

The Myth of Carbon Neutral Buildings



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YOU CAN'T AFFORD TO BE SLOW IN AN EMERGENCY
ACT NOW FOR THE PLANET





Case Study

School of Architecture and Design
at Victoria University of Wellington



In June 2008, they became the **world's first** Schools of Architecture and Design to become certified **carbon neutral** through sponsorship to offset the green house gas emissions through **carbon credits** from Meridian Energy's **wind farm projects** in New Zealand certified by Landcare Research under the carboNZero program.

Why did SoAD decide to pursue carbon neutrality?



United Nations statistics show that the **20%** of the world's population that lives in **wealthy** countries **consumes** up to **80%** of the world's resources **unsustainably** and is largely responsible for global GHG emissions.

Advanced economies
In transition
Less developed
Least developed

What's wrong with resorting to
carbon offsets?

PROBLEM WITH THE SCIENCE BEHIND CARBON OFFSETS

- Difficult to calculate accurately
- Complex to measure the CO₂ that has been hypothetically neutralised
- Carbon savings expected to be made in the future are counted as savings made in the present
- Doubts as to the validity of the scientific basis for offsetting
- Problems with the temporary storage of carbon

- Offsets **do not** provide **incentives** for individuals and institutions to greatly change consumption patterns or existing social economic and political structures but give people the option of an **'easy way'** out.
- The existence of offset schemes is a direct reflection of the **capitalist** driven agenda

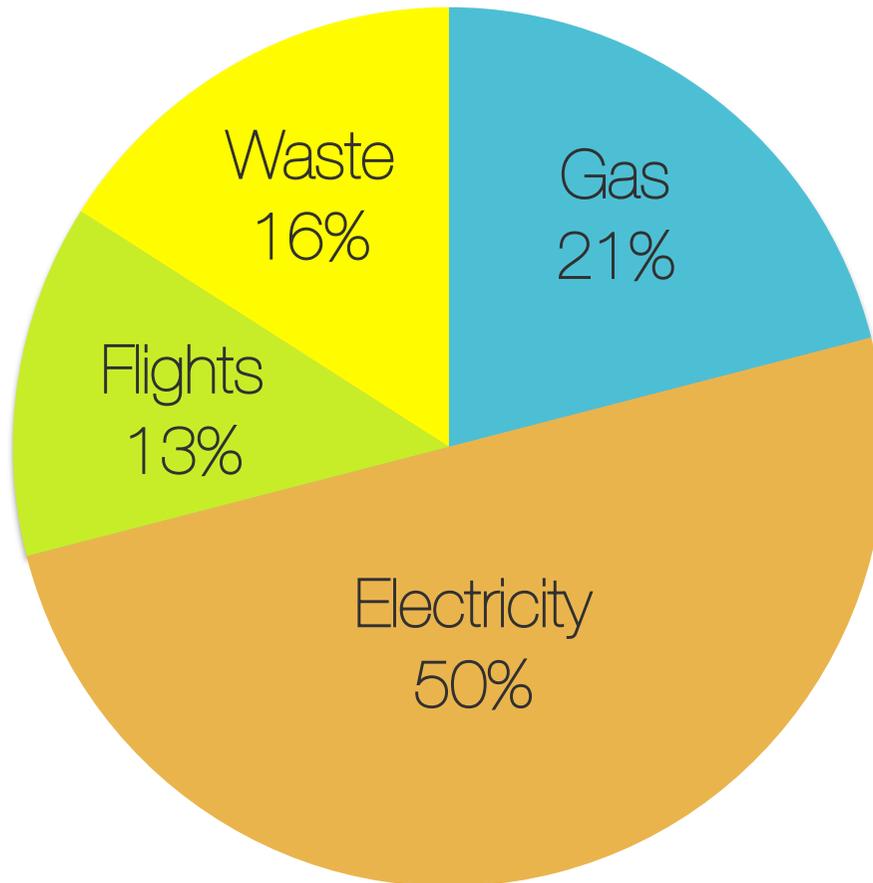


carbontradewatch.org

Can we actually be carbon neutral
without offsets?

- Reduce use/demand – impose limits, voluntary changes
- Eliminate wasteful use
- Improve efficiency – better planning
- Invest in better technology, upgrade building fabric
- Switch to renewable electricity generation

SoAD's ANNUAL GHG EMISSIONS FOOTPRINT



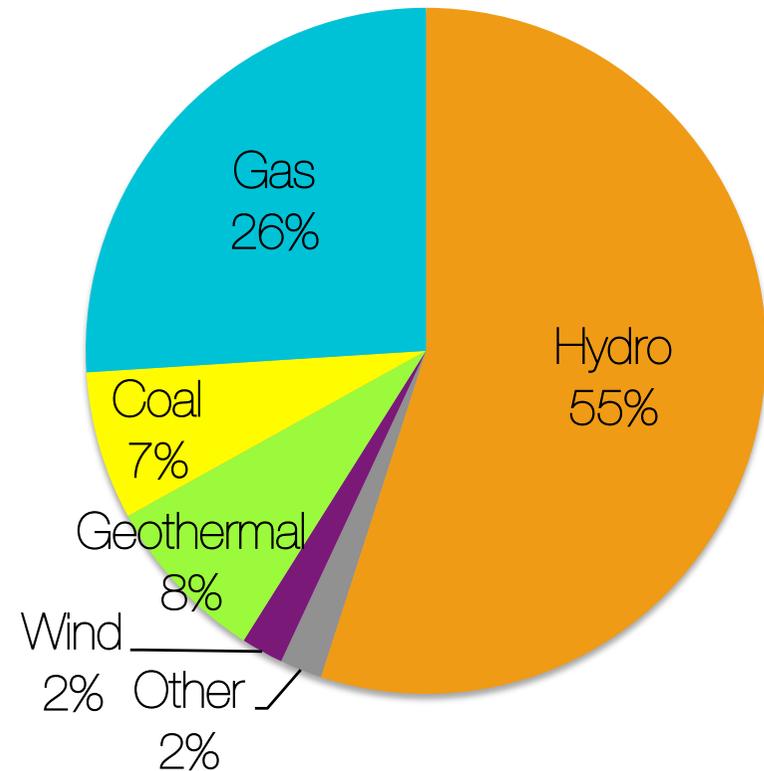
Not included:

- Books, equipment, stationary etc.
- Food?
- Transport to school?
- Underestimated staff flights

IT'S NOT ENOUGH!

= Total 65% of renewable energy production

Meridian's contribution to total NZ electricity generation was approx. 30% of national supply. 63% of electricity for sale to consumers was generated using renewable resources* (2008)



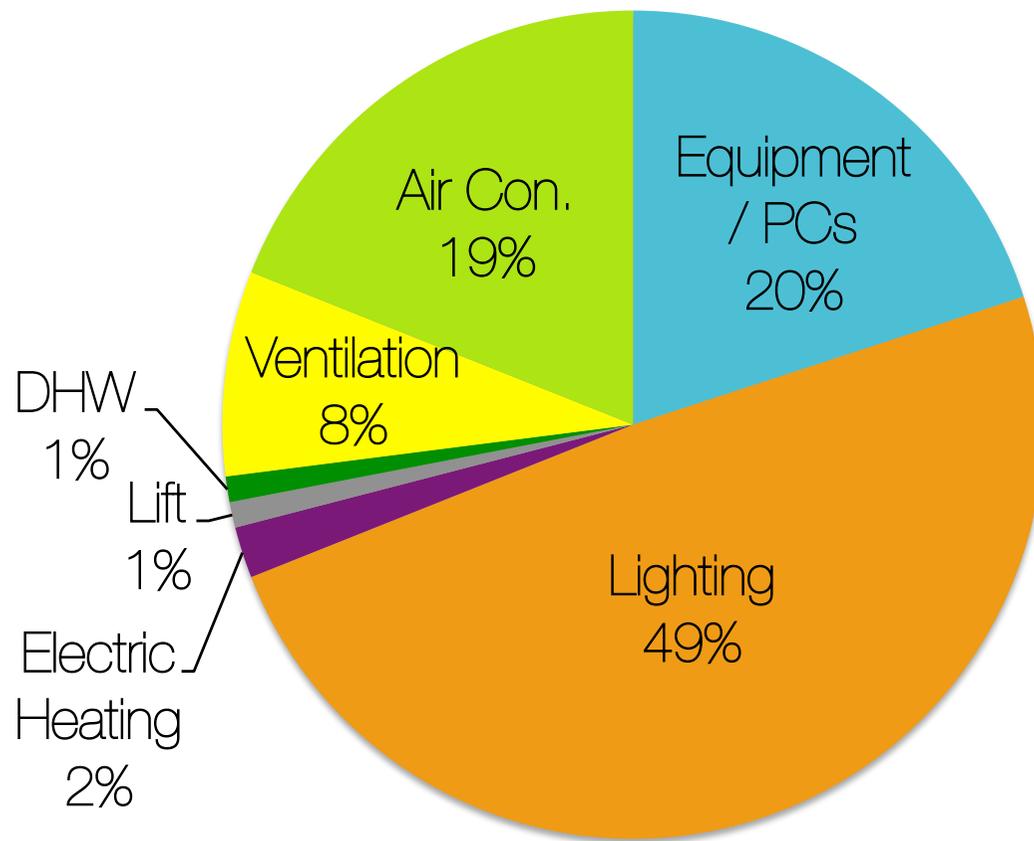
Source of electricity generation in NZ, 2007 (MfE)

REDUCTION GOALS:

25%, 50%, 90%

The emerging consensus is that 50 – 85% emissions reduction by 2050 will be required to stabilise the temperature, thereby avoiding the worst effects of climate change.

ALWAYS CONCENTRATE ON THE BIG THINGS THAT MATTER



1. Lighting
2. Equipment / PCs
3. Air Conditioning
4. Ventilation

What can you do to reduce 25% of electricity use?

25% REDUCTION - LIGHTING

Up to 32% lighting electricity reduction achieved by de-lamping and installing lower wattage lamps (dimmers)

25% REDUCTION – EQUIPMENT / PC

Savings	% savings
Switch off 50% of student PCs currently left on at night (Tri 1 & 2)	11%
Switch off 50% of student PCs after class hours (Tri 1 & 2)	12%
Switching staff PCs to go into sleep mode (Tri 1 & 2: operation hours)	3%
TOTAL	26%

25% REDUCTION – AIR CONDITIONING / VENTILATION

Savings	% savings
Switch off 50% of labs with air conditioning (Tri 1 & 2: after class hrs)	10%
Close 100% of computer labs with air conditioning (Tri 3)	11%
Reduce fresh air intake to reduce AHU load (Tri 1 & 2: Opening hours)	11%
TOTAL	32%

What can you do to reduce 50% of electricity use?

50% REDUCTION - LIGHTING

Savings	% savings
Turn 50% off of remaining lights left on after closing hours (Tri 1 & 2)	16%
Close down 54% of the student service part of the building (Tri 3)	18%
Close off 45% of the teaching areas after class hours (Tri 1 & 2)	10%
Install motion sensors in intermittently used spaces (Tri 1, 2 & 3)	6%
TOTAL lighting energy savings	50%

50% REDUCTION – VENTILATION / AIR CONDITIONING (VAC)

55% reduction in VAC electricity by changing the PCs to laptops (with similar specification) in computer labs

The power rating of the computers is an indication of heat output. Laptop electricity use is 65%-80% lower than for the current desktop PCs

50% REDUCTION – EQUIPMENT / PCs

Low cost method

- ALL SoAD computers need to be set to sleep mode, hibernating after 20mins of inactivity during operation hours

OR

50% REDUCTION – EQUIPMENT / PCs

High cost method

- All staff PCs needs be replaced with the equivalent laptop. This would result in 13% savings. As students require computers with a higher specification, 71% of student PCs need to be replaced with laptops to achieve a combined 50% savings in electricity.

What can you do to reduce 90% of electricity use?

90% REDUCTION - Lights

The combination of switching from T8 Fluorescent to LED equivalent lighting AND lowering exceeding lighting level

- LED wattage power consumption is 60-80% lower, there is no requirement for a ballast or a starter, and no mercury
- 10 times more expensive than an equivalent fluorescent light, HOWEVER, life span is 5 times longer, reducing the price difference to half. (lower maintenance costs & heat output)



90% REDUCTION – VENTILATION & AIR CONDITIONING (VAC)

Eliminate air conditioning at SoAD through passive cooling methods and changing the occupants' cooling expectations

Retrofit the building so that it does not need any active cooling system

- 70% VAC electricity reduction can be made by eliminating air conditioning throughout the whole year.
- 11% VAC electricity reduction can be made by reducing fresh air intake during non-cooling periods (9 months) to Building Code requirement

This is only a total of 81%. The remaining 9% saving would need to be met via renewable electricity generation.

90% REDUCTION - PCs

Switch all SoAD standard PCs to Laptops with equivalent specification (79% saving) and reduce the number of computers available (11% saving made by reducing 63% of student PCs)



Renewables electricity generation:
Solar or Wind?

RENEWABLE ELECTRICITY GENERATION: Solar

- Not enough roof **space** (3000m²) to provide 100% electricity demand (1.6 million kWh/yr). Around 20% of electricity generation can be met within roof space costing under \$3 million
- PVs too **expensive** for low efficiency
- Peaks in **summer** months when the school is least busy but appropriate for providing for **air conditioning**

RENEWABLE ELECTRICITY GENERATION: Wind



\$1 million to install, 1500m² land required, Windy Wellington

Energy Reduction	Extra energy (credit) from 1.8million kWh/yr produced	Credit in dollars / year (Using \$11.83/kWh average for electricity)	Payback period from surplus
25%	+589,897 kWh/yr	+\$69,785	14.3 years
50%	+993,264 kWh/yr	+\$117,503	8.5 years
90%	+1,638,653 kWh/yr	+\$193,853	5.2 years

Is it practical? Is it viable?

- Behavioural changes cost **nothing** to implement.
- It is not about viability, people don't think this is a **priority**.
- Carbon offsets will cost money too!
SoAD need about **\$16,000** to offset JUST their electricity use each year.

WHICH UTILITY WOULD YOU INVEST?



TOYOTA RAV 4 (2000 CC)

- 1990's model, around 100,000km = \$4000 - \$8000 2nd hand
- Brand new \$40,000+
- Operating costs: WOF, petrol, parking, insurance, maintenance



SOLAR HOT WATER

- \$4000-\$8000 installed (incl. the cylinder)
- 50%-75% of annual hot water needs for average household,
- Provide savings of approx \$400 a yr; about 2200kWh/yr electricity

So what about the building?

- Existing building stock needs **upgrading** for the future (i.e. double glazing, more insulation, airtightness, etc)
- Any new building must be **zero energy**
- Other factors that require attention (i.e. **transport, food, waste** etc)
- Buy-in of **Operation/Building managers** to implement change

SUMMARY

- 25% reduction : Eliminate wasteful use
- 50% reduction: Improve efficiency
- 90% reduction: Reduce use drastically or invest in renewable technology

AT WHAT COST?

25% reduction in electricity use is equal to turning off 1000 lights running continuously for 6 months

50% reduction in electricity use is equal to turning off 1000 lights running continuously for 1.3 years

90% reduction in electricity use is equal to turning off 1000 lights running continuously for 2.3 years

SoAD's annual electricity cost approx. **\$191,000**

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