

Green Buildings



What makes a green building?

[Story of a Green Building](#)

Portugal's Pavilion at the Expo 2010 Shanghai



Building made from cork

Cork



Bamboo Car Park, Leipzig Zoo, Germany



What is a Green Building?



Green Building Design Principles

Optimize the potential of the site and its surroundings

Conservation of energy / reduced emissions

Protect and Conserve Water

Optimize Building Space and Material Use

Enhance Indoor Environmental Quality

Optimize Operational and Maintenance Practices (“building management”)

Waste minimisation

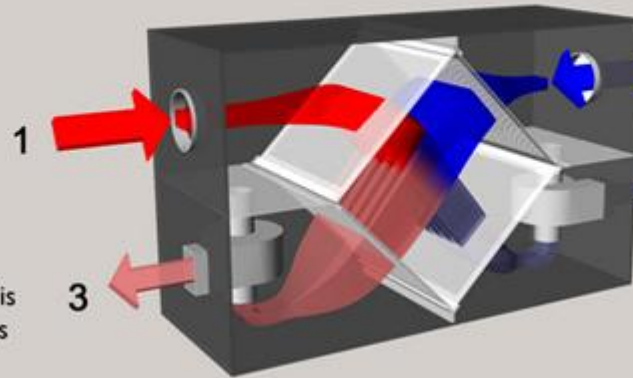
Green Design

Examples of devices from previous lecture

How a Heat Recovery Ventilator Works

1 Warm, stale air is drawn from the kitchen and bathrooms

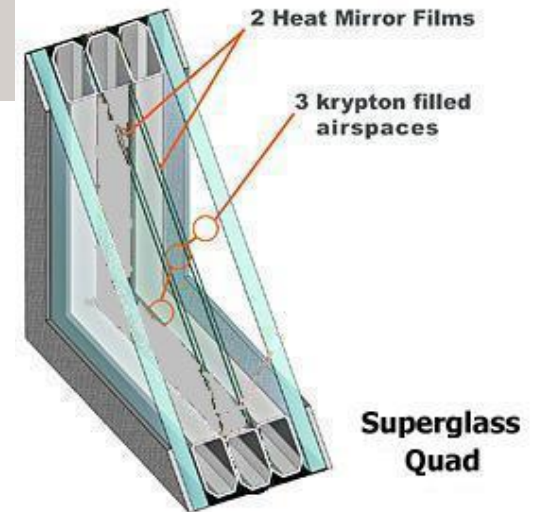
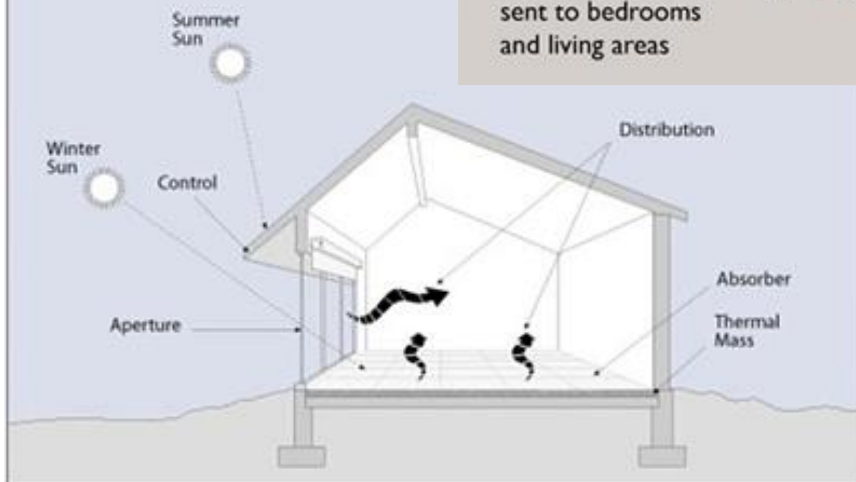
3 Fresh, heated air is sent to bedrooms and living areas



2 Fresh, cold air from outside is drawn in

4 Stale, cool air from inside is exhausted outside

Five Elements of Passive Solar Design



Common Sustainability Features

Recycling of construction waste

Low VOC flooring, paints and adhesives; low formaldehyde wood products.

Good insulation to reduce heating requirements

Natural ventilation, good lighting for staff comfort

Energy-efficient and water-efficient fixtures and fittings

Energy and water metering to monitor and encourage responsible use

Solar panels for energy generation

Rainwater harvesting systems

Electric vehicle parking spaces and charging

Cycling facilities e.g. bike storage, showers, lockers

Building Management System

The “brain” of the green building

Monitors water and energy consumption, waste produced, lighting, people movements, ambient temperature.

Controls the lighting and HVAC (heating, ventilation & air conditioning) based on monitoring.

Improved comfort for building occupants

Optimised energy consumption

Meridian Building Wellington



Britomart Hotel

Owner purchased Britomart precinct from Auckland Council

Mix of old and new buildings

Britomart Hotel – Green Star

Plan to make whole precinct a “green community”, however existing old buildings unable to get green start credit.

Owner investing in energy-efficient technologies.

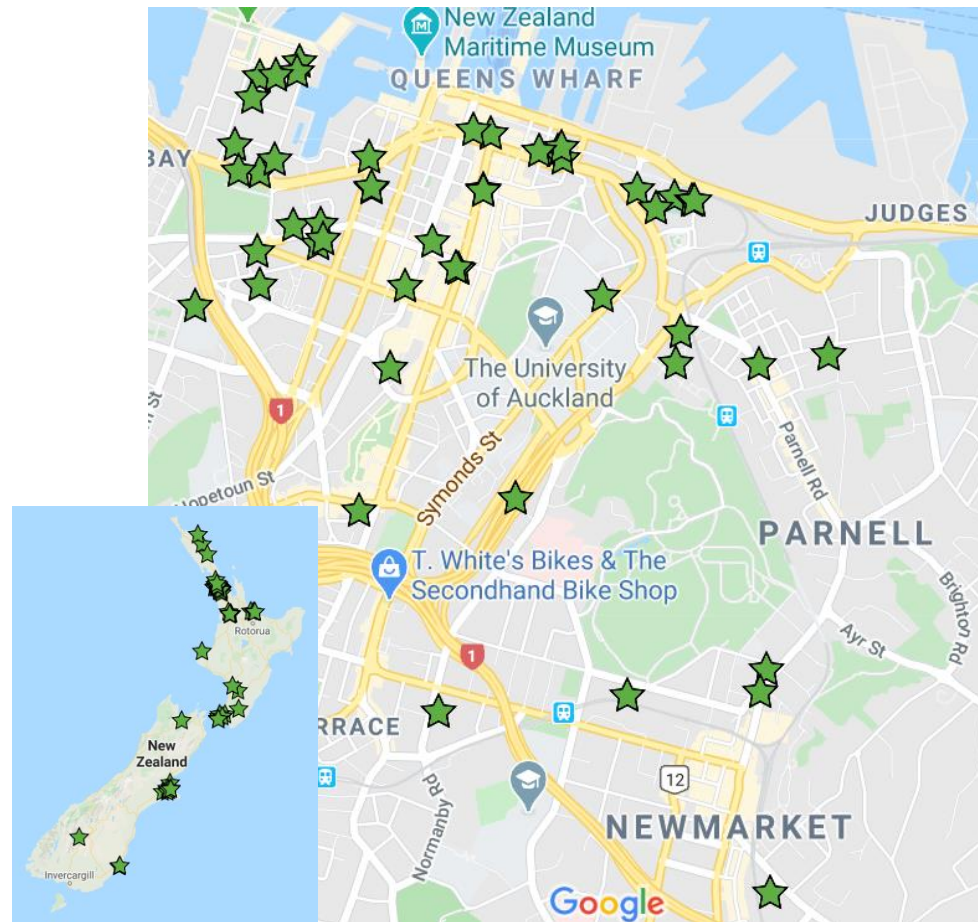


The Green Building movement is growing!

In Auckland as well as nationally and internationally...

Why?

- Different drivers for Investors, Developers, Owners, Tenants
- Environmental consciousness
- Recognition / status / market edge
- Cost savings
- Attract tenants / higher rents, longer leases
- Staff comfort
- Opportunities for green leases



Worldwide Green Assessment

Most assessment systems have standard categories such as energy, water and indoor environmental quality for rating the building



Green Building Assessment

> How to get recognised as a green building?

A building is assessed and certified against a Green Building Assessment System

Different Systems in different countries

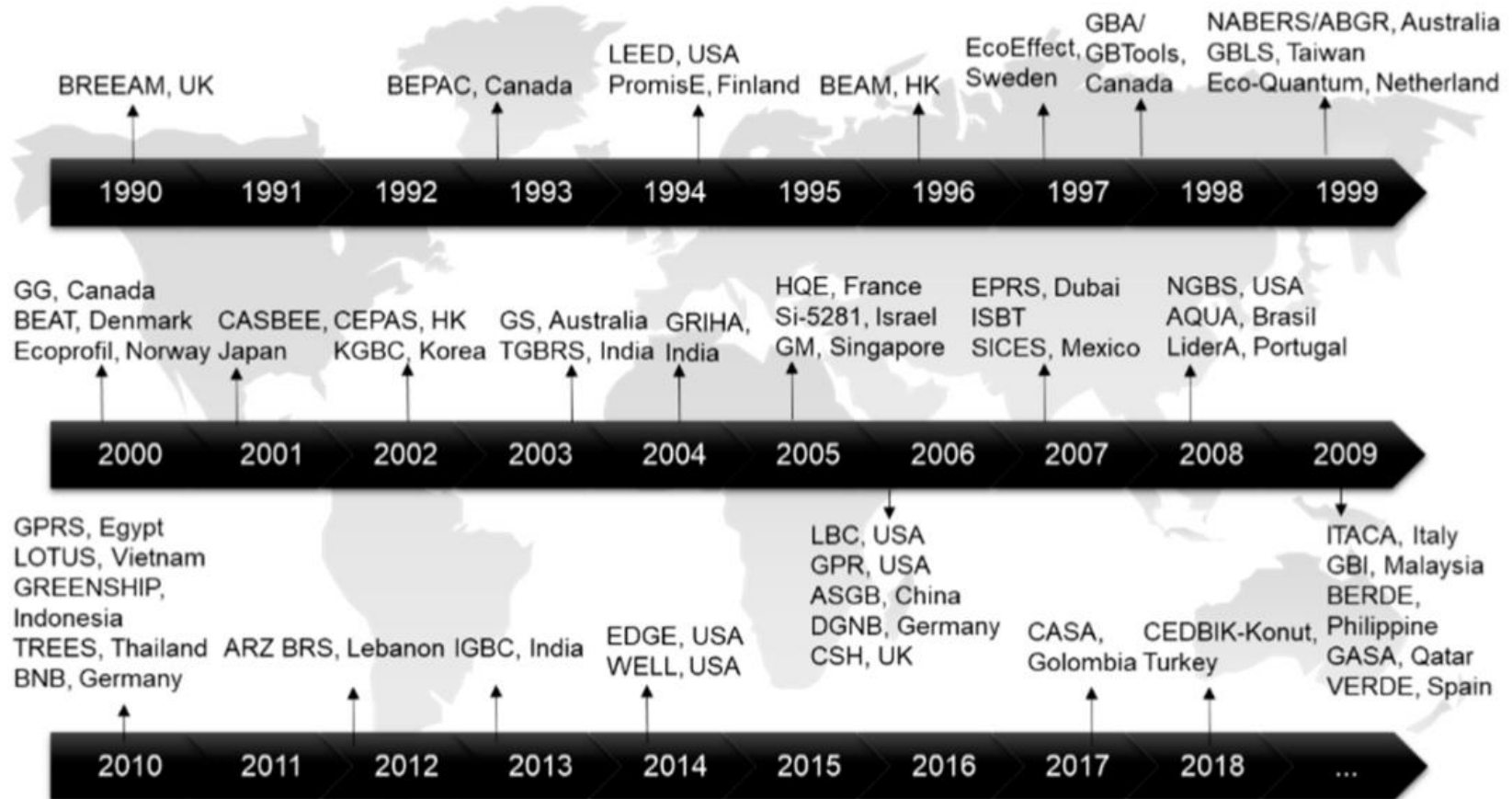
Building scores points according to criteria as set out by the Assessment System

High Performance Green Building is defined by the assessment system that rates it

No standard approach globally

Assessment criteria is highly variable between countries

Green Building Assessment Systems timeline



<https://www.youtube.com/watch?v=JOG4GwSPsY8>

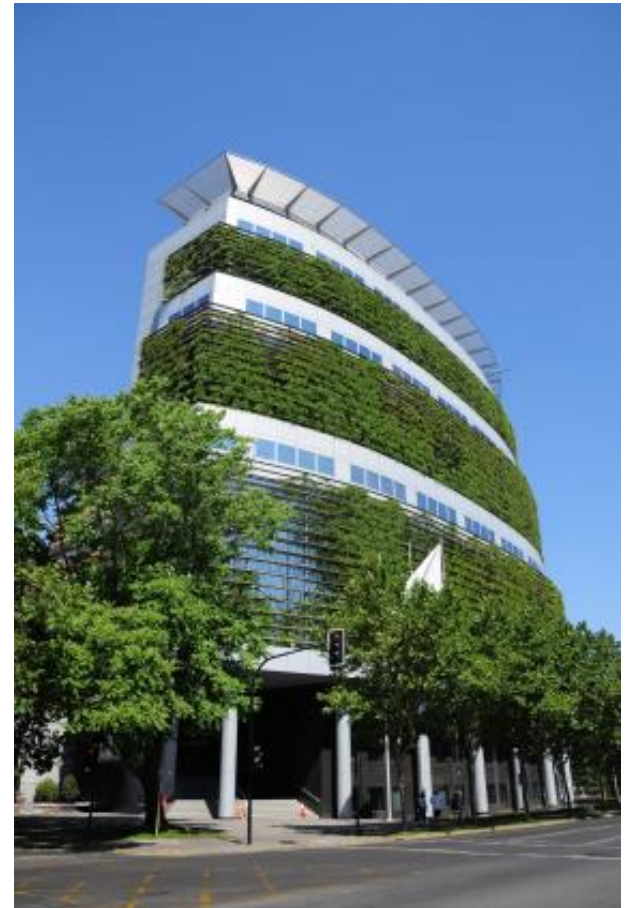
Green Building Assessment Systems

There are number of assessment systems available, including:

LEED & LBC (USA)

BREEAM (UK)

Green Star (AUS, NZ, SA)



Features of different Green Building Assessment Systems

Major Themes of Sustainability	Selected International Green Rating Tool				Rank
	Green Globes	LEED	Green Star	NABERS	
Energy efficiency and atmosphere	✓	✓	✓	✓	1
Water efficiency	✓	✓	✓	✓	1
Indoor environmental quality (IEQ) management	✓	✓	✓	✓	1
Sustainable site management & planning, land use, and ecology	✓	✓	✓		2
Material & resources	✓	✓	✓		2
Waste & emission	✓		✓	✓	2
Project management	✓		✓		3
Innovation		✓	✓		3
Transport			✓		4

LEED (USGBC)

LEED (Leadership in Energy and Environmental Design)

"how green is your building?"

Single number determines the building's assessment or rating based on an accumulation of points in various impact categories.

Certified, silver, gold or platinum

6 minimum program requirements (MPRs), 8 parameters and a maximum of 110 points divided into 7 major categories.



LEED Credit Categories

LEED Credit Categories



Rating	Points Required
Platinum	80-110
Gold	60-79
Silver	50-59
Certified	40-49
No rating	<39

https://www.youtube.com/watch?v=aD1U82i02bl&list=PLOx8fa9EbcPud5SGuhAcZ9-DFq_FP5Uo4&index=14

BREEAM (UK)

Building Research Establishment Environmental Assessment Method for buildings (BREEAM).

Describes a building's environmental performance

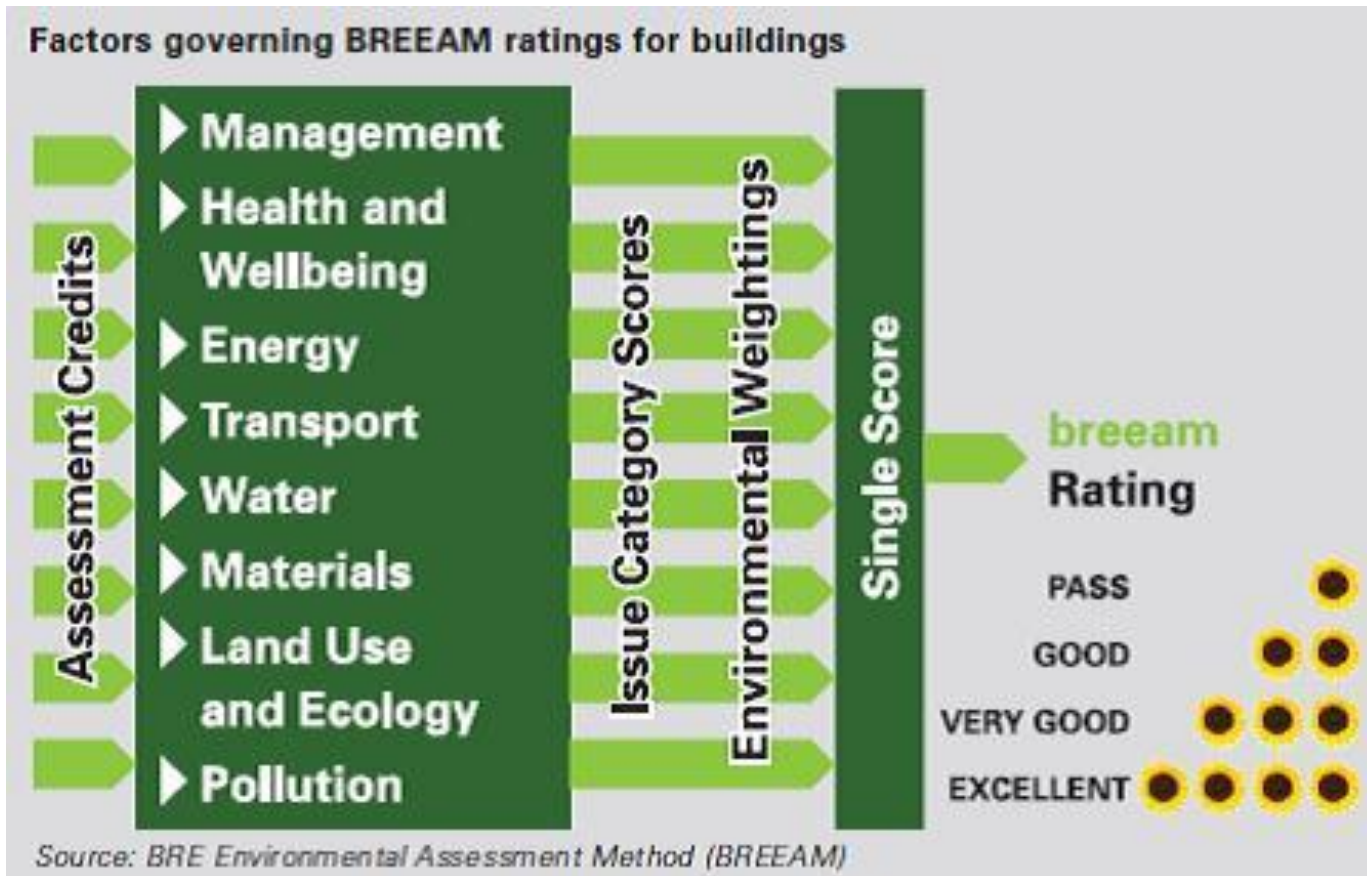
Best practice for sustainable building performance in the UK.

All building types (old and new).

49 individual assessment issues, 9 environmental categories, plus 10th category, titled Innovation.



Factors governing BREEAM



BREEAM Rating

BREEAM rating	Percentage score	Performance
Outstanding	85	Less than 1% of new UK nondomestic buildings (innovator)
Excellent	70	Top 10% of UK nondomestic buildings (best practice)
Very Good	55	Top 25% of UK nondomestic buildings (advanced best practice)
Good	45	Top 50% of UK nondomestic buildings (intermediate best practice)
Pass	30	Top 75% of UK nondomestic buildings (standard best practice)
Unclassified	<30	

NZGBC (NZ Green Building Council)

Not-for-profit, industry-led, member-based organization

Promotes the benefits of sustainable buildings

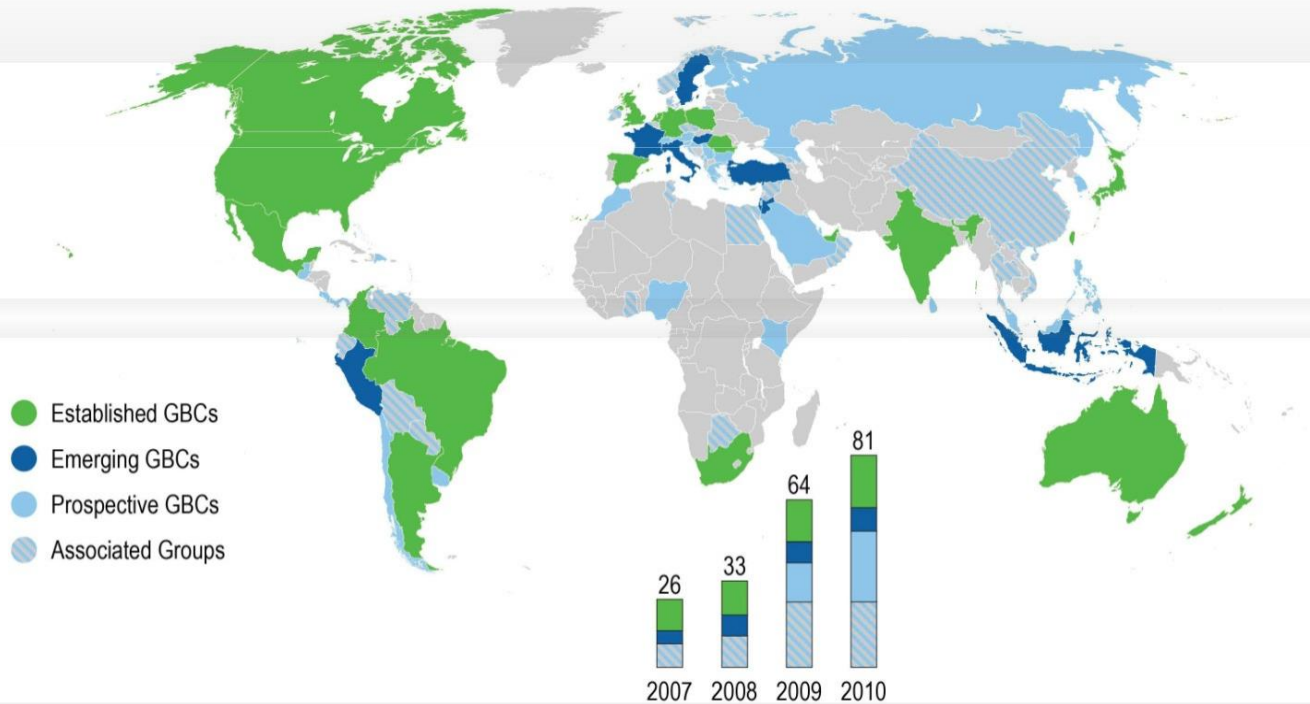
Assists property & construction sector gain skills/knowledge to deliver sustainable built environment

Motivates and rewards sustainable development and operation of buildings across NZ



NZGBC – Global Connections

Member of the World Green Building Council



NZGBC – Rating Tools



New Zealand: Green Star NZ

- 50% of buildings undertaking GS certification driven by tenant demand.
- 66 projects certified.

Australia: Green Star, Nabers, ACTHERS & more!

Since 2010, **mandatory** disclosure for energy efficiency when selling or leasing office space with area > 2,000 m².

United States: LEED

More than 28,000 commercial projects participating in the LEED green building certification system, comprising over 7.1 billion square feet of construction space

NZGBC - how it works

NZGBC

- Setting standards of best practice
- Education and training for building industry value chain
- Providing networks, information and resources for our members to actively lead the market
- Knowledge leadership



Rating tools

 greenstar

 homestar



Green Star - Objectives

Reduce environmental impact of buildings

Establish a common language

Encourage collaborative design

Raise awareness

Recognise and reward environmental leadership



Green Star – what it rates

Buildings:		
TYPE	PHASE	STATUS
Office	Design	New building
Industrial	Built	Existing building
Education	Interior fit-out	Major refurbishment
Custom		
Homestar		
TYPE	PHASE	STATUS
Houses	Design	New Building
Multiple Units	Built	



Green Star - Categories

8 Categories + Innovation

- | | |
|-------------------------------|-----|
| 1. Management | MAN |
| 2. Indoor Environment Quality | IEQ |
| 3. Energy | ENE |
| 4. Transport | TRA |
| 5. Water | WAT |
| 6. Materials | MAT |
| 7. Land Use and Ecology | ECO |
| 8. Emissions | EMI |
| + <i>Innovation</i> | INN |



Green Star - Fees

Green Star – Design & As Built & Interiors NZ Single Project Certification

For an As Built Certified Rating, the following fees apply.

An interim Design Review Certified Rating is optional and is included in the fees outlined below. The Certification fee is payable in full upon Registration.

Project Value(\$)	Members (excl. GST)	Non-members (excl. GST)
0M - <3M	\$13,000	\$18,000
3M – <10M	\$17,000	\$23,000
10M – <30M	\$22,000	\$31,500
30M – <60M	\$30,000	\$44,000
60M – <90M	\$36,500	\$54,000
≥90M	\$46,500	\$69,000



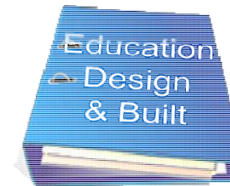
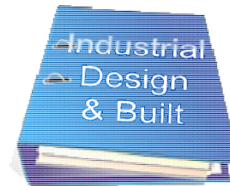
Green Star – Tools Available

Office 2009
'Design' & 'Built'

Office Interiors
2009
'Built' only

Industrial 2009
'Design' & 'Built'

Education 2009
'Design' & 'Built'



Geyser Building, Parnell

The Geyser building is the first new 6-green star building

Using nearly a third less energy

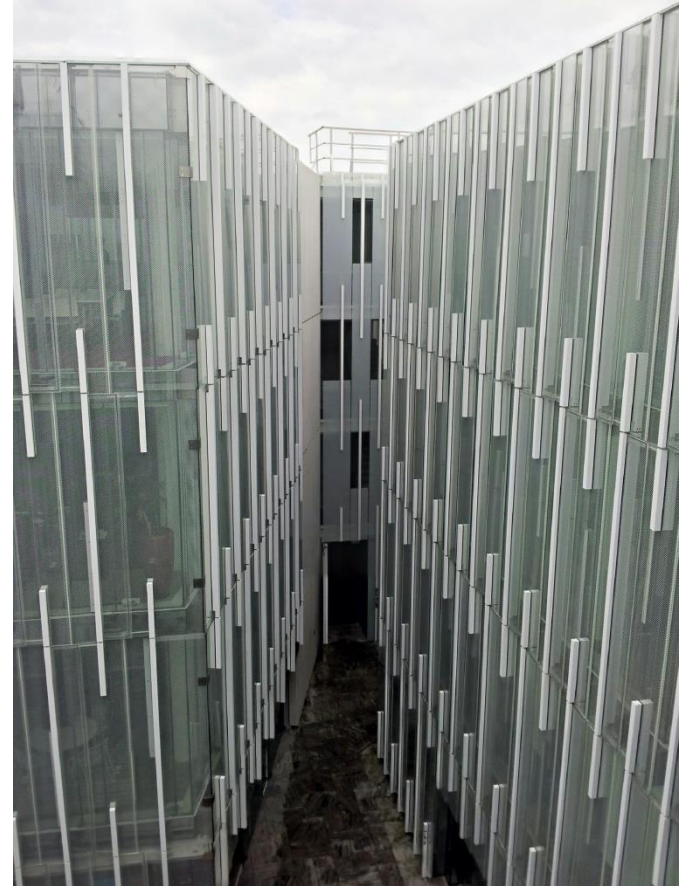
Using half the amount of artificial lighting and water

Breathing 100% fresh air

Accessing a 165 vehicle automated car-stacker

Using rainwater harvesting for toilets and irrigation system

Utilising showers, lockers and cycle parks to encourage active transport



Geyser Building - Green Star Certification

Green Star Category	Points	Percentage of total
Management	12	8.1%
Indoor environment	27	18.2%
Energy	29	19.6%
Transport	11	7.4%
Water	12	8.1%
Materials	25	17.0%
Land-use and ecology	8	5.4%
Emissions	19	12.8%
Innovation	5	3.4%
Total	148	100.0%



Geyser Building – Some Disadvantages

The building has no heating system and so electric heaters are used during some months

The car-stacker has been observed to deliver the wrong car on occasions which increases energy usage.

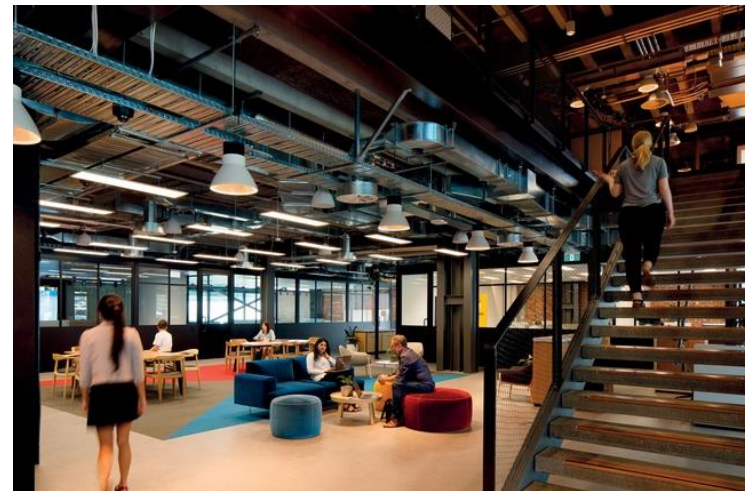
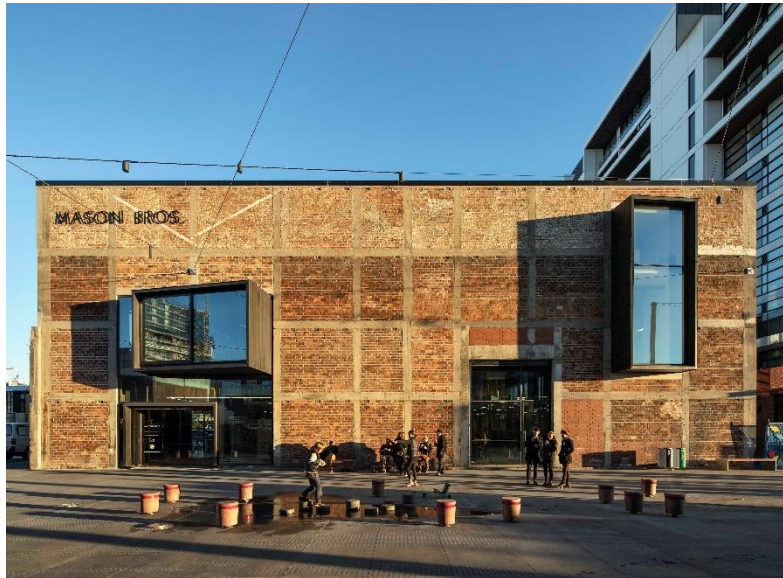
Mason Bros. Building

6 Green Star and a 5 Star NABERSNZ rating

2016 redevelopment of 1920s warehouse in Wynyard Quarter

3 level collaboration and innovation hub

Designed in line with the Wynyard Quarter Sustainability Framework



Mason Bros. Building

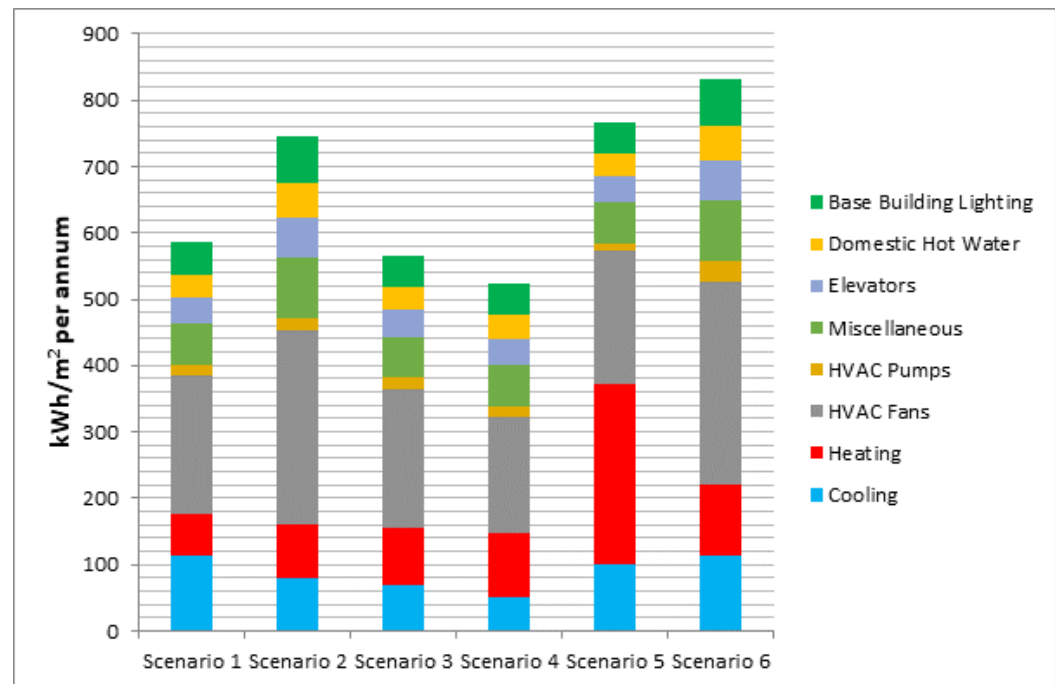
Full Lifecycle Assessment

Original building at end of serviceable life.

Lifecycle assessment tool (by BRANZ) showed redevelopment had 50% less

- global warming potential
- acidification potential
- eutrophication potential
- mineral depletion
- fossil fuel depletion

than an equivalent new building.



Mason Bros. Building – key sustainability features

Good environmental management practices during construction to minimise impact on local environment

Over 70% of construction waste recycled and so diverted from landfill

Environmental Management Operation rules included in Tenant Lease Agreement

All lighting is LED

Good insulation to reduce heating requirements

Energy submetering to allow responsible use of energy

Water efficient fittings to allow conservation of water

Stormwater from the site is filtered to meet the required standard

HOW TO MAKE YOUR BUILDING GREEN

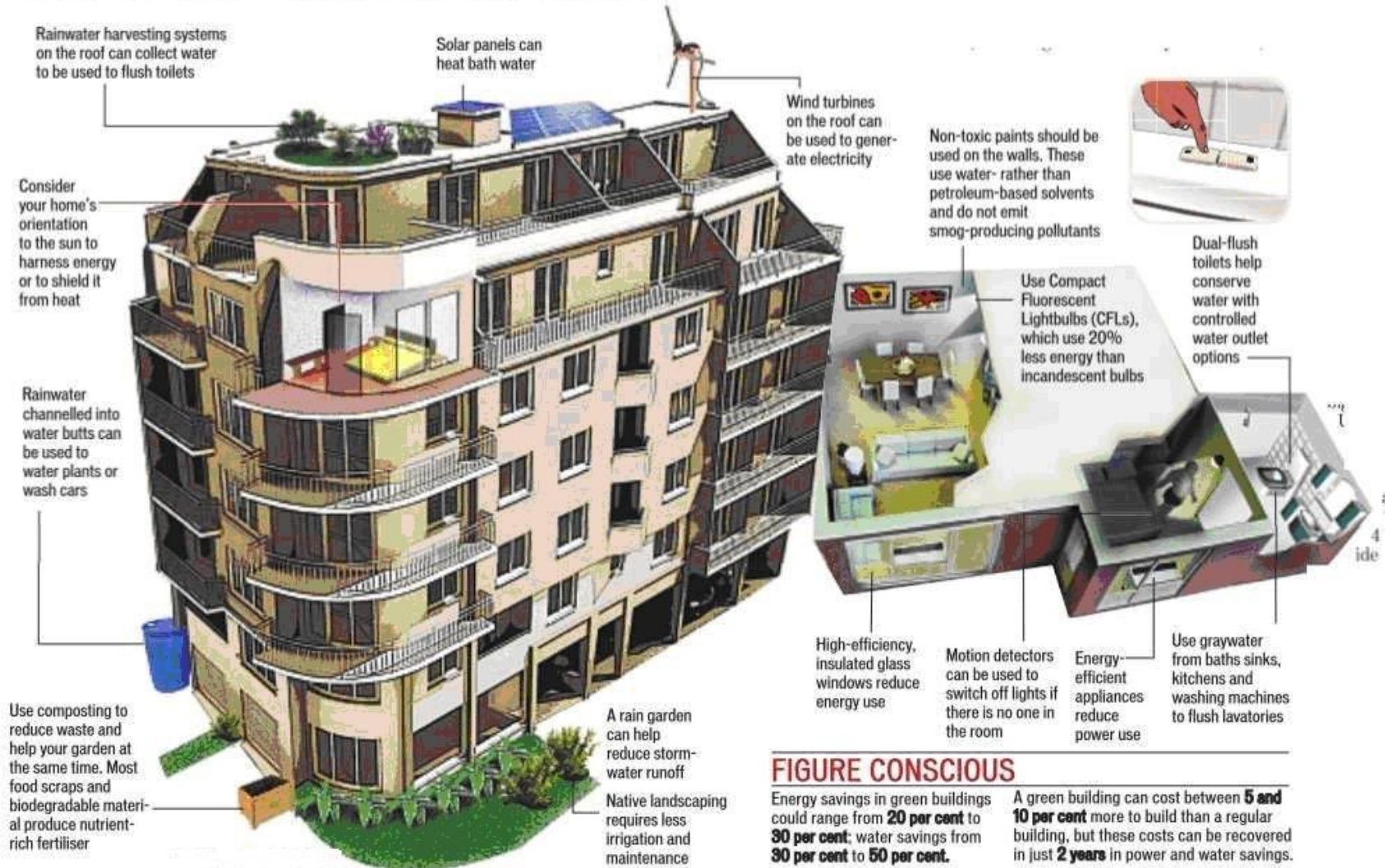


FIGURE CONSCIOUS

Energy savings in green buildings could range from **20 per cent** to **30 per cent**; water savings from **30 per cent** to **50 per cent**.

A green building can cost between **5 and 10 per cent** more to build than a regular building, but these costs can be recovered in just **2 years** in power and water savings.