



Australian
sustainable
building
developed
over 40,000
years...

The latest in sustainable buildings in Melbourne



Green Building Challenge

A nighttime photograph of a city skyline reflected in a river. The sky is a deep blue, and the city lights are vibrant. A prominent yellow building with a clock tower is visible on the right. The river in the foreground shows the reflection of the lights and a small boat. The overall scene is a mix of modern skyscrapers and older, historic-style buildings.

Energy Efficiency in Buildings

Jeff Norton

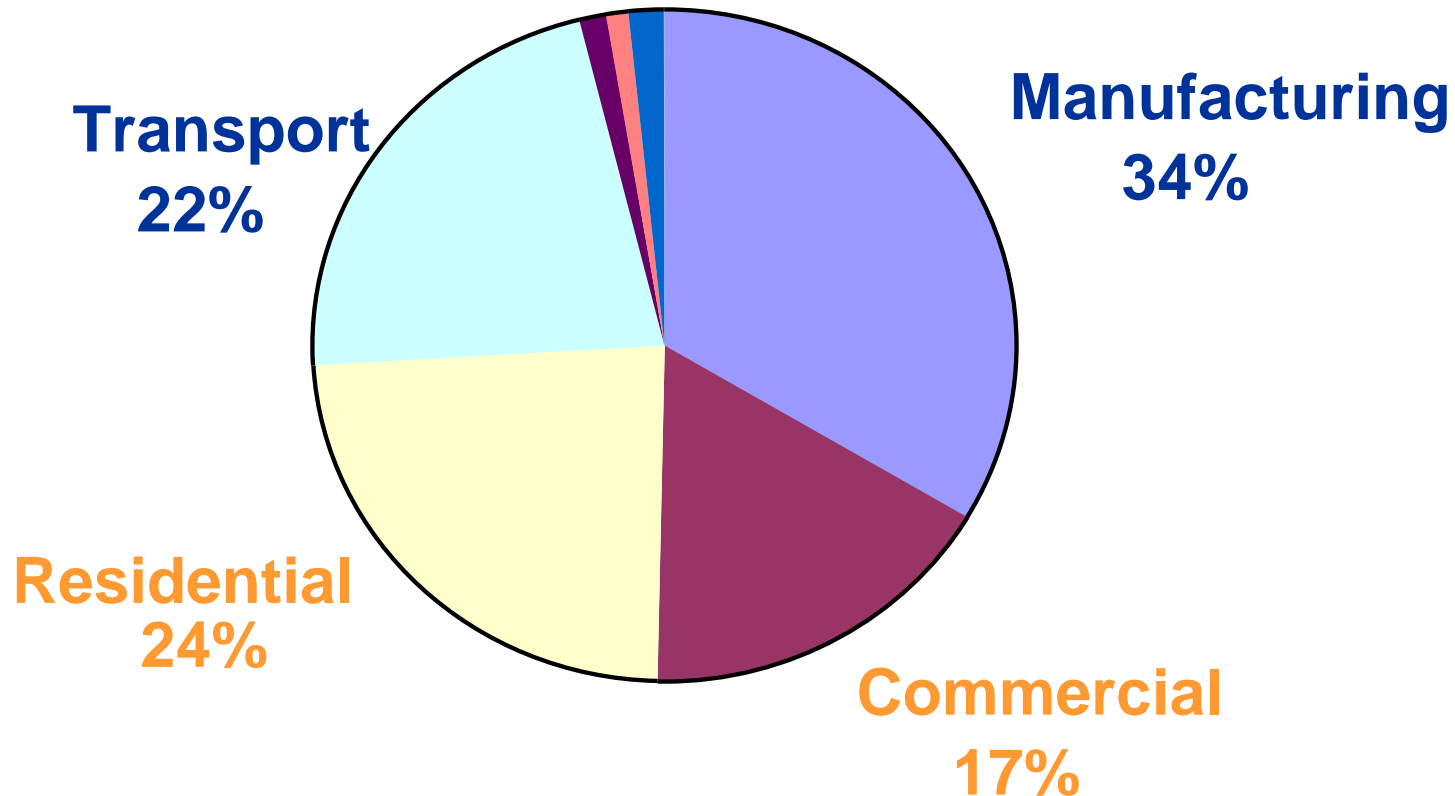
Overview

- **Context – why buildings?**
- **The case for Sustainable Buildings**
- **Recent achievements & successes**
- **What are the learnings**

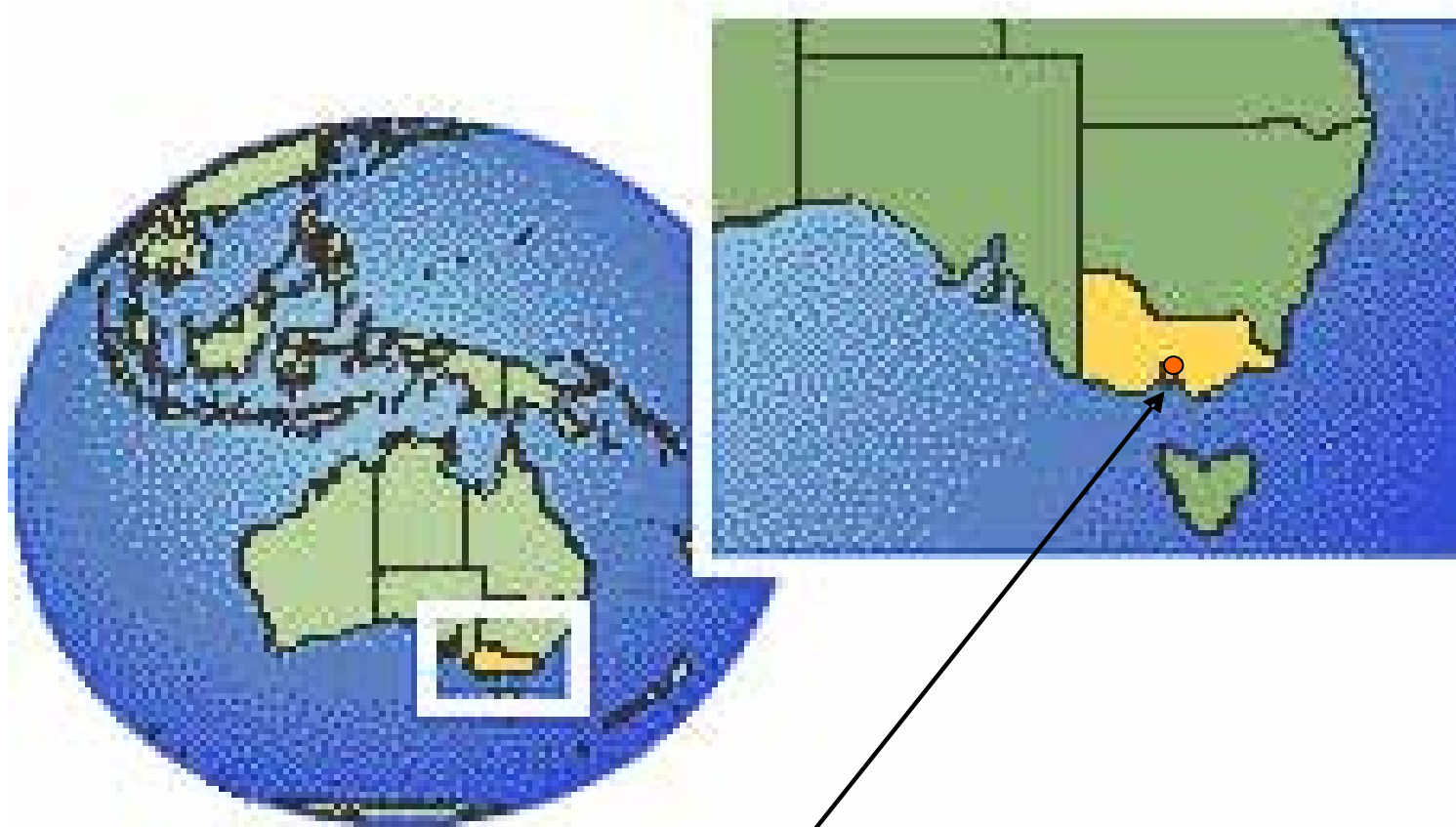
Building Impacts on the Environment

- 40 – 50% of **energy** use
= greenhouse gas emissions
- 40% of **solid waste** to land fill
- 16% global **fresh water** demand
- 40% raw **materials** consumption
- 25% of global **timber** harvest

Victoria's Greenhouse Emissions



Where are we?



Melbourne, Victoria

Who are we?

- The **Building Commission** is a Statutory Authority that oversees the building control system in Victoria.
- Victoria's **Building Regulation System** is recognized nationally and internationally as a leading model for building control

What do we do?

- We **ensure** the safety, liveability and sustainability of our built environment
- We **oversee** building legislation, **regulate** building practices, **advise** government and **provide** services to industry and consumers



OECD says that



- Key issues for sustainable buildings are:
 - Energy use and greenhouse emissions
 - Waste management
 - Indoor air quality
 - Water resources [a pressing problem for Australia, not so much in Europe and Asia – but increasingly so]
- OECD recommended policy responses:
 - Energy efficiency => regulation
 - Waste management => market measures, such as waste levies & charges
 - Indoor air quality => further research needed

How should Governments respond?

- **Regulate** minimum performance standards
- **Price** resources fully – energy and water
- **Environmental levies** - greenhouse taxes
- **Provide information** to consumers
- **Lead by example** – purchase, lease green buildings

The Building Code of Australia

- The **Building Code of Australia (BCA)** is produced and maintained by the Australian Building Codes Board on behalf of the Australian Government and State and Territory Governments
- The **BCA** has been given the status of **building regulations** by all States and Territories

Building energy efficiency standards

- **National** commitment to reducing greenhouse gas emissions from buildings - agreed in 2000 by all Australian governments
- Progressive implementation during 2003 – 2006
- Now have national energy measures for all building classes through the Building Code of Australia

5 Star housing standard

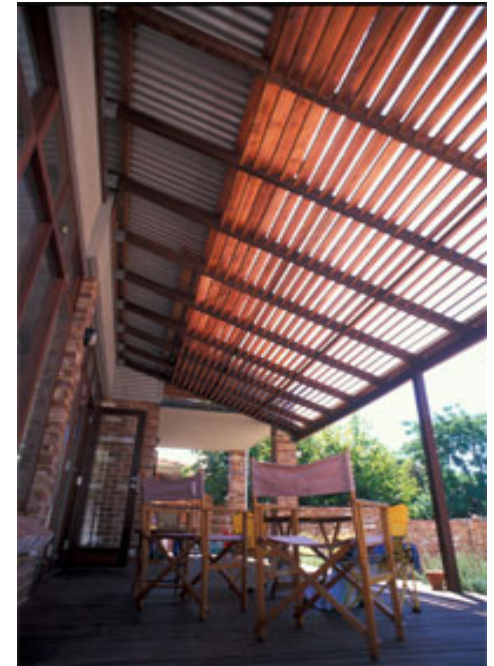
- **Triple Bottom Line Benefits**
 - **Homeowner**
 - **Victorian economy**
 - **Environment**

www.buildingcommission.com.au



Homeowner Benefits

- More comfortable homes
- Up to **10 degrees cooler** in summer, **5 degrees warmer** in winter
- Save **\$200+** on annual energy bills
- Increase in house prices **<\$2000**
 - based on actual costs



Economic benefits for Victoria

- **\$720M** added to Gross State Product
- **1800** new jobs
- Growth in energy consumption reduced
 - lower peak power demand pressures
 - lower energy prices
- Competitiveness of export industries enhanced
- Energy savings exceed **\$30M** annually in 5 years

Environmental Benefits

- Annual greenhouse gas reductions ramp up by **40,000t CO₂**
- Greenhouse abatement totals **2 million tonnes CO₂** within 10 years
- Equivalent to removing **500,000 cars** from our roads



Commercial buildings

- Greenhouse gas emissions from commercial buildings projected to increase **94%** between 1990 and 2010
- Unless we **take action**
- No energy efficiency standards in place for non-residential buildings in Aust. until 2006
- **1 May 2006** was the date for action through the Building Code of Australia [BCA]



BCA 2006 energy measures for commercial buildings

- Economic benefits - **\$3.4 Billion** nationally, over 10 year study period
- For an investment of **\$700M**
- Energy savings – **9.9 Gigajoule/annum**
- Greenhouse benefits – **18 Mt CO₂**
- Benefit/cost ratio – **4.6:1**

www.abcb.gov.au

Vision for Sustainable Buildings:

Three fold strategy

1. Minimum performance standards set in building regulation
2. Valuing Green buildings: commercial property sector - use of Green Star ratings
3. Government leading by example – setting environmental standards for its own property portfolio

Sustainability in the Building Code: Going beyond energy efficiency

- **Sustainability** defined as high level objective
- Alongside health, safety, durability, amenity
- Priority elements to be addressed:
 - Energy efficiency/**greenhouse gas emissions**
 - **Water** management and conservation
 - **Indoor environment**
 - **Materials** management

Valuing **Green** in the marketplace

- Government support for establishment of Green Building Council of Australia (2002)
- **Green Star** suite of rating tools (modeled on US LEED scheme) rapidly expanding in scope & market influence
- Publication of *Dollars and Cents of Green Buildings* by GBCA [Feb 2006]

www.gbcaus.org



Government leading by example

- **5 Green Star** minimum standard for new offices
- **Green Star** used to embed sustainability features in Melbourne Convention Centre design = > **6 Star** outcome (2009)
- **Green star** to be used to set standards for health care and educational facilities



Melbourne's Green Building Wave

- **60L** – the pioneer (2002)
- **40 Albert Road** – 6 Green Star refurbishment on challenging site (2005)
- **CH2** – 6 Green Star trail blazer (2006)
- **500 Collins** – 5 Green Star transformation of tired 30yo building (2005)
- **6 Star Melbourne Convention Centre** (2009)
- Momentum for change is **quicken**ing



CH2: Council House 2

200 Little Collins Street Melbourne

Australia's **first** Green Star rated building

- **Water**
 - 72% reduction in mains water consumption compared to the existing Council House of similar size
- **Materials**
 - timber from sustainable sources
- **Transport**
 - 25% car parking for small cars
 - cyclist shower and changing facilities provided



wind turbines

The exhaust plenum is at slightly negative pressure, induced by north flues, 'stack-effect' and wind-powered turbines.

vertical planting

Green north facade and roof top assists shading, glare + air quality.

Access to nature enhances productivity by relieving stress.

shading + light

Light shelf + balcony floors provide horizontal shading from northern sun.

Ambient and direct daylight bounces off external and internal light shelf.

exhaust

High level ceiling exhaust ensures complete emptying of warm air in ceiling spaces.

chilled ceilings

Chilled ceiling panels absorb radiated heat from equipment and occupants.

Occupants experience 'coolth' by radiating heat to chilled ceilings overhead.

roof top energy

Includes photovoltaic cells, solar hot water panels and a gas-fired co-generation plant.

healthy air

100% outside air supply via vertical ducts deliver air floor by floor to sealed access floor plenum.

thermal mass

Thermal mass in concrete slab absorbs excess heat from the space.

displacement air

Fresh air fed at low speed through controllable floor vents.

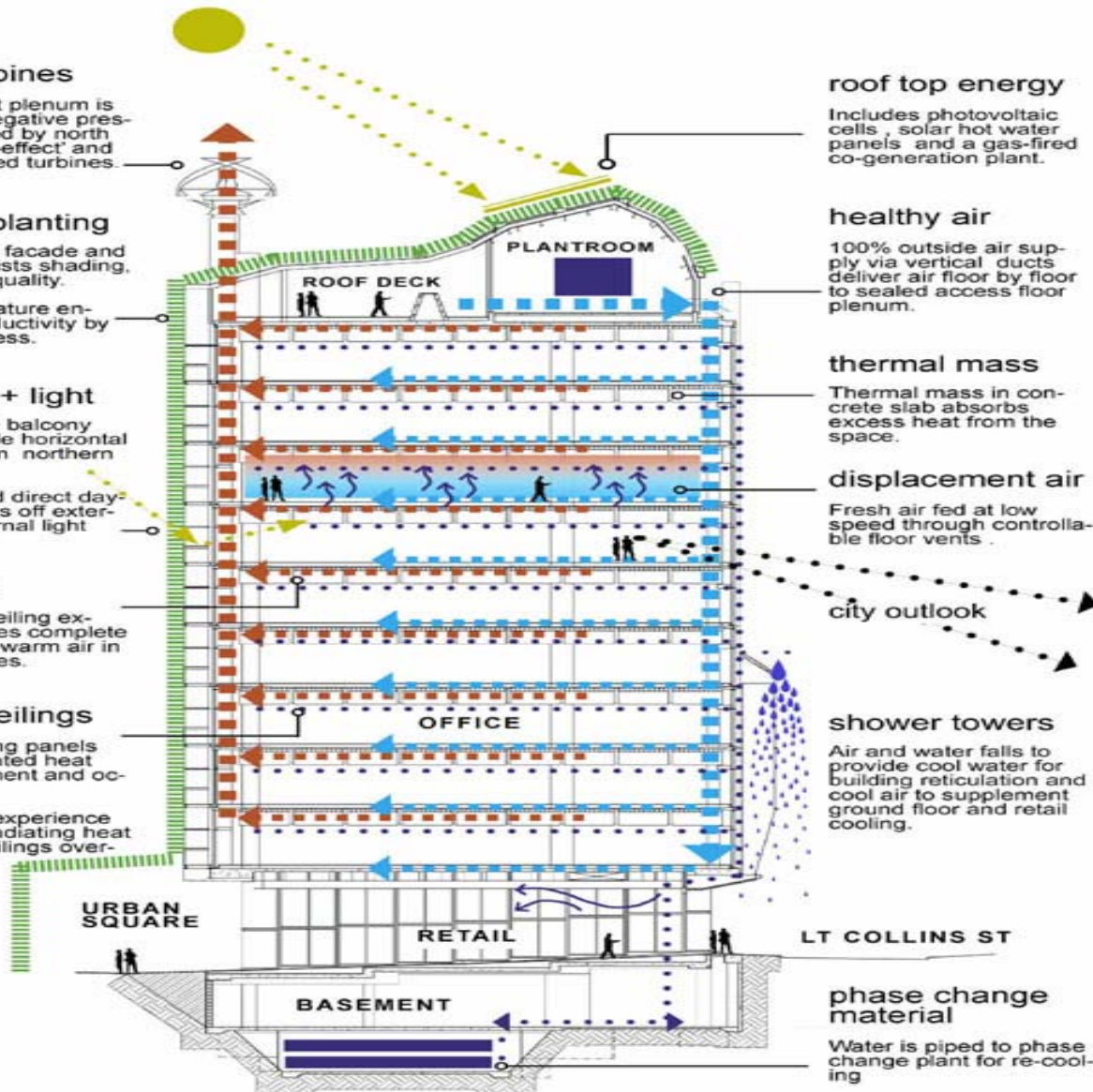
city outlook

shower towers

Air and water falls to provide cool water for building reticulation and cool air to supplement ground floor and retail cooling.

phase change material

Water is piped to phase change plant for re-cooling.



BIO CLIMATIC SECTION

CH2: Council House 2 (continued)

- **Innovation:** Multi water re-use sewer mining plant; phase change materials (PCM) thermal storage
- **Emissions:** 80% reduction in sewer emissions through the multi water re-use (MWR) plant; stormwater pollution management and treatment
- **Energy:** 85% reduction in electricity consumption compared to existing Council House of similar size; solar photovoltaic cells for electricity generation; building integrated wind turbines
- **Indoor Environment Quality:** 100% fresh air supply (no re-circulated air); fresh air supply quantities are 3 x Australian Standard; occupant controlled air vents; high thermal comfort performance



40 Albert Road, South Melbourne



- **First office refurbishment in Australia to be awarded 6 Star Green Star – Office Design V1 rating**
- **Management**
 - Comprehensive waste management plan
- **Indoor Air Quality**
 - Automated ventilation system using outside air, linked to a weather station
 - Low volatile organic compound content used throughout for building materials
- **Transport**
 - Provision of new bicycle, shower and locker facilities
- **Water**
 - Potable water reductions of 82% compared to similar offices
 - Cooling tower water consumption eliminated

40 Albert Road, South Melbourne (continued)

- **Energy**
 - Ceramic fuel cell to generate low- emission, off-grid energy with potential of providing for >30% of building energy requirements
 - 70% reduction in energy use compared to conventional offices
 - Reduction in office lighting power density
- **Materials**
 - Recycling facilities for office waste
 - High recycled content of structural concrete
- **Emissions**
 - Sewer discharge reductions of 72%
 - Aiming to become a greenhouse sink/net energy exporter within two years
- **Innovation**
 - Australian first permanent commercial office installation of natural gas VRV engine air conditioning units



Milestones on the road

- **2004** – 5 Stars for Victoria: Class 1 and 2 (energy and water measures included)
- **2004** – **Sustainability** defined as core BCA Objective
- **2005** – BCA energy measures for Class 2, 3,4
- **2006** – BCA energy measures for Classes 5 – 9
- **2006** – 5 Star housing (Class 1) nationally in BCA
- **2007/8** – **Sustainability** measures in BCA

Lessons learnt

- Energy efficient buildings deliver **Triple Bottom Line** benefits
- **5 Star scenario** also applies to **commercial buildings** - comparable economic, social and environmental benefits
- **Performance based regulations** are a very effective policy instrument
- Whole building **rating tools** are the way to go forward

Building Commission



The Building Commission is a professional, supportive forward thinking body. It strives to create better buildings through its leadership, its partnership, its education of the Victorian building industry.