



## The rise of sustainability

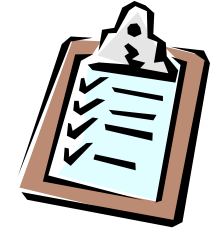


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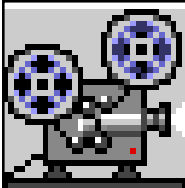


- The concept of sustainability
- Business case for sustainability
- Business case for green buildings
- How to design and specify green building

# The concept of sustainability



- **Sustainability** is a broad discipline
  - It draws on politics, economics, philosophy and other social sciences as well as the hard sciences
- Growing importance of sustainability
  - Sustainability skills and environmental awareness is a priority in many corporate jobs at graduate level and businesses
- Transformations in our economy are required to achieve sustainability



# The Rise of Sustainability

<http://complexitylabs.io/the-rise-of-sustainability-2/>



(Video: The Rise of Sustainability (42:14) [http://youtu.be/L\\_skrxnh7Ik](http://youtu.be/L_skrxnh7Ik))

This short documentary film explores the rise of the concept of sustainability as it has gone from the fringes to the mainstream within just a few short decades driven by an environmental crisis on a global scale. The film looks at this new environmental context of the Anthropocene and the key structural transformations in our economy required to achieve sustainability.

(Source: Complexity Labs <http://complexitylabs.io>)

# The concept of sustainability



- How buildings impact the environment\*
  - Energy use (e.g. electricity)
  - Impact on the air (greenhouse gas emissions)
  - Water use (potable water use)
  - Construction materials
  - Waste from building construction & demolition
- Detrimental effects on the local, regional, and global environment

Do you know what are the major impacts and effects?

# The building sector has an oversized environmental footprint: major impacts and effects

- **Energy**: Approximately one third of global energy end use takes place within buildings, while the manufacture of building materials consumes a further 10% of the global energy supply
- **Carbon**: the use phase of buildings alone is estimated to be responsible for 19% of total global greenhouse gas emissions
- **Materials**: Each year, approximately 40-50% of the total flow in the global economy – are used in the manufacturing of building products and components worldwide
- **Waste**: Building construction and demolition waste contributes about 40 per cent of solid waste streams in developed countries
- **Water**: Buildings in use have been estimated to be responsible for 12% of global water use, but can indirectly account for much more



# Business case for sustainability



- Companies to embrace sustainability as a means to enhance their global competitiveness
- Economic benefits:
  - Lower resource and production costs
  - Lower regulatory compliance costs
  - Improved sales and brand reputation
  - Greater access to financing and capital
  - Easier employee hiring and retention



(Video: Business Case for Sustainability (4:37) <https://youtu.be/KIW8-WW0k3g>)

(Source: The Business Case for Sustainability <https://www.cbd.int/financial/mainstream/ifc-businesscase.pdf>)

# Sustainability and Competitiveness

Why are companies embracing **sustainability** as a means to enhance their global competitiveness?

## **COSTS:**

In an increasingly competitive world with variable energy and materials costs, manufacturers must realize every efficiency possible.



Recycling an aluminum can saves 95% of the energy used when making cans from virgin ore and produces 97% less water pollution.<sup>1</sup>



## **CUSTOMERS:**

Companies are facing greater demands from all kinds of customers— other manufacturers, retailers, government, households – for greener products and more data about these products.

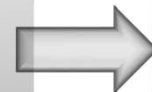


In 2007, Wal-Mart announced that it would only sell concentrated liquid laundry detergent in an effort to reduce water use and packaging.<sup>2</sup> Detergent producers had to comply with the new policy.

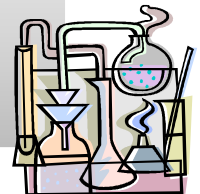


## **COMPLIANCE:**

There is an increasing number of both domestic (federal, state and local) and international environmental regulations that make compliance more complicated.



The European Union's REACH regulation requires industry to provide chemical safety information on approximately 30,000 substances.<sup>3</sup>



<sup>1</sup> "Recycling Fun Facts," Can Manufacturers Institute.

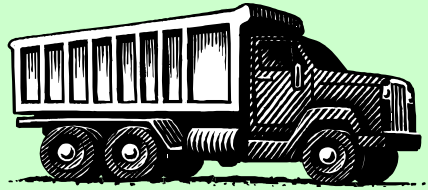
<sup>2</sup> "Wal-Mart to Only Sell Eco-Friendly Laundry Detergent." GreenBiz.

<sup>3</sup> "REACH Overview for US Firms." Rosemary Gallant. U.S. Commercial Service.



# Economic Benefits: A Closer Look

**Sustainability** can have a positive effect on a number of business areas.



Resource and  
Production Costs



Regulatory  
Compliance Costs



Sales and Brand  
Reputation



Financing and  
Capital



Employee Hiring  
and Retention

# Business case for green buildings



- Business costs and benefits:\*
- Design and construction cost
- Asset value
- Operating cost
- Workplace productivity and health
- Risk mitigation
- Scaling up from **green buildings** to **green cities**

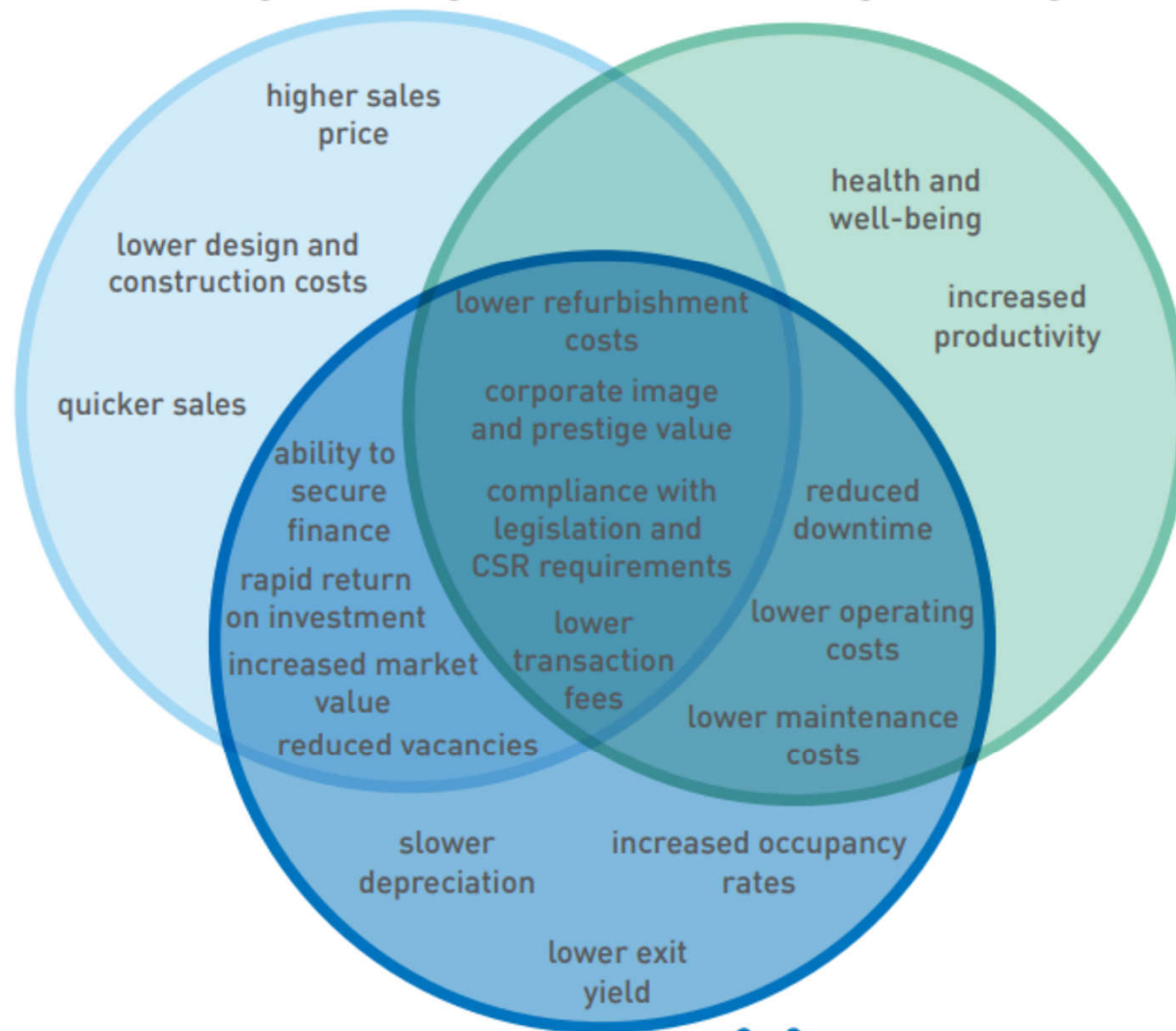
How to consider the costs and benefits of green buildings?

 **DEVELOPER**  
Why would I want  
to build this green building?


**TENANT**  
Why would I want  
to lease this green building?

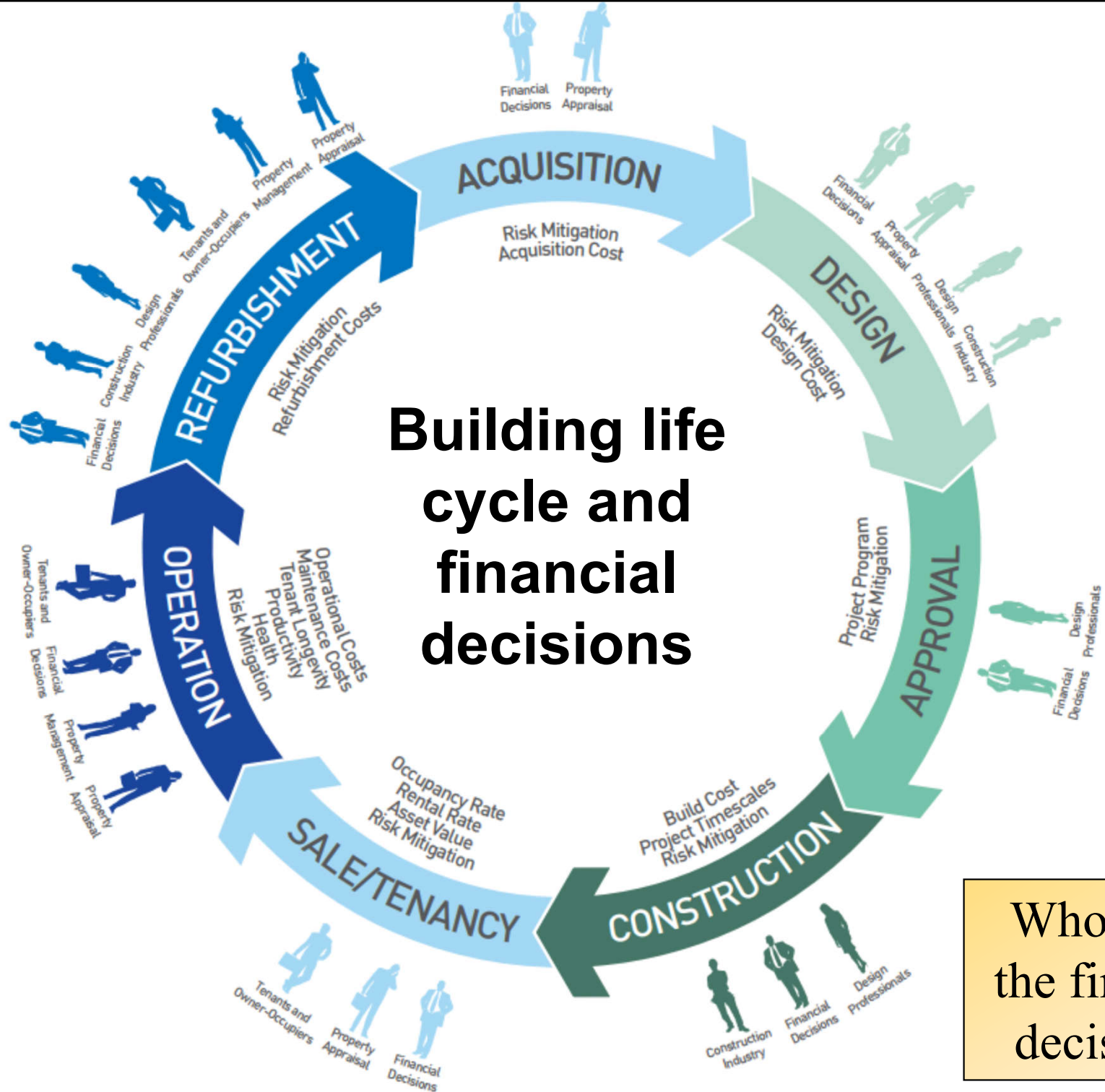


Why would I  
want green  
building?



Stakeholder  
perceptions that  
affect the  
value of green  
buildings

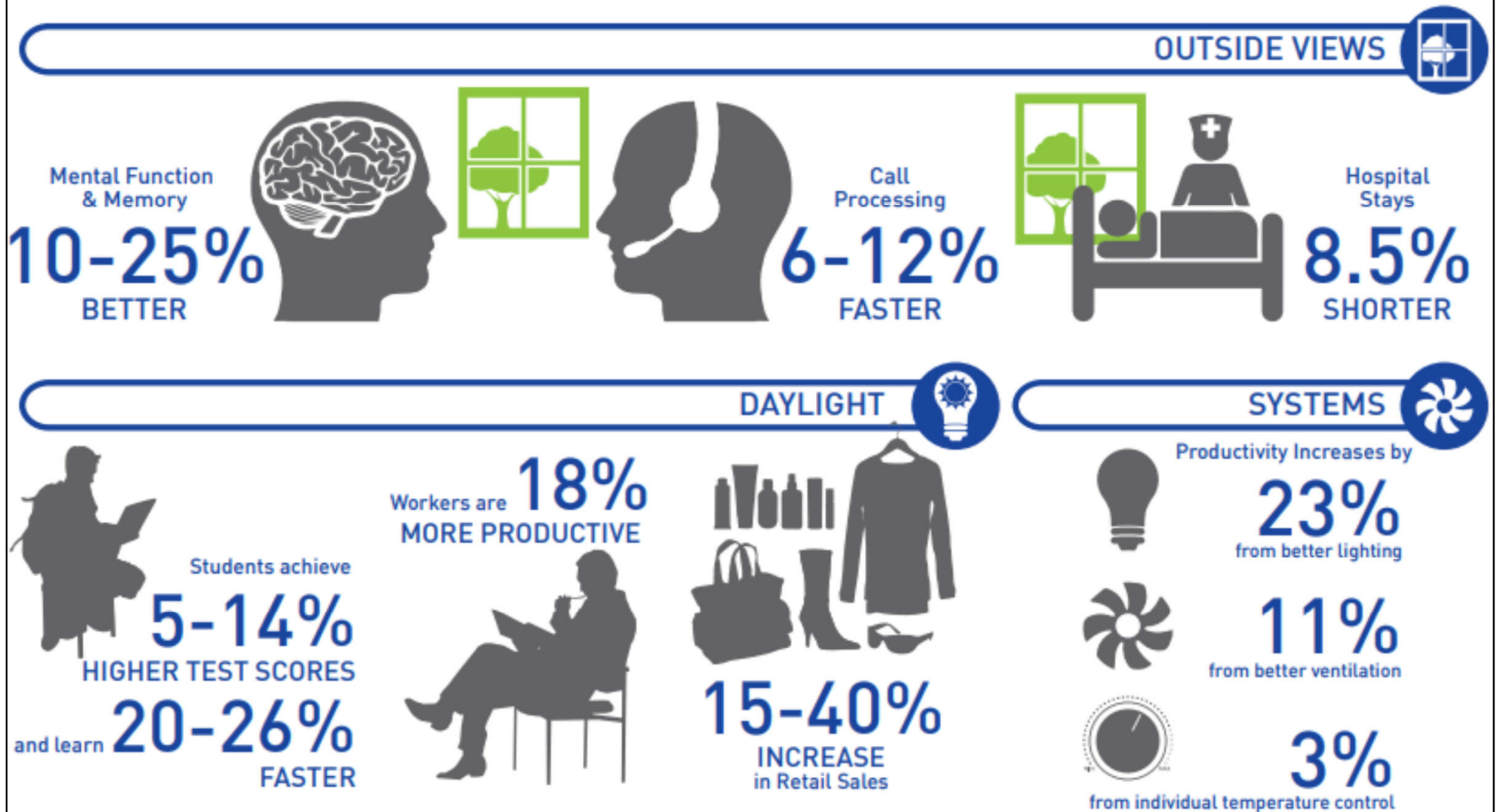
 **OWNER**  
Why would I want  
to own this green building?



Who make the financial decisions?

(Source: WGBC, 2013. *The Business Case for Green Building*)

# Net present value analysis of the operational cost and productivity and health benefits of LEED certified buildings



Evidence shows that green design attributes can improve occupant productivity, health and well-being. Investing in better indoor environments can lead to better returns on one of every company's greatest assets – its employees.

(Source: WGBC, 2013. *The Business Case for Green Building*)

# REGULATORY RISKS

- Property value decrease due to changes in planning/transport policy
- Inability to compete with newer, greener properties
- Decrease in value due to low energy rating
- Inability to lease due to new regulations

# MARKET RISKS

- Brown discounts
- Increased speed of depreciation
- Lower occupancy rates
- Shorter tenancies
- Higher risk exposure of non-sustainable portfolio (more volatility)
- Failure to meet sustainability benchmarking criteria of potential investment partners

How to mitigate the risks?

Risk radar and considerations for green buildings

# PHYSICAL RISKS

- Extreme weather events
- Flooding
- Subsidence
- Increased temperatures
- Changing rainfall patterns
- Decreased future occupant comfort and satisfaction

## ACQUISITION

## DESIGN

## APPROVAL

## CONSTRUCTION

## SALE/LEASE

## OPERATION

## REFURBISHMENT

# TECHNOLOGY RISKS

- Unintended consequences
- Costly maintenance regimes
- Missed opportunities

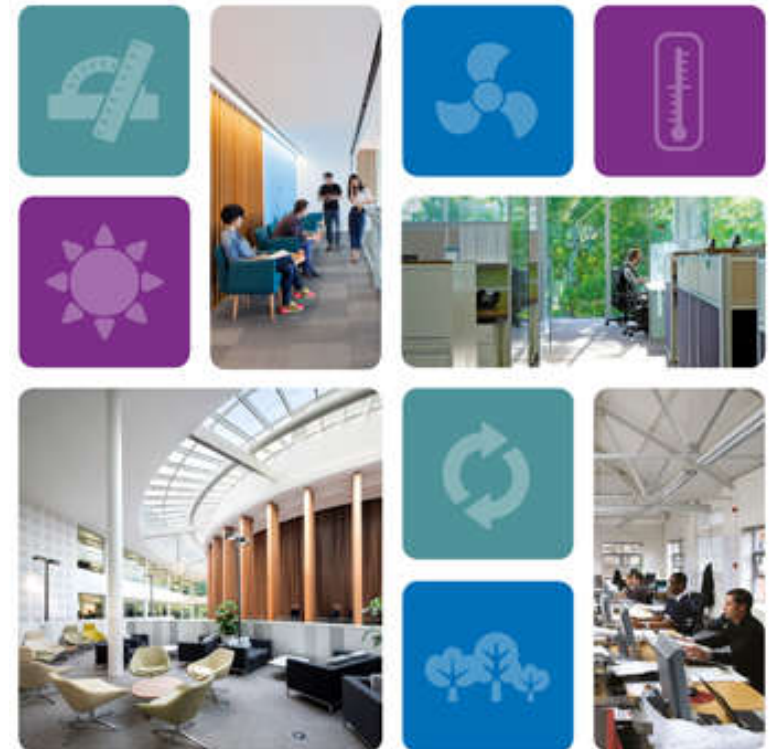
## Major business case benefits of green buildings:

1. Energy and water cost savings
2. Increased building valuation from higher profits owing to such savings
3. Possible incentive payments from government and utilities
4. Increased rent and occupancy
5. Productivity and health benefits for office occupants.
6. Risk management (economic, financial, market, legal, political, etc.)
7. Marketing and public relations
8. Increased in reputation value for public companies
9. Recruitment and retention of key personnel
10. Access to capital from responsible property investing funds

# Business case for green buildings



- **Health, wellbeing and productivity**
- 8 features that make healthier and greener offices:
  - 1. Indoor Air Quality
  - 2. Thermal Comfort
  - 3. Daylighting & Lighting
  - 4. Noise & Acoustics
  - 5. Interior Layout & Active Design
  - 6. Biophilia & Views
  - 7. Look & Feel
  - 8. Location & Access to Amenities





# Business case for green buildings



- **Green buildings** produce wide economic and social benefits:
  - Better life-cycle costing
  - Improved productivity or performance in functional terms
  - Better social relationships at a building and community level
  - Enhanced image for the building and the organisation responsible for its inception

# Each green building is a learning experience for the developer, contractor and professional team

## Advantages of green office buildings:

- consumer satisfaction;
- benefits to health and comfort;
- company image;
- commercial advantage of environmental ethics;
- value for money in the long term.

## Disadvantages of green office buildings:

- lack of consistent performance standards and feed-back;
- lack of exemplar projects;
- complexity of comfort and control;
- limitations on cellular space;
- PC screen reflectance problems (with high daylight levels).

# How to design and specify green building



- Good practice design guides, such as:
  - ASHRAE, 2013. *ASHRAE Greenguide: the Design, Construction, and Operation of Sustainable Buildings*, 4th ed., Elsevier/Butterworth-Heinemann, Amsterdam and Boston. <http://webpac.vtc.edu.hk/record=b11444456> (ebook)
  - PTI, 1996. *Sustainable Building Technical Manual: Green Building Design, Construction and Operations*, Public Technology, Inc. (PTI), Washington, D.C. <http://infohouse.p2ric.org/ref/04/03128.htm>
  - Whole Building Design Guide (WBDG) <http://www.wbdg.org/>

# How to design and specify green building



- Green building design strategies  
[http://ibse.hk/GB\\_design\\_strategies.pdf](http://ibse.hk/GB_design_strategies.pdf)
  - Examine the major aspects of green building design
  - Set up performance targets and requirements
  - Conduct analyses and specify green design features
  - Monitor building life cycle performance
- Green building assessment and rating, such as:
  - BREEAM (UK)
  - LEED (US)
  - BEAM Plus (HK)

# BREEAM (UK): major aspects and indicators

## Energy

- reduction of CO<sub>2</sub> emissions
- low and zero carbon technologies
- energy monitoring
- energy-efficient external lighting
- energy-efficient cold storage
- energy-efficient transportation systems
- energy-efficient laboratory systems
- energy-efficient equipment (process)
- drying space

## Transport

- public transport accessibility
- proximity to amenities
- cyclist provision
- minimum car parking capacity
- travel plan

## Land use and ecology

- site selection
- ecological value of site and protection of ecological features
- mitigating ecological impacts
- enhancing site ecology
- long-term impact on biodiversity

## Health and well-being

- visual comfort
- indoor air quality
- thermal comfort
- water quality
- acoustic performance
- safety and security

# BREEAM (UK): major aspects and indicators (cont'd)

## Water

- water consumption
- water monitoring
- water leak detection and prevention
- water efficient equipment

## Waste

- construction waste management
- recycled aggregates
- operational waste
- speculative floor and ceiling finishes

## Materials

- life-cycle impacts
- hard landscaping and boundary protection
- responsive sourcing of materials
- insulation
- designing for robustness
- pollution
- impacts of refrigerants
- NO<sub>x</sub> emissions
- surface water run-off
- reduction of night-time light pollution
- noise attenuation

## Management

- sustainable procurement
- responsible construction practices
- construction site impacts
- stakeholder participation
- service life-planning and costing

# How to design and specify green building



- Benefits of green building assessment:
  - Raise standards beyond that required in legislation, added value to new buildings and refurbished ones
  - Provide a set of environmental measures against which a design can be assessed and the final building monitored
  - Establish a global set of green values to allow for international comparisons to be made
  - Encourage the development of life-cycle methodologies using key performance indicators (energy, materials, waste, water)
  - Profits tax concession and financial incentives\*



# Further reading

- Edwards, B. and Naboni, E., 2013. *Green Buildings Pay: Design, Productivity and Ecology*, 3rd ed., Routledge, London.
  - <http://webpac.vtc.edu.hk/record=b11074290> (ebook)
  - Chapter 1 How do green buildings pay?
  - Chapter 2 Designing green buildings
- WGBC, 2013. *The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants*, World Green Building Council (WGBC), London.
  - [https://group.skanska.com/4af531/globalassets/sustainability/reporting--publications/reports-on-green-building/business\\_case\\_for\\_green\\_building\\_report\\_web\\_2013-03-13.pdf](https://group.skanska.com/4af531/globalassets/sustainability/reporting--publications/reports-on-green-building/business_case_for_green_building_report_web_2013-03-13.pdf)
- Building the Business Case: Health, Wellbeing and Productivity in Green Offices  
[http://www.worldgbc.org/sites/default/files/WGBC\\_BtBC\\_Dec2016\\_Digital\\_Low-MAY24\\_0.pdf](http://www.worldgbc.org/sites/default/files/WGBC_BtBC_Dec2016_Digital_Low-MAY24_0.pdf)
- Green building design strategies [http://ibse.hk/GB\\_design\\_strategies.pdf](http://ibse.hk/GB_design_strategies.pdf)