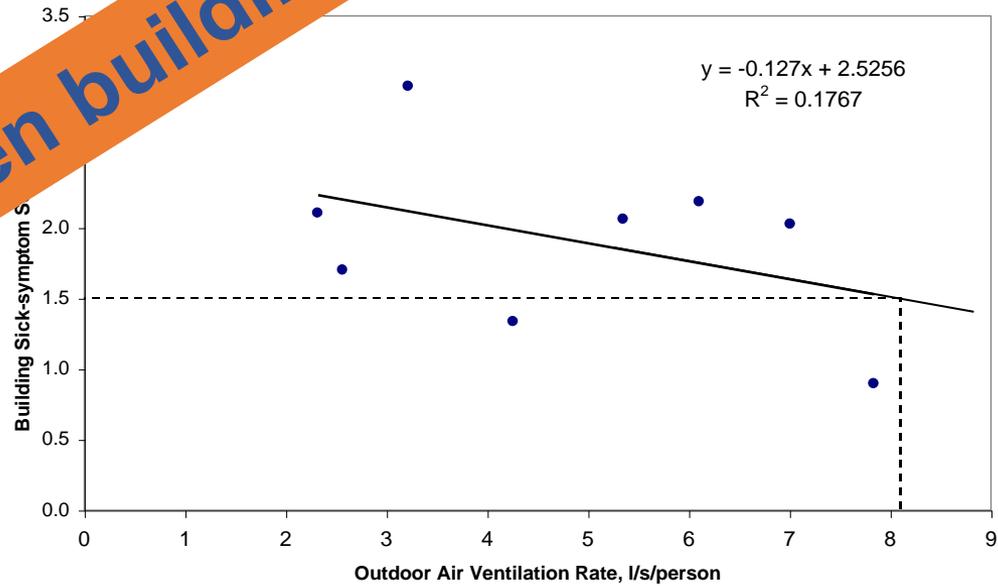
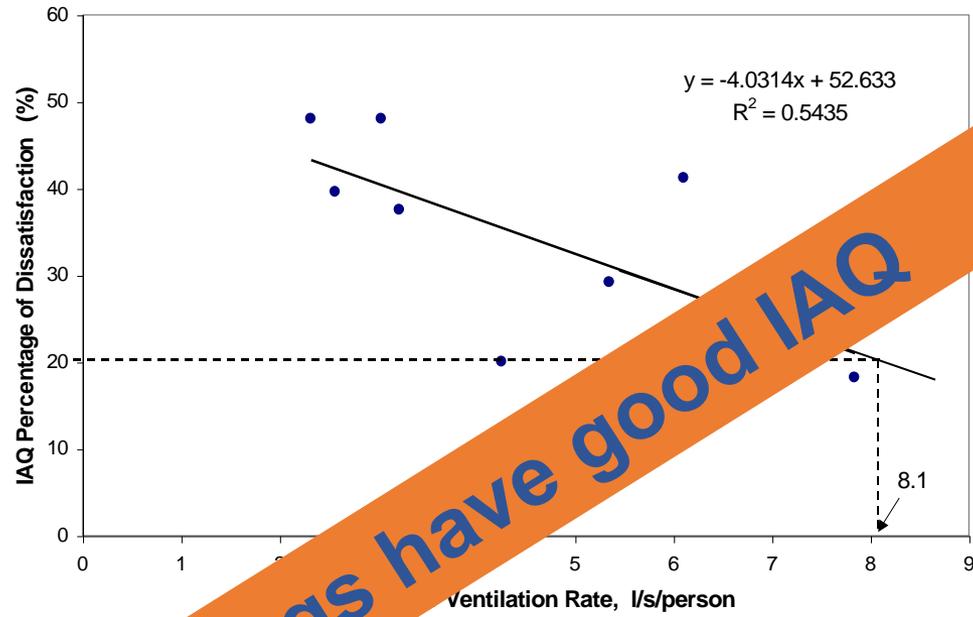


# SBS related to operations and maintenance

buildings that are poorly operated and maintained have higher BSS



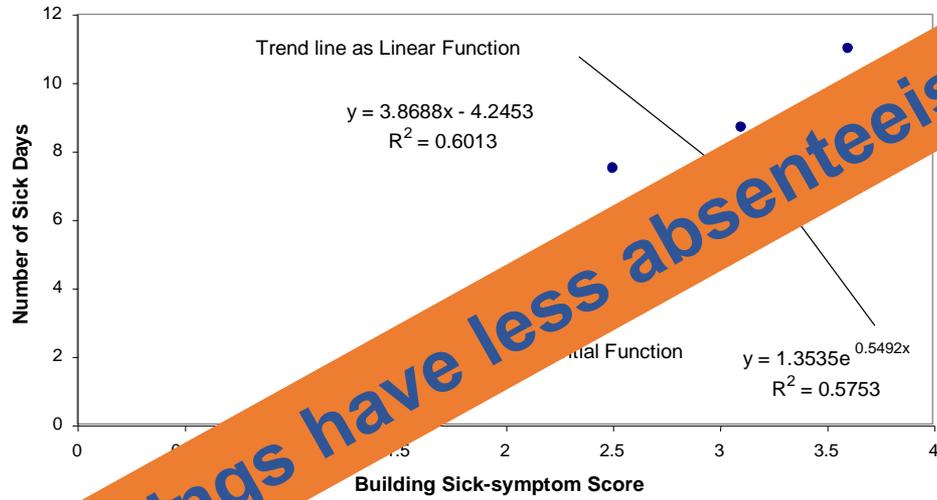
# IAQ and SBS



Green buildings have good IAQ

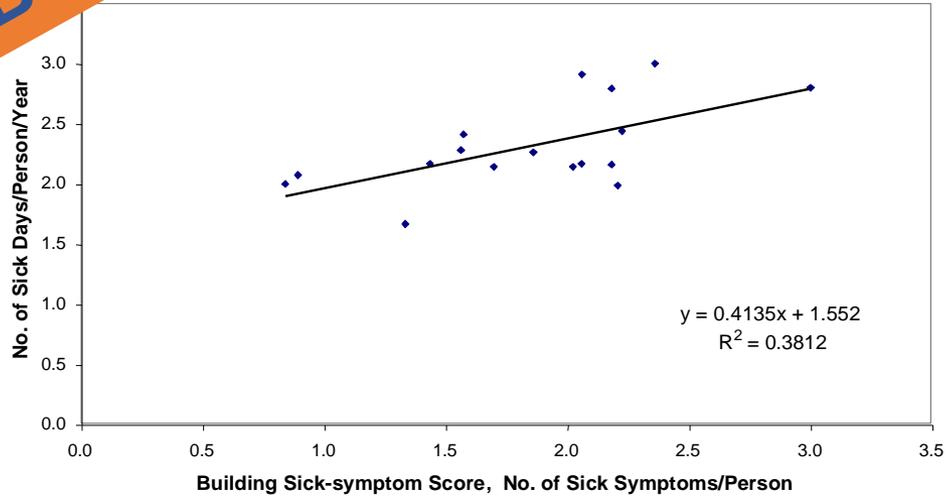
# SBS and Absenteeism

UK



**Green Buildings have less absenteeism**

Hong Kong



# Multiple Benefits

## FUTURE PROOFING

- Retrofitting may be increasingly dealt with through regulations;
- Green buildings may be considered a lower risk, which could result in a higher yield on investment.

## CORPORATE RESPONSIBILITY

- Corporate Social Responsibility (Carroll, AB, 1991) for a business includes ethical and philanthropic responsibilities, alongside economic and legal responsibilities.

## MARKETABILITY

- Sustainability credentials enjoy increased marketability;
- More easily attract tenants and to command higher rents and prices;
- Emerging 'brown discounts', where buildings that are not green may rent or sell for less;
- Green leases can provide benefits to both tenants and landlords.



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# GREEN RETROFITS

Many of the buildings that will be here in 2050 already exist.

Commercial buildings often fast track and not sustainable.

Not operated by owner – green leases.



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# GREEN RETROFITS

- i. *Commissioning*, typically **22%** energy savings, with payback period of 1.1 years;
- ii. *Standard retrofit*, **25-45%** savings with payback period less than 4 years. Such retrofits generally adopt a package of component-level replacements of existing equipment;
- iii. *Deep retrofits*, integrated whole-building approach typical savings of **45%**, with payback period of up to 3 years, upgrades to the building envelope are combined with retrofits of lighting and mechanical systems.

(Pacific Northwest National Laboratory, 2011)



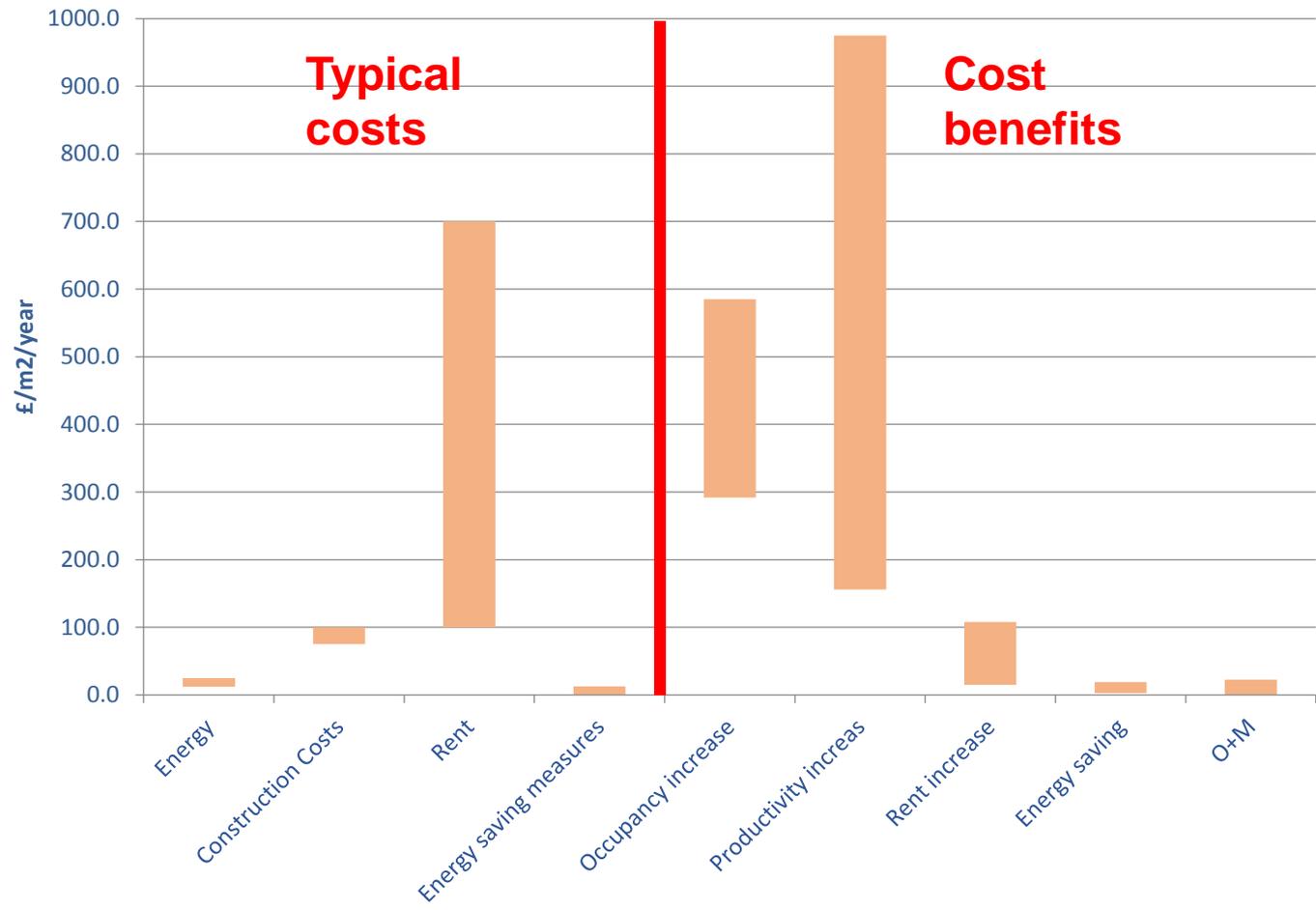
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# SUMMARY



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# Multiple Benefits of Green Commercial Buildings

## National / Global

- Carbon emissions reduction.
- Reduced use of resources.
- Security of energy supply.
- Improved public health and well-being, and reduced health related costs.
- Reduced environmental damage.

## Building

- Increased resale value.
- Increased rental rates.
- Higher occupancy rates.
- Lower operating costs.
- Higher net operating income.
- Lower risk of obsolescence.
- Less need for refurbishment in the future.
- Lower tenant turnover affecting renewals, inducements and fitting out costs amongst others.
- Quicker to secure tenants.
- Better indoor environment: health, well-being and productivity gains.

**CHALLENGE !**  
**How can our cost models place value on multiple benefits**

- Attract grants, subsidies and other inducements to do with environmental stewardship.
- Higher demand from institutional investors mandatory for government tenants.
- Contribute to company CSR policy.



# *Thank You*



Organisers:



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Sustainable Buildings and Climate Initiative  
Promoting Policies and Practices for Sustainability

