

Who Occupies the Green Building: a Case of Australia

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Abstract: For successful outcome of real estate development projects, it is important to understand the potential tenants as they drive the demand for properties. The aim of this study is to investigate tenant characteristics of the Australian green office building sector. The specific objectives are to; (1) compare and contrast the increment trend of green buildings within the green office building sector; (2) identify the tenancy profile of green buildings; (3) ascertain the possible industry concentrations within the current green building sector; and (4) explore the relationship between green building occupants' characteristics and their tenancy. Descriptive statistics shows that Finance, Insurance and Real Estate (FIRE) industries along with government owned companies are the major tenants of green office buildings in the NSW State of Australia. In particular, real estate companies occupy more than half of the NSW based green office buildings whilst one third of them are the tenants of the 6-star rated buildings – the highest rated building in the current form of Australian Green Star accreditation scheme.

Keywords: Green building, Environmentally friendly building, Tenancy, Green Star, Sustainability

I. INTRODUCTION

For last two decades, the building and construction sector is often seen as a major contributor to environmental degradation, causing constant rise in CO₂ emission, and energy and material consumption. Particularly in Australia, the building sector is currently the world largest single contributor of greenhouse gases, and consumes approximately one third of the water and generates 40 per cent of waste.^[1] These emerging environmental issues have resulted in increasing interests in the application of the sustainability concept.^[2] The widely referred definition of sustainability, or sustainable development, is established by the World Commissions on Environmental and Development (WCED); “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.^[3]

As an effort to incorporate the sustainability concept into the building sector, building sustainability assessment schemes were established. Some of the internationally well-known building sustainability assessment schemes include: BREEAM (U.K.), LEED (U.S.), Green Mark (Singapore), and Green Star (Australia). The term “Green Building” typically refers to the buildings which are accredited by these assessment schemes. The building sustainability assessment schemes measure, quantify and rate the different environmental impacts throughout the lifecycle of a building ranging from the water and energy consumption to waste disposal. These schemes typically implement different weighting system according to different building types (i.e. office, retail, residential) and building stages (i.e. design, operating performance). Furthermore, some of them assign different weights to reflect location specific sustainability interests such as water scarcity.

Indeed, benefits of obtaining an accreditation from a building sustainability assessment scheme are not limited to reduction of greenhouse gases, and energy and re-

sources savings (See Table I). In addition to the environmental benefits, Eichholtz et al. reported that there are pecuniary and non-pecuniary benefits, and economic benefits.^[4] Many of these benefits of green buildings are closely related to the interests of building tenants, although green buildings are not specifically designed for any particular building stakeholder group.

TABLE I
BENEFITS OF GREEN BUILDINGS

Benefits	Areas of Research	Major Approach
Environmental benefits	Reduction of CO ₂ emission, Energy savings	Direct measurement
Pecuniary and non-pecuniary benefits	Productivity increase, Higher employee's health & satisfaction level, Reduction of absenteeism, Lower energy and tax bills	Survey, Direct observations
Economic benefits	Higher rental and sales price, Higher occupancy rates, Shorter payback period	Hedonic regression analysis

Green Building Council of Australia (GBCA)'s database shows the number of Green Star certified buildings across different states and territories in Australia (Table II). As of May 2015, state of Victoria has the biggest number of green buildings (n=228), followed by: New South Wales (hereafter NSW) (n=202), Queensland (n=174), Western Australia (n=82), South Australia (n=72), Australian Capital Territory (n=50), Tasmania (n=10) and Northern Territory (n=9). Australian Capital Territory (hereafter ACT) where the Australia's capital city Canberra is located has noticeably bigger number of green buildings for its population presumably because of the federal government's initiatives; the ACT government has invested \$5 million fund to transform all the government operations such as schools, hospitals and offices to be carbon neutral by 2020.^[5] Meanwhile, NSW has less green buildings

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than Victoria in spite of its bigger population and size of economy compared to any other states and territories in Australia.^[6] Perhaps, NSW's smaller number of green buildings compared to Victoria may be somehow related to its occupant's characteristics as occupants (or tenants) drive the demand for properties. To verify this and find other possible underlying reasons, answering the question "who occupies the green buildings in NSW" should be the first step.

TABLE II
 NUMBER OF GREEN BUILDINGS BY STATES AND TERRITORIES

States/Territories	Population ¹ (‘000)	No. of Green Buildings ²
New South Wales	7,544.5	202
Victoria	5,866.3	228
Queensland	4,740.9	174
Western Australia	1,688.7	82
South Australia	2,589.1	72
Tasmania	515.0	10
Australian Capital Territory	387.1	50
Northern Territory	246.3	9

¹Population as of end September quarter 2014. Data source: ABS

²Number of Green Star certified buildings as of May 2015. Data source: GBCA

II. RESEARCH DESIGN AND METHODOLOGY

The aim of this paper is to examine the tenant characteristics of Australian green building sector with particular interests in NSW. Under this aim, the specific objectives are to; (1) compare and contrast the increment trend of green buildings within the green office building sector; (2) identify the tenancy profile of green buildings; (3) ascertain the possible industry concentrations within the current green building sector; and (4) explore the relationship between green building occupants' characteristics and their tenancy. Office buildings are selected as it is the most dominant sector within the current Australian green building sector by number of buildings accredited by Green Star assessment scheme. Data of supply of the Green Star certified buildings were collated and analysed. Then, the obtained data were analysed by industry, sub-location and, accreditation types and levels. Descriptive statistics have been computed to probe the relationship between tenancy, occupants' characteristics, and the spatial patterns and rating levels of green buildings.

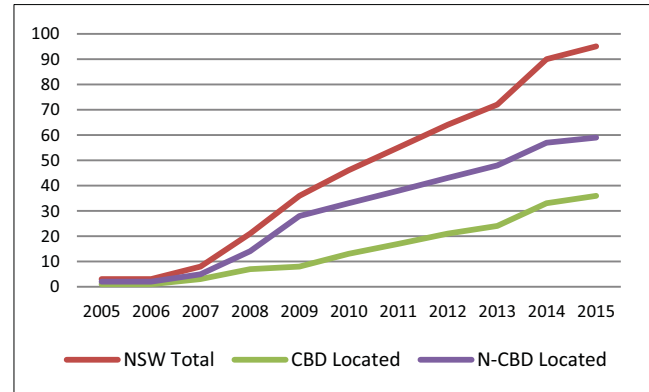
III. THE AUSTRALIAN GREEN OFFICE BUILDING SECTOR

A. Annual Increment of Green Office Buildings in NSW

Since the first introduction of the building sustainability assessment schemes in Australia, the number of green buildings has increased steadily. The number of Green Star certified buildings has increased by more than 100 per cent for last 10 years, from only 1 in 2004 to more than 800 buildings as of mid-2015, whilst more than 70 per cent of them are office buildings.^[7] In the meantime, CBD based green office buildings accredited by NABERS, another building sustainability assessment scheme initiated by Australian government, have more than tripled in the last four years.^[8] When considering

rapidly increasing number of green building entering to the real estate market is seen globally^[9], it seems that building sustainability assessment schemes played a role as an attribute to the diffusion of green buildings.

FIGURE I
 INCREMENT OF GREEN OFFICE BUILDINGS IN NSW SINCE 2005



Indifferent to the national trend, NSW's green building sector is hugely driven by the office sector. Number of green office buildings in NSW has been increased significantly for last 10 years from only 3 buildings in 2005 to 96 buildings in mid-2015 (Figure I). Both Sydney CBD located green office buildings and green office buildings in other suburbs have been increased steadily especially since late-2000s. This proves that the global financial crisis begun in late 2000s has not significantly influenced the trend, at least in NSW office sector.

FIGURE II
 INCREMENT OF GREEN OFFICE BUILDINGS IN NSW BY STARS

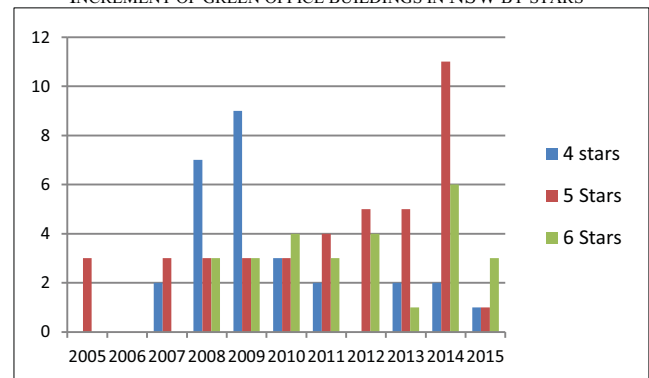


Figure II shows the longitudinal trend of increment of the green office buildings in NSW by number of stars awarded. Noticeably, more than half of the 4 stars green office buildings were built in 2008 and 2009 (n=16) and they decreased slowly but steadily afterwards. This may indicate that companies started to look for more than "just above the average" buildings. Increment trend of the 5 stars office buildings shows slight but steady increase since 2010 and showed significant growth in 2014. The 6 stars office buildings show relatively stable trend albeit with fluctuations.

B. Tenancy Profile of Green Office Buildings in NSW

In NSW, office sector dominates the green building stock as approximately half of the green buildings are certified by Green Star accreditation scheme for office buildings (n=96)¹. Most of these green office buildings are located within the Sydney metropolitan area except for those few buildings located in regional cities of NSW such as Newcastle and Wollongong. Within the Sydney metropolitan area, green office buildings are mostly concentrated in areas like Sydney Central Business District, (CBD) Ultimo, North Sydney, Macquarie Park, Olympic Park and Parramatta. In general, this is consistent with the list of major office markets in Sydney.

TABLE III
 NUMBER LOCATED GREEN OFFICE BUILDINGS IN NSW¹

	No. of Buildings (n)		NLA ² (m ²)	
	New Cons.	Refurb.	New Cons.	Refurb.
Sydney CBD	19 (27.54%)	15 (71.43%)	809,028 (53.47%)	230,237 (51.26%)
Other suburbs	50 (72.46%)	6 (27.57%)	703,997 (46.53%)	218,954 (48.74%)
NSW Total	69 (100%)	21 (100%)	1,513,025 (100%)	449,191 (100%)

¹Figures exclude green office buildings without an information on new construction vs. refurbishment
²Net Lettable Area

From Table III, it can be seen that approximately three quarter of green office buildings in NSW are newly constructed (n=69) and that the total Net Lettable Area (NLA) of the new constructions is 3 times more than that of refurbished buildings. However, an interesting phenomenon was noted when comparing the number of new and refurbished green buildings located in Sydney CBD and non-CBD suburbs. We found that there is no much difference between the number of new and refurbished green office buildings in the Sydney CBD area. On the other end, the number of new constructions is considerably higher than the number of refurbishments outside the CBD area. One possible explanation is that buildings located in CBD may be built with relatively better quality than those buildings in non-CBD locations. Indeed, refurbishment would be especially attractive for well-structured Class B buildings in a prime location as they can be repositioned to Class A after refurbishment.^[10]

Currently the Green Star assessment scheme rates the sustainability of a building based on a number of stars. Green buildings can be awarded with a minimum of 4 stars to a maximum of 6 stars. In general, a higher star rating means higher level of sustainability of a building. We found that there is sharp contrast in the level of sustainability of office buildings located between Sydney CBD and other locations (Table IV). Only seven out of the 60 (equivalent to 11.7 per cent) green office buildings located outside CBD achieved 6 star-rating despite the fact that total

number of green buildings in CBD is only 60 per cent of the number of green buildings in non-CBD locations. In contrast, more than half of the green office buildings located in CBD achieved a 6 star-rating – thus the number of 6 stars rated buildings in Sydney CBD is almost three times higher than those in non-CBD suburbs.

TABLE IV
 NUMBER OF GREEN OFFICE BUILDINGS IN NSW BY STARS ACHIEVED

	4 Stars	5 Stars	6 Stars	Total
Sydney CBD	7 (25.00%)	9 (21.95%)	20 (74.07%)	36 (37.50%)
Other suburbs	21 (75.00%)	32 (78.05%)	7 (25.93%)	60 (62.50%)
NSW Total	28 (100%)	41 (100%)	27 (100%)	96 (100%)

In Table V, it can be seen that newly constructed buildings have generally higher star-rating than refurbished buildings – this is especially noticeable in Sydney CBD area. However, “the more the new green construction, the better” trend is inconsistent with the U.S. study^[11] which found refurbishment is usually greener than new construction due to its lower climate change impact created during the construction stage. Geographically, Sydney CBD is sustainable than rest of the suburbs in average; both newly constructed buildings and refurbished green buildings in CBD have higher average star-ratings than non-CBD areas. When considering both location (CBD vs. other suburbs) and building type (new construction vs. refurbishment), newly constructed green office buildings in Sydney CBD achieved the highest Green Star ratings in average amongst the entire green office buildings throughout NSW.

TABLE V
 AVERAGE STARS ACHIEVED BY GREEN OFFICE BUILDINGS IN NSW¹

	New Cons.	Refurb.	Average
Sydney CBD	5.68	5.00	5.36
Other suburbs	4.78	4.50	4.77
Average	5.03	4.86	4.99

¹Figures exclude green office buildings without an information on new construction vs. refurbishment

C. Industry Concentration of Green Office Buildings in Sydney

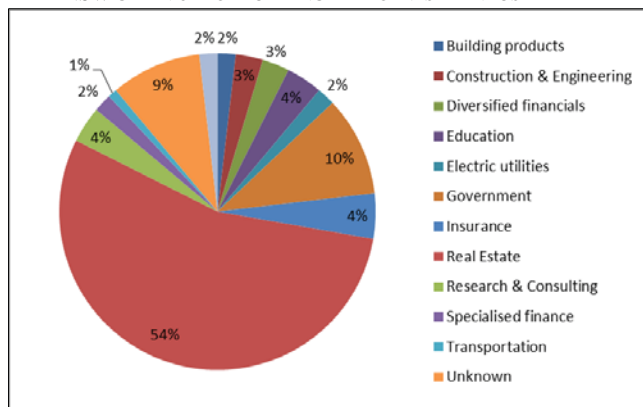
In view of the large number of green office buildings located in NSW, an attempt was made to analyse the type of occupants for those green office buildings. Figure III shows the Green Star certified office buildings by applicants. The list of companies applied the Green Star certification for office buildings was first obtained from the GBCA’s database. Then, these applicants are refined by the GICS (Global Industry Classification Standard) standardised classification system² which is widely used in

¹ Only Green Star – Office as Built and Green Star – Office Design certified buildings are counted. Green Star – Office Interiors are not counted due to its limited considerations besides the interior aspect

² In case of unlisted/undefined companies, we classified them according to their primary business activity. In case of an applicant is a subsidiary/division of a corporation, its parent company name is used for classification. Government body is defined as “government”. University is defined as “education”

ASX (Australian Stock Exchange). The results show that NSW's green office building sector is mostly driven by companies in the Finance, Insurance and Real Estate (FIRE) industries along with government owned companies. Of these, the real estate related companies show the significantly bigger contribution compared to applicants from all other industries. When considering real estate service sector only contributes 2.8 per cent to the GSP (Gross State Product) of NSW^[12], this is an evidence of real estate firm's active participation in sustainability practices. Government owned companies (10.2 per cent) is the next followed by both financial (4.6 per cent)¹ and insurance related companies (4.6 per cent). Contribution to the NSW's GSP by public administration, and finance and insurance services is 4.9 per cent and 12.0 per cent, respectively. Again, these results are not consistent with those of Miller et al.^[13] that real estate-related firms are not the main occupiers of green buildings in the U.S. Although it is hard to generalise the findings of NSW presented in this section to explain the entire Australian green office sectors, the different industry concentration of the green office buildings in the U.S. and Australia may indicate different nature of green office sector that each country has.

FIGURE III
 NSW GREEN OFFICE BUILDING APPLICANTS BY INDUSTRY^{1,2}



¹Figures exclude applicants without information on name of the applicant
²Figures based on the name of applicant at the time of lodging the application for certification

D. Occupant's Characteristics of Green Office Buildings in NSW

In this study, we also looked at the relationship between the occupant's characteristics and level of Green Star rating. Table VI shows the number of 6, 5 and 4 stars rated green office buildings occupied by each industry in NSW. It can be seen that approximately one third of the NSW based real estate companies that applied for Green Star certification obtained the 6 stars for their offices. This could imply that many of the real estate companies involved in sustainability of their workplace did not aim at "just above the average" standard. Rather, many of them aimed at the "national best" when it comes to standard of sustainability of their office spaces. In fact, we found that

many of these companies are the Australia's most reputable real estate investors and developers (such as Lend Lease, Brookfield Multiplex, Mirvac, Investa, and GPT) which run their businesses national-wide. All of the green office buildings in NSW occupied by financial companies (including both the diversified and specialised companies) are 6 stars rated. Although underlying reason for this is yet unclear, it is assumed that these companies may have willingness as well as capabilities to pay for the 6 star ratings which typically requires higher input compare to the lower ratings. Two of 11 government bodies occupying Green Star accredited buildings are 6 stars rated although none of them were awarded less than 5 stars. This indicates, in general, green office buildings occupied by government bodies in NSW are above the average standard. In contrast, only one insurance company occupied 6 stars for its office building whilst rest of them obtained 4 stars ratings. The number of companies in other industries is yet too small.

TABLE VI
 APPLICANTS OF GREEN OFFICE BUILDINGS IN NSW

Industry	Companies occupying Green Star buildings (n)	6 Star buildings (n)	5 Star buildings(n)	4 Star buildings(n)
Real Estate	59 ¹	20	19	16
Government	11	2	9	none
Insurance	5 ¹	1	none	3
Education	4	1	3	none
Research & Consult.	4	none	3	1
Diversi. financials	3	3	none	none
Const. & Engin.	3	1	1	1
Specialised finance	2	2	none	none
Electric utilities	2	none	2	none
Water utilities	2	none	2	none
Building products	2	none	2	none
Transportation	1	none	1	none
Unknown	10	2	1	7

¹Companies occupying more than one Green Star certified buildings are counted separately

IV. CONCLUSION

This study attempted to explain the general trend of the Australian green office building sector with emphasis upon the state of NSW – the most populous and economically biggest state in Australia. In general, number of green office buildings has been increased gradually since the introduction of the Green Star accreditation scheme in 2003 – both nationally and within NSW. However, the increment trend is varied by the quality of green buildings. In NSW, number of 5 and 6 stars office building have increased steadily whereas 4 star office buildings have continuously decreased since 2010. This may be the signal of more active participation of the companies entering to the green building market at least in NSW. NSW's green building sector is hugely driven by the office sector especially those green office buildings located in major office districts such as Sydney CBD. When comparing

¹The share of financial industry is comprised with "specialised finance" and "diversified financials" which contributes 1.9% and 2.7%, respectively

between Sydney CBD and other suburbs, statistically meaningful different trend was observed. Firstly, proportion of refurbishments for the new constructions is significantly high in the CBD area compared to non-CBD suburbs. Secondly, Sydney CBD is comprised with considerable number of the 6 star rated office buildings whereas there are more 4~5 star rated office buildings in outside of CBD. Overall, Sydney CBD is a more sustainable suburb than rest of the NSW suburbs combined when only considering the Green Star certified office buildings. Active engagement of the FIRE industries along with government owned companies were found in the sustainability of the office buildings in NSW. Particularly, one third of the real estate related companies are the tenants of the 6 star rated green office buildings in NSW. The findings of this exploratory study could support urban researchers and real estate professionals to understand who demands the green buildings more than others, offering plausible insights into the potential buyers and lessees of future green building developments.

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