RETROFITTING VICTORIA’S COMMERCIAL BUILDINGS
Better Commercial Buildings Research
The Next Wave Refresh

Prepared by
AECOM Australia Pty Ltd
Level 10, Tower Two, 727 Collins Street, Melbourne VIC 3008, Australia
T +61 3 9653 1234  F +61 3 9654 7117  www.aecom.com

ABN 20 093 846 925

Prepared by Sian Willmott, Weng Chan, Sarah Brennan
Reviewed by Liz Johnstone

The Next Wave Refresh © Sustainability Victoria 2018.

While reasonable efforts have been made to ensure that the contents of this publication are factually correct, Sustainability Victoria gives no warranty regarding its accuracy, completeness, currency or suitability for any particular purpose and to the extent permitted by law, does not accept any liability for loss or damages incurred as a result of reliance placed upon the content of this publication. This publication is provided on the basis that all persons accessing it undertake responsibility for assessing the relevance and accuracy of its content.

The Next Wave Refresh should be attributed to Sustainability Victoria.

The Next Wave Refresh is licensed under a Creative Commons Attribution 4.0 Australia licence. In essence, you are free to copy, distribute and adapt the work, as long as you attribute the work and abide by the other licence terms. To view a copy of this licence, visit: http://creativecommons.org/licenses/by/4.0/
Executive Summary

Commercial buildings contribute significantly to Australia’s greenhouse gas emissions and present a significant opportunity for low cost abatement and energy efficiency. In recent years, the focus has been on office buildings, particularly existing, non-premium buildings over 2000m². In July this year, mandatory disclosure thresholds were lowered to include buildings larger than 1000m². This presents a timely opportunity to investigate the potential to improve environmental performance across a broader range of commercial buildings in addition to offices.

This report expands upon Sustainability Victoria’s Next Wave Report 2013, which identified opportunities for upgrading mid-tier office buildings; including factors affecting building performance and the potential for upgrade, such as building size, age, location and ownership. Sustainability Victoria has since delivered a number of programs (such as the Energy Efficient Office Building program) which have demonstrated the efficiency gains and emissions reductions that can be achieved when effectively targeting segments of the commercial buildings sector.

This Next Wave Refresh Report builds upon the previous research, but has expanded its scope to include commercial retail, healthcare, accommodation and hospitality buildings. The change to the Commercial Building Disclosure program’s (CBD) mandatory threshold (to 1,000m² NLA from the previous 2,000m² on 1 July, 2017) under the Building Energy Efficiency Disclosure Act (2010) has also been considered. The disclosure requirement relates to the provision of energy efficiency information when a commercial office is offered for sale or lease. Previously in Victoria, 752 office buildings (GFA > 2,000m²) were required to report on performance under the Act. These buildings comprise a total 52% of office GFA in Victoria. The revision in threshold now means that up to an additional 793 office buildings will be required to report on performance when sold or leased, bringing the GFA to 61% of Victoria’s office GFA (1,545 office buildings). Despite this, 15,027 small office buildings (< 1,000m² GFA) remain below the reporting threshold. These small buildings represent 39% of total office GFA and present opportunities for upgrading.

A key feature of this refresh is the inclusion of four other commercial building sectors being:

- Retail: shopping centres, box retail and shopping strips
- Healthcare: general practitioners, consulting suites, super clinics, but not hospitals
- Accommodation: hotels, short-stays, backpackers, motels, bed and breakfast, and student accommodation
- Hospitality: restaurants, cafes, bars and fast food outlets.

Research and energy efficiency programs and grants to date have focused on office buildings. The inclusion of additional sectors in this report provides an understanding of the environmental impact of other mid-tier buildings and where opportunities may exist to expand retrofitting programs where the CBD reporting threshold does not apply.
What are the overall opportunities for retrofitting commercial buildings?

As expected, the distribution of office buildings across the state is concentrated in the Melbourne CBD and other activity centres; with some presence in regional cities. Retail and healthcare buildings are spread more evenly throughout populated areas, with accommodation and hospitality buildings distributed widely, but more prevalent within tourism regions and the central city.

Retail, healthcare, accommodation and hospitality buildings in Victoria are much more numerous than office buildings (approximately 3.8 to 1) and are generally smaller (below 1,000m$^2$ GFA). Unlike larger commercial buildings, which tend to be owned and managed by a smaller number of companies, and concentrated in the City of Melbourne; the more diverse retail, hospitality, healthcare and accommodation buildings are further varied in location, size, age, ownership and management regimes; making the drivers for environmental upgrades less clear.

The challenge of working with smaller buildings is not dissimilar from the challenges of working with the domestic residential sector, and strategies additional to incentivising building upgrades may be required.

### TABLE 1 COMMERCIAL SECTORS SIZE AND PERFORMANCE SUMMARY

<table>
<thead>
<tr>
<th>Commercial sector</th>
<th>Total GFA (m$^2$)</th>
<th>Total number of buildings</th>
<th>Average NABERS Energy Star rating</th>
<th>Total emissions (millions kg CO$_2$-e / annum)</th>
<th>Average NABERS Water Star rating</th>
<th>Total water consumption (millions L/ annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria-state-wide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office</td>
<td>12,588,338</td>
<td>16,572</td>
<td>3.13</td>
<td>1,951</td>
<td>3.56</td>
<td>7,354</td>
</tr>
<tr>
<td>Retail$^1$</td>
<td>20,671,260</td>
<td>50,322</td>
<td>3.26</td>
<td>1,027</td>
<td>2.88</td>
<td>17,017</td>
</tr>
<tr>
<td>Healthcare$^2$</td>
<td>1,141,346</td>
<td>4,456</td>
<td>50</td>
<td>904</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accommodation$^3$</td>
<td>2,368,735</td>
<td>2,548</td>
<td>3.6</td>
<td>551</td>
<td>3.25</td>
<td>6,295</td>
</tr>
<tr>
<td>Hospitality</td>
<td>2,863,232</td>
<td>5,370</td>
<td>TBC</td>
<td>TBC</td>
<td>TBC</td>
<td>TBC</td>
</tr>
</tbody>
</table>

Source: Valuer-General Victoria, NABERS and AECOM

FIGURE 1 GFA COMPARISON OF COMMERCIAL SECTORS SOURCE: VALUER-GENERAL VICTORIA AND AECOM

---

1. Average rating based on publicly available ratings for shopping centres. Different operational profiles have been assumed between "small”, “medium” and “large” retail outlets. See Section 3.6.
2. Retail emissions used as basis for calculations. See Section 4.6.
3. Average rating based on publicly available ratings for hotels.
The small and medium commercial building (SMCB) market provides challenges due to its size and diversity. While energy efficiency retrofits present opportunities to improve building performance, as well as achieve broader environmental sustainability and corporate social responsibility (CSR) objectives, SMCBs do not appear to have seen the same penetration of energy efficiency technologies as larger offices and shopping centres. This could be attributed to the split incentives between building owners and tenants, lack of customer demand (and education), difficulty in accessing funding for retrofits and the relatively lower expenditures on energy management.

As prices for energy continue to rise and the need to reduce greenhouse gas emissions becomes more pressing, the importance of energy savings across all building types will only increase, and the energy efficiency retrofit market for SMCB will also grow. The focus on larger buildings which are able to generate greater benefits and shorter return on investment periods must continue and be supplemented by strategies to support energy efficiency retrofits for SMCBs.

Strategies may be to encourage staged approaches rather than upfront capital-intensive investment to incrementally improve building performance, and bring forward benefits.

Opportunities could relate to:

› A focus on underperforming/ageing equipment and prioritising replacements to achieve greatest reduction in energy use;
› Building tuning to increase energy efficiency;
› Low energy lighting upgrades, which can also improve workplace comfort;
› On-site generation of renewable energy; and
› Improvements to heating and cooling systems, including the upgrade or adjustment of fan systems.

Providing guidance for building owners and managers concerning manufacturers and suppliers of retrofit products and services, the costs and benefits of options available, and improving the communication of benefits to users of commercial buildings will assist to address the market barriers and drive change. Communications could explain Green Building rating systems, energy efficiency and emission reduction regulatory and policy initiatives, thresholds for mandatory disclosure and relevant building energy rating standards.

Market barriers may be best addressed via a segmented approach such as working with industry groups, targeting SMCB portfolio owners, franchise chains (or areas with significant numbers and GFA of commercial buildings), or real estate agents specialising in commercial properties.

Despite this, barriers such as split incentives, lack of green leases, perception of high capital cost, perceived reduced business continuity and the diversity of the market remain.
What are the overall opportunities for retrofitting in each sector?

This report identifies the size, age, type and location of commercial buildings across Victoria and, using NABERS energy and water performance data, estimates the potential benefits available through pursuing sustainability initiatives. Figure 2 and Figure 3 compare potential emissions and water savings across commercial sectors.

**FIGURE 2 POTENTIAL FOR EMISSIONS SAVINGS ACROSS DIFFERENT SECTORS**

![Emissions Graph]

Source: NABERS and AECOM calculations

**FIGURE 3 POTENTIAL FOR WATER SAVINGS ACROSS DIFFERENT SECTORS**

![Water Graph]

Source: NABERS and AECOM calculations
Office

In Victoria, 16,572 office buildings constitute 12.6M m$^2$ of GFA. Of these office buildings, 60.5% of GFA is over the revised mandatory reporting threshold of 1,000 m$^2$ and 45% of office GFA is located in the City of Melbourne. The mean energy star rating for offices is 3.13, with rural and regional Victoria performing slightly better than metropolitan Melbourne; a small (15) sample of medium sized offices (1,000–2,000 m$^2$) received a higher average rating of 3.7 stars. This is likely due to the opportunities realised through the National Green Leasing Policy for government tenants.

The upgrade of building office stock is being strongly driven by tenants; including their desire to reduce operational costs and to enhance amenity to retain staff. Drivers for building owners are similar, with aims to reduce ongoing energy and water associated with the base building services and to decrease vacancy rates in a competitive commercial market. A number of barriers to upgrading remain primarily around ownership structure and the ultimate beneficiary.

Opportunities for improving offices:

- The largest predicted emissions reduction could be achieved in buildings over 2,000 m$^2$ in the City of Melbourne and buildings below 2,000 m$^2$ in metropolitan Melbourne. If these buildings were raised from their current condition to a 5 Star NABERS equivalent; savings of approximately 395,000 tonnes CO$_2$-e/annum and 270,000 tonnes CO$_2$-e/annum could be realised in the City of Melbourne and metro Melbourne respectively.
- The largest predicted water savings could be made in the same areas, with 1,000 mega-litres and 730 mega-litres of savings available across the City of Melbourne and metropolitan Melbourne respectively.
- A large number of office buildings (20% of total office GFA) were constructed between the years 1980–1989; presenting an opportunity to upgrade their centralised HVAC systems (average plant life of 30 years). If the upgrade of a major plant resulted in a 1 Star increase in NABERS rating, an emissions saving of 128,000 tonnes CO$_2$-e/annum could be realised.
- 39% of Victoria’s office GFA remains below the CBD threshold. While reaching out to and upgrading 15,027 office buildings presents a challenge, an opportunity to address this could result in savings of 447,000 tonnes CO$_2$-e/annum.
- Although long term, low rate financing is available from Victorian local councils under the Local Government Legislation Amendment (Environmental Upgrade Agreements) Bill 2015, other barriers for upgrading such as time and education may need to be overcome for many smaller commercial building owners to consider upgrades.
- The National Green Leasing Policy for government tenants has been effective in the upgrade/provision of a number of energy efficient buildings across Victoria. Communicating these principles across a broader range of buildings and tenants may assist in expanding the uptake of green leases.

**FIGURE 4 ESTIMATED EMISSIONS ACROSS THE COMMERCIAL SECTOR**

Source: NABERS and AECOM calculations
FIGURE 5 ESTIMATED WATER USE ACROSS THE COMMERCIAL SECTOR

Greater potential for water savings

- Metro Melbourne
- City of Melbourne
- Rural
- Regional Centres

Source: NABERS and AECOM calculations
Retail

Retail has the highest total GFA of the sectors analysed at a total over 20M m$^2$ across more than 50,000 buildings. 31% of the retail GFA in Victoria consists of 1,313 large retail buildings (>2,000m$^2$) such as shopping centres, box retail and larger supermarkets. More than half of retail GFA is made up of approximately 47,000 small retail buildings (<1,000m$^2$), 30,000 of which are located in metropolitan Melbourne (such as strip shopping precincts and convenience stores).

The ownership profile between larger shopping centres and small retail shops varies significantly. Shopping centres are typically owned by large investment or property groups; a number of whom have programs and policies in place regarding business operation and asset sustainability. The mean NABERS energy rating across shopping centres is 3.26 stars with regional shopping centres performing slightly better than their metropolitan counterparts (3.1 stars compared to 3.6), which could be attributed to building age.

Small retail is typically tenanted with ownership structures minimising incentives to upgrade. As noted above in the office sector, targeting such a large number of buildings can be challenging when considering retrofitting.

Opportunities for improving retail:

› The largest emissions and water intensive areas for retail can be found in metro Melbourne; with predicted total greenhouse gas emissions of 629,000 tonnes CO$_2$e/annum and water use of 10,446 mega-litres per annum. The largest portion of this is within retail <1000m$^2$ at 55% of total GFA.
› Given the ownership structure of small retail, approaching large-scale tenants i.e. chain stores may be beneficial. Further steps would entail investigating the feasibility of engaging with small retail through avenues such as large retail chains, specific local councils if they have programs or plans in place for shopping precincts, or traders associations.
› Retail was the most intensive sector for water use; and given that the majority of retail centres are single storey; opportunities may exist for rainwater harvesting and reuse.

FIGURE 6 ESTIMATED EMISSIONS USE ACROSS THE RETAIL SECTOR

Source: NABERS and AECOM calculations
FIGURE 7 ESTIMATED WATER ACROSS THE RETAIL SECTOR
Source: NABERS and AECOM calculations

Comparison of the year of construction for office and retail buildings indicates that the bulk of the office buildings in Victoria were built primarily after 1970. The retail buildings were primarily built after 1920. This gives more opportunities for upgrading retail building stock. There are also fewer office buildings than retail buildings.

FIGURE 8 COMPARISON OF OFFICE AND RETAIL NUMBER OF BUILDINGS AGAINST CONSTRUCTION YEARS
FIGURE 9  COMPARISON OF OFFICE AND RETAIL GFA AGAINST CONSTRUCTION YEARS

Source: VSV
Healthcare

87.8% of the healthcare buildings analysed are small (< 1,000m²), consisting of general practitioners, dentists, consulting suites and surgeries. They are generally located in a mix of residential buildings (generally owner operated), shopping centres and commercial retail street precincts (tenanted); with 71% of the total healthcare GFA located in metropolitan Melbourne. These ownership models have different drivers for upgrading however, reduced operational costs appear as consistent reasoning behind upgrades. The barriers to improving healthcare facilities will not be dissimilar to office buildings.

Out of the sectors examined in the report, healthcare buildings had the smallest impact on the environment, responsible for approximately 42 tonnes CO₂-e/annum and 781 megalitres/annum.

Opportunities for improving healthcare:
› Apply lessons learned from office program in terms of ownership drivers

FIGURE 10 ESTIMATED EMISSIONS ACROSS THE HEALTHCARE SECTOR

![Graph showing emissions across healthcare sectors](image)

Source: NABERS and AECOM

FIGURE 11 ESTIMATED WATER USE ACROSS THE HEALTHCARE SECTOR

![Graph showing water use across healthcare sectors](image)

Source: NABERS and AECOM
Accommodation

There are 2,548 buildings used for commercial accommodation purposes in Victoria equating to approximately 2.3M m² GFA. While 59% of all accommodation buildings are located in rural Victoria, the proportion of total GFA is more evenly split between City of Melbourne (39%), rural Victoria (30%) and metropolitan Melbourne (23%). GFA tends to be split between large (>2,000m²) buildings located in the City of Melbourne and metropolitan Melbourne, and small buildings (<1,000m²) in rural Victoria.

The publicly available data from NABERS hotel ratings provides a high level indication of how the accommodation sector is performing, with a mean energy star rating of 3.6 stars and a mean water star rating of 3.25 stars.

Ownership varies across the sector from hotel groups that own multiple chains to owner-operated bed and breakfasts and small hotels. Larger global hotel chains with buildings of over 2,000m² in central locations are undertaking their own initiatives driven by operating costs, broader amenity upgrades, market competition, CSR, increased floorplate efficiencies and consumer choice. The performance and any initiatives undertaken by smaller operators particularly those in rural Victoria given the substantial number are largely unknown.

Student accommodation has increased in recent years, spurred on by the strong education market in Melbourne. The majority were constructed post 2000 and therefore an impact in this sector may be limited. Upgrades are generally driven by reduced operational costs and student choice for quality of accommodation.

Student accommodation comprises of 35% of the total number of buildings and 26.7% of the total GFA for Melbourne. The remaining accommodation type buildings are commercial buildings.

Opportunities for improving accommodation include:

- The largest predicted emissions use in the accommodation sector can be attributed to 60 large buildings in the City of Melbourne, responsible for an estimated 174,000 tonnes CO₂-e/annum and 1800 megalitres of water/annum. Upgrading these buildings to an equivalent 5 Star NABERS rating could result in savings of 93,000 tonnes CO₂-e/annum and 1,150 megalitres/annum. In accordance with CLUE data;

- The second largest potential impact could be made in rural Victoria; however, the ownership structure here is more independent and a large number of buildings would need to be targeted (490,912m² over 1,391 small buildings);

- Further pursue initiatives such as government accommodation procurement policies that require staff to stay in accommodation that meets certain sustainability criteria.

FIGURE 12 ESTIMATED EMISSIONS ACROSS THE ACCOMMODATION SECTOR

Source: NABERS and AECOM calculations
FIGURE 13 ESTIMATED WATER USE ACROSS THE ACCOMMODATION SECTOR

Source: NABERS and AECOM calculations
Hospitality

There are 5,370 hospitality buildings across the state equating to approximately 2.86M m² GFA. The majority of hospitality buildings are small (<1,000m²) and are located in metropolitan Melbourne. Of note, there are 125 large buildings primarily in metropolitan Melbourne and the City of Melbourne that constitute 21% of overall GFA (609,588m²).

There is little information relating to emissions and water use for hospitality buildings.

Table 2 below summarises the number of buildings and GFA across all sectors.

<table>
<thead>
<tr>
<th>Regions</th>
<th>Buildings</th>
<th>GFA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Office</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro Melbourne</td>
<td>10,126</td>
<td>61%</td>
</tr>
<tr>
<td>City of Melbourne</td>
<td>2,701</td>
<td>16%</td>
</tr>
<tr>
<td>Rural Victoria</td>
<td>1,955</td>
<td>12%</td>
</tr>
<tr>
<td>Regional Centres</td>
<td>1,790</td>
<td>11%</td>
</tr>
<tr>
<td>Total buildings</td>
<td>16,572</td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro Melbourne</td>
<td>31,861</td>
<td>63%</td>
</tr>
<tr>
<td>City of Melbourne</td>
<td>3,610</td>
<td>7%</td>
</tr>
<tr>
<td>Rural Victoria</td>
<td>9,248</td>
<td>18%</td>
</tr>
<tr>
<td>Regional Centres</td>
<td>5,603</td>
<td>11%</td>
</tr>
<tr>
<td>Total buildings</td>
<td>50,322</td>
<td></td>
</tr>
<tr>
<td>Healthcare</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro Melbourne</td>
<td>3,306</td>
<td>74%</td>
</tr>
<tr>
<td>City of Melbourne</td>
<td>57</td>
<td>1%</td>
</tr>
<tr>
<td>Rural Victoria</td>
<td>541</td>
<td>12%</td>
</tr>
<tr>
<td>Regional Centres</td>
<td>552</td>
<td>12%</td>
</tr>
<tr>
<td>Total buildings</td>
<td>4,456</td>
<td></td>
</tr>
<tr>
<td>Accommodation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro Melbourne</td>
<td>538</td>
<td>21%</td>
</tr>
<tr>
<td>City of Melbourne</td>
<td>254</td>
<td>10%</td>
</tr>
<tr>
<td>Rural Victoria</td>
<td>1501</td>
<td>59%</td>
</tr>
<tr>
<td>Regional Centres</td>
<td>255</td>
<td>10%</td>
</tr>
<tr>
<td>Total buildings</td>
<td>2,548</td>
<td></td>
</tr>
<tr>
<td>Hospitality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro Melbourne</td>
<td>2,877</td>
<td>54%</td>
</tr>
<tr>
<td>City of Melbourne</td>
<td>634</td>
<td>12%</td>
</tr>
<tr>
<td>Rural Victoria</td>
<td>1,227</td>
<td>23%</td>
</tr>
<tr>
<td>Regional Centres</td>
<td>632</td>
<td>12%</td>
</tr>
<tr>
<td>Total buildings</td>
<td>5,370</td>
<td></td>
</tr>
</tbody>
</table>

Source: Valuer-General Victoria and AECOM