

Rethinking Architectural Passive Cooling Strategies in New Zealand's Non-residential Building Stock

Lesley Metibogun & George Baird

Victoria University of Wellington



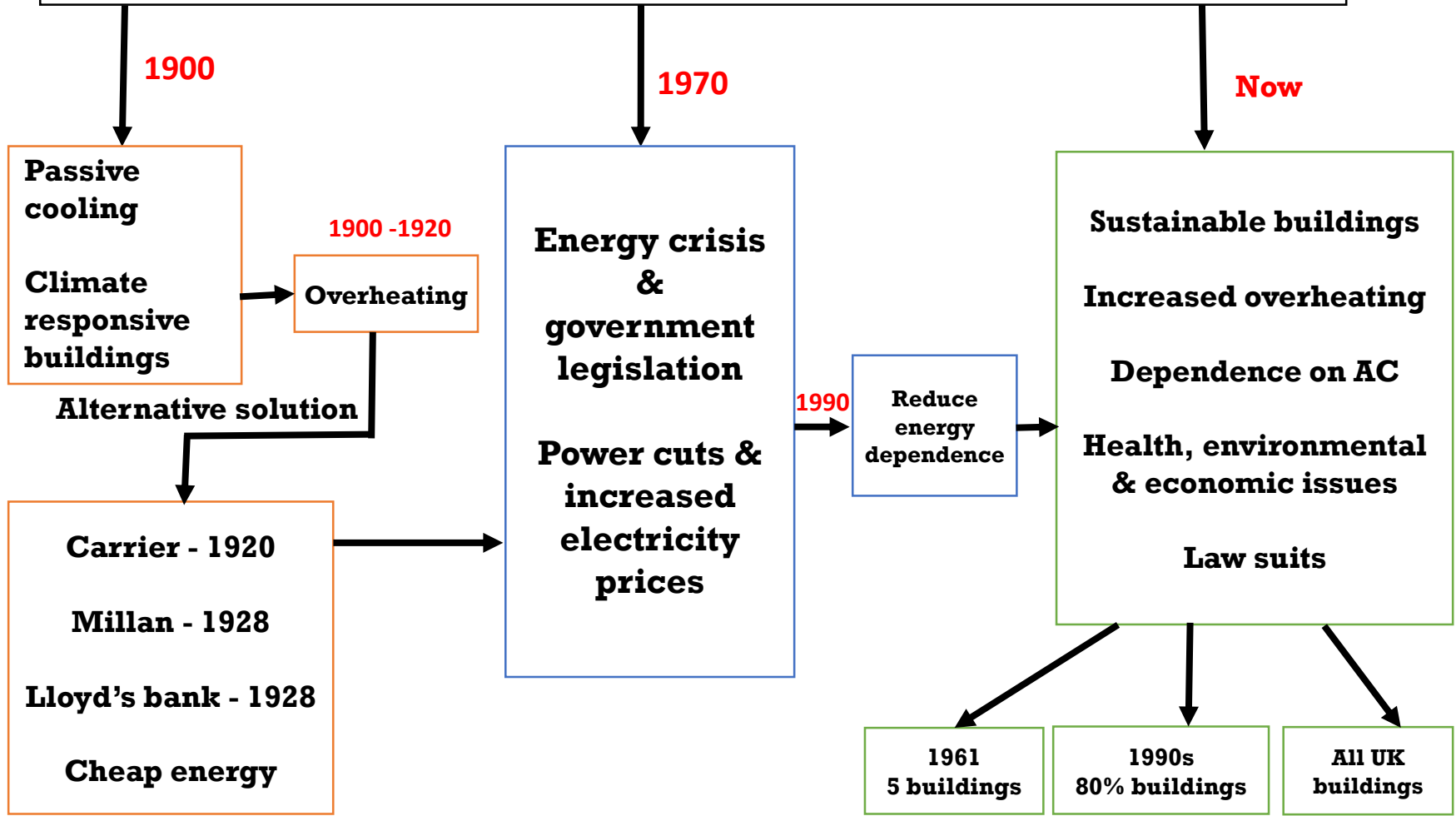
Organisers:



International Co-owners:



Trend towards dependence on air conditioning



The New Zealand context

- NZ Green Star buildings overheat.**
- Rising outside temperatures will worsen overheating.**
- Poor AC controls.**
- Inside temperatures will exceed 25°C more than 3% of occupied hour.**
- Energy use for AC will rise up to 70 % by 2070.**



Organisers:



International Co-owners:



The New Zealand Building Stock

FLOOR AREA STRATA	S1	S2	S3	S4	S5	TOTAL
Approx. No. of buildings	27,609	8,007	3544	1496	499	41,154
% of buildings	67	19	9	4	1	100
% of floor	21	19	20	19	21	100
Average floor area (m²)	298	955	2198	5187	17014	970

- 31% (7.9Mm²) located in Auckland .**
- Three building use types; office, retail, & others.**
- Air-conditioning accounts for 5-10% of energy use.**



Organisers:



International Co-owners:



Sustainable Buildings and Climate Initiative
Promoting Policies and Practices for Sustainability

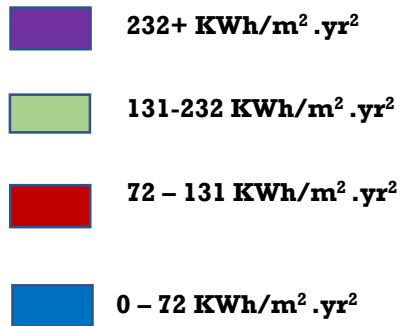


Global Alliance
for Buildings and
Construction

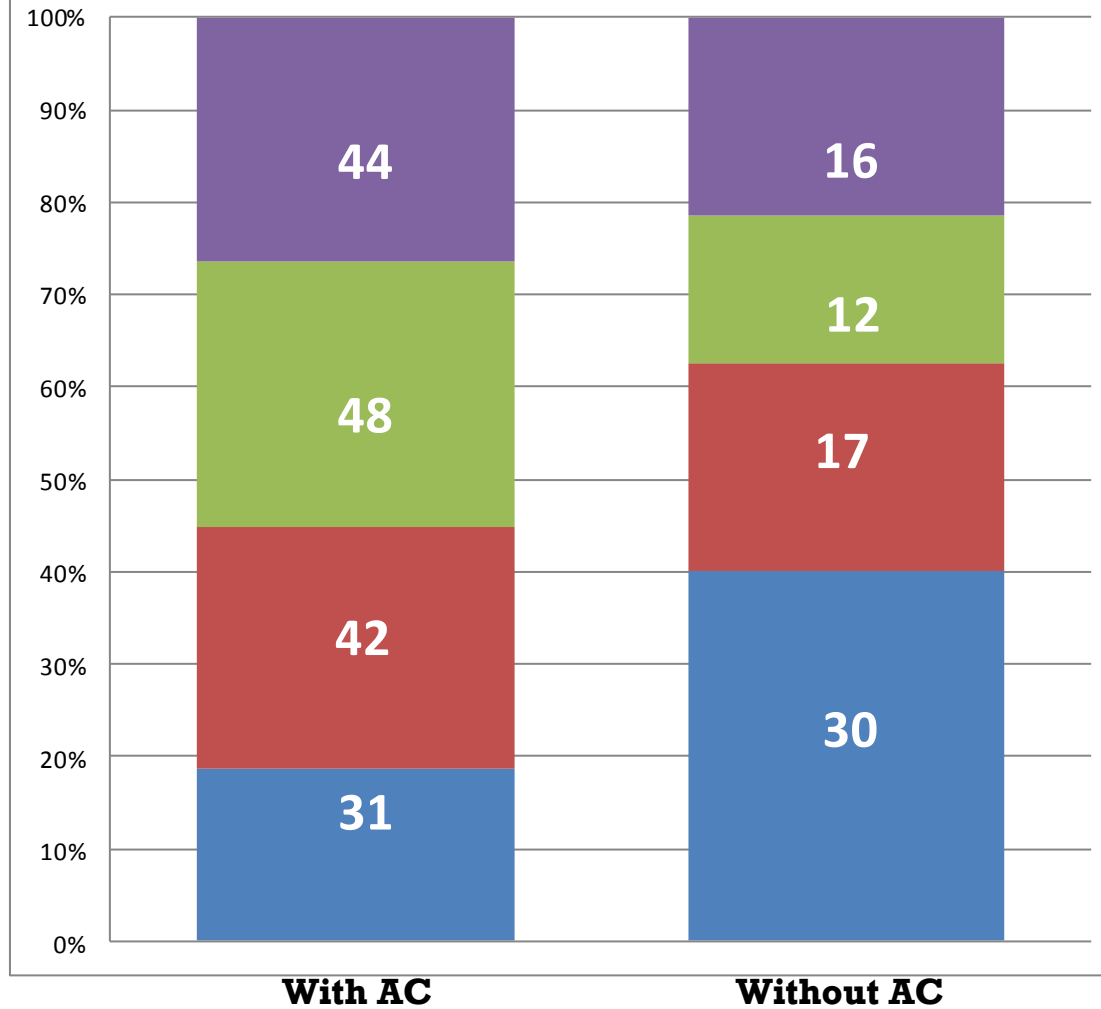
Inside temperature requirements

MOE	18°C - 22°C & 19°C - 24°C
CIBSE	20°C - 24°C
WHO	18°C - 24°C

Colour code



Premises in buildings with AC and those without.



Institutional drivers and the use of air conditioning



NEW ZEALAND INSTITUTE OF
ARCHITECTS
I N C O R P O R A T E D

APPROVED CPD PROVIDER



Organisers:



International Co-owners:



Retrofitting for Passive Cooling

- The aim is to prevent overheating.**
- Adaptation- change in design, construction, upgrade and occupation.**
- Mitigation- increase energy efficiency and reduce GHG emissions.**
- Energy and seismic upgrade.**
- 75% of existing stock will soon require retrofit.**



Organisers:



International Co-owners:



Sustainable Buildings and Climate Initiative
Promoting Policies and Practices for Sustainability



Passive Design ECMs

Applicable	Not Applicable
Advanced envelope	Optimised building form
Advanced glazing	Thermal zoning
Passive solar heat gain	Thermal mass
Solar shading	
Natural ventilation	
Window to wall ratio	
Skylights solar tubes	



Organisers:



International Co-owners:



Sustainable Buildings and Climate Initiative
Promoting Policies and Practices for Sustainability



Global Alliance
For Buildings and
Construction

Energy Efficient ECMs

Applicable	Not Applicable
Energy efficient lighting	Load management
Energy office equipment	Radiant heating
Advanced lighting control	
Mechanical air heat recovery	
Efficient air source pump	



Organisers:



International Co-owners:



Sustainable Buildings and Climate Initiative
Promoting Policies and Practices for Sustainability



Global Alliance
for Buildings and
Construction

Renewable ECMs

Applicable	Not Applicable
Photovoltaic	Solar thermal
	Biomass powered CHP
	Geothermal



Organisers:



International Co-owners:



The 'Aorangi' House



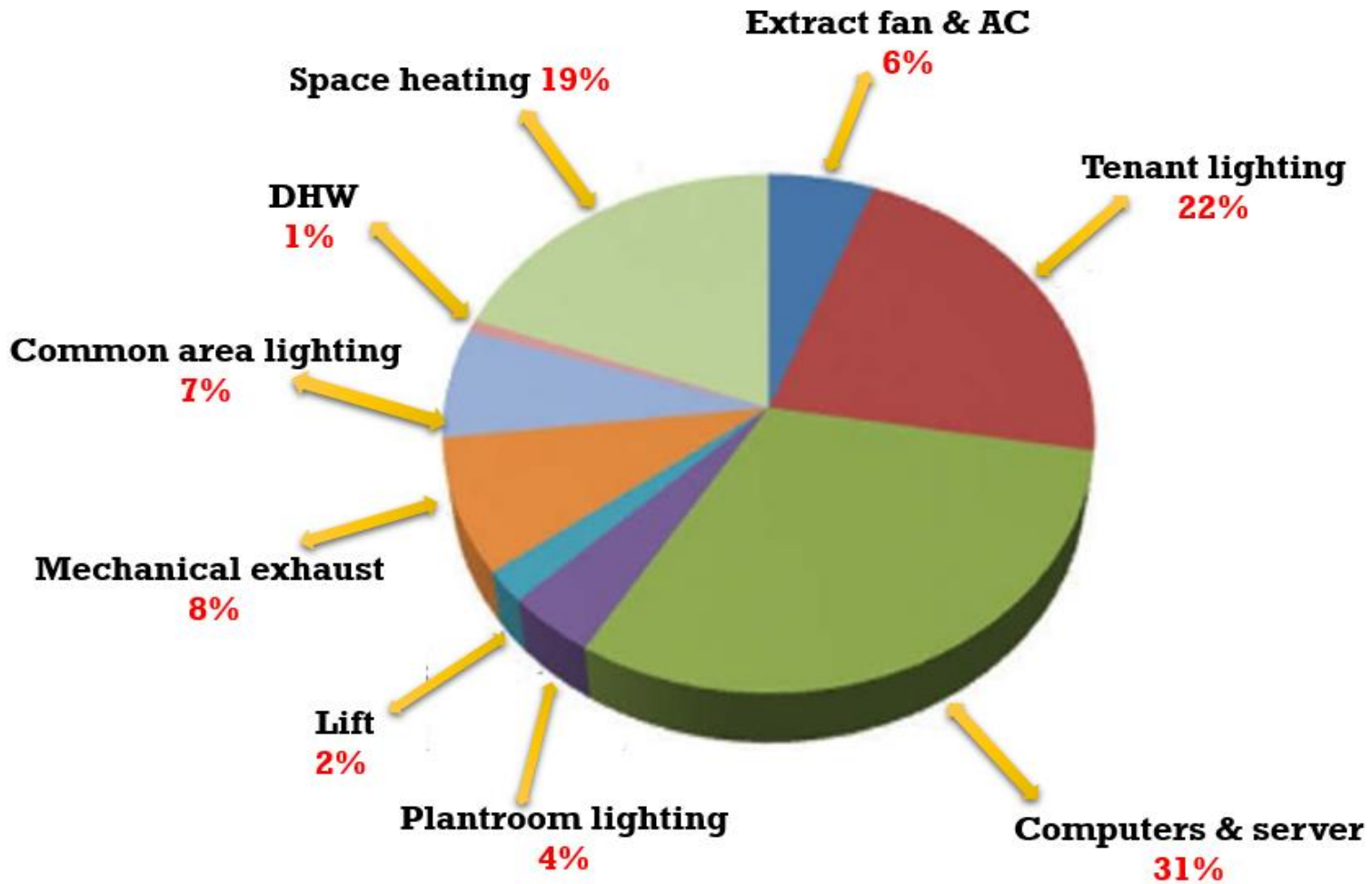
External solar shading

Opening windows

Anti-glare blinds



Workstation layout



AEUI 2010- 133KWh/m².yr; 2011- 101KWh/m².yr



Organisers:



International Co-owners:



Sustainable Buildings and Climate Initiative
Promoting Policies and Practices for Sustainability



Global Alliance
for Buildings and
Construction

Conclusion

- Existing policies & practices encourage the use of AC.
- Design, rental value, and institutions militate against passive cooling strategies.
- Passive cooling strategies would reduce national electricity demand.
- NZ target - carbon neutral by 2020.
- International target - 20% carbon emission reduction by 2020.
- Integrating passive cooling strategies with government initiated policies.



Organisers:



International Co-owners:



Sustainable Buildings and Climate Initiative
Promoting Policies and Practices for Sustainability



Thank you



Organisers:



International Co-owners:

