

## A STUDY OF MODERN SUSTAINABLE BUILDINGS IN SYDNEY FROM THE FENG SHUI PERSPECTIVE

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### ABSTRACT

*Problem/Purpose: The interaction between humans and the environment is an everyday process. In western contemporary architecture, these interactions with the natural and man-made environment are called sustainable design. The fundamental concept of modern sustainable building emphasizes on a holistic approach to reduce negative environmental impact of man-made structure, and this is coincided with the ancient Chinese knowledge of Feng Shui that aims to creating harmony between heaven, earth and human. Previous studies have already indicated that there are many similarities between ecological sustainable design and principles and practice of Feng Shui. The purpose of this paper is to explore these similarities in a systematic manner.*

*Design/methodology/approach: This is an empirical study of 31 Green Star rated modern sustainable buildings in Sydney. Their sustainability concepts and characteristics will be compared with the theories and applications of Feng Shui knowledge.*

*Findings: This study finds that the higher Green Star rated of sustainable office buildings achieved higher similarities with Feng Shui concepts.*

*Research limitations/implications: Although this study has only considered modern sustainable office buildings in Sydney, it will provide directions for future studies of national and international sustainable buildings.*

*Takeaway for practice: The results of this study will provide a framework for Feng Shui concepts to be considered and applied into the modern sustainable buildings that will enhance the effectiveness of sustainable development.*

*Originality/value: The re-interpretation of Feng Shui knowledge will embrace the effectiveness of sustainable development.*

*Social Implications: This cross-cultural study expanded the boundary of the built environment research from east and west philosophies.*

**Keywords:** Feng Shui, sustainable design, sustainability, green star, office buildings, Sydney

### INTRODUCTION

Feng Shui is the traditional wisdom of the Chinese art of building design. Its central aim is to ensure that buildings are in harmony with their surroundings. Nowadays, as many researchers seek to establish a deeper understanding of the relationships between the human and natural environments, architects and building professionals are beginning to recognize Feng Shui as a broad ecologically and architecturally connected paradigm. Hwangbo (1999) believed that the practice of Feng Shui is an intuitive matter involving site selection and spatial organization, although it has strong parallels with the western concept of geometry in architectural design. Sustainable design emphasizes on a holistic approach to eliminate negative environmental impact through skillful and sensitive design. The goal of sustainable design is to look at all the systems together and

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to make sure they work in harmony. This integrative design process is similar to the Chinese holistic view and the Feng Shui approach to the built environment (Humphreys, 1976).

With a desire to improve the relationship between humanity and the environment, there is an increasing interest for architects and other building professionals to apply the concepts of Feng Shui into building design and the built environment. It is suggested that interpreting Feng Shui knowledge would embrace the western concept of sustainable design. This paper investigates the relationships between the concepts of sustainable design and Feng Shui in environmental design using modern sustainable office buildings in Sydney. Firstly, the principles and practices of sustainable design and Feng Shui in environmental design are briefly explained. Then, a set of five concepts of sustainable design and five Feng Shui concepts in terms of environmental design are identified and compared. Finally, 31 Green Star rated sustainable designed office building in Sydney are investigated to illustrate the correlations between the concepts of sustainable design and Feng Shui environmental design.

## SUSTAINABLE DESIGN AND GREEN STAR

The original concept of Green Buildings emphasizes “the increasing efficiency with which buildings and their sites use water, energy and material; and reducing building impacts of human health and the environment, through better siting, design, construction, operation, maintenance and removal throughout the complete life cycle” (Office of Federal Environmental Executive, 2003).

The concept of Green Buildings has been extended on a larger scale, focused on “Sustainability” or “Sustainable Development”. According to the World Commission on Environment and Development (WCED), it is defined as *"forms of progress that meet the needs of the present without compromising the ability of future generations to meet their needs"* (Brundtland, 1987). The sustainable development concept includes many areas such as Waste and recycling, Energy, Water, Building Design, Emission, Indoor Environmental Quality (IEQ), Alternative Transport, Landscaping, and about everything that revolves around human activity, and aims to eliminate negative environmental impact while continuing to be completely ecologically sustainable, through skilful and sensitive design (McLennan, 2004).

In Australia, Sustainable Development also implies an improvement in the quality of life through education, justice, community participation, and recreation (Australian Government, 2009). All States in Australia require newly designed homes to meet minimum thermal performance standards, i.e., to reduce the amount of fossil fuels burned to produce energy for homes, thereby reducing Australia’s greenhouse gas emissions. All dwellings must achieve a 4-5 star thermal performance standards, which is regulated by the Building Code of Australia (BCA), with the exception in the state of New South Wales (NSW) that undertakes a more stringent Building Sustainability Index (BASIX) targeting for 40% saving in water and energy as well as minimum performance levels for thermal comfort of the dwelling (Department of Planning, 2009).

Green Star is a comprehensive, national, voluntary environmental rating system, developed by the Green Building Council of Australia (GBCA) to assess the sustainability of a building’s design and construction for commercial buildings (Green Building Council of Australia, 2014). Points are awarded in nine categories: management, indoor environment quality, energy, transport, water, materials, land use and ecology, emissions and innovation. Scores are then weighted depending on the state and territory the project is in to reflect the diverse environmental concerns in Australia. Table 1 shows the Green Star rating system.

Table 1: Green Star Rating in Australia

Rating	Score	Description
<b>4 Star Green Star</b>	<b>45-59</b>	Signifies best practice in environmentally sustainable design and construction
<b>5 Star Green Star</b>	<b>60-74</b>	Signifies “Australian excellence” in environmentally sustainable design and construction
<b>6 Star Green Star</b>	<b>75-100</b>	Signifies “world leadership” in environmentally sustainable design and construction

Source: Adopted from GBCA, 2014

## **FENG SHUI AND ECOLOGICAL SUSTAINABLE DEVELOPMENT**

The concept of sustainable design in the western world only dates back three decades ago in dealing with the harmonious relationship between human and nature. However, Feng Shui, the ancient Chinese knowledge that aims at creating a harmony between heaven, earth and human has influenced most traditional built environmental design in China for thousands of years.

Since the late 1960's, the impact of western civilisation and technology has grown to global proportions, with more western scholars becoming aware of the limitations of modern scientific paradigms that fail to explain the whole realm of natural phenomena and beginning to realize that there are similarities between modern science and eastern philosophy (Capra, 1975).

However, it was not until 1956, when Joseph Needham published his book series "Science and Civilisation in China", that western readers began to appreciate the scientific context in which Feng Shui flourished. Needham tried to identify relevant aspects of western science and their applications to traditional Chinese counterparts. He began to appreciate the value of Feng Shui in ecology and landscape aesthetics. According to Needham (1959, p.361) Feng Shui "embodied ... a marked aesthetic component, which accounts for the great beauty of the siting of so many farms, houses and villages throughout China".

Furthermore, Kevin Lynch, a pioneer of environmental behaviour research, paid great attention to Chinese geomancy. In his book, "The Image of the City", he concluded that Feng Shui has two major features: firstly, it is an open-ended analysis of the environment where new meanings, new poetry, and further developments are always possible; secondly, it leads to the use and control of outside forms and their influences where it emphasizes that man's foresight and energy rule the universe and can change it (Lynch, 1960).

Anderson and Anderson (1973) recognized that Feng Shui is an aspect of Chinese cultural ecology. For instance, they interpreted village-level siting of Feng Shui configurations with modern planning opinions on site planning, land use and natural resources, especially those of ecology. They noted that Feng Shui is "*basically a very practical system whereby a village is situated such that it does not take up farmland or lay itself open to floods and typhoons... based on sound pragmatism*" (Anderson & Anderson, 1973, p.45-50). They called Feng Shui "the traditional Chinese science of site planning", containing "an organized body of knowledge, intensely practiced in application, and of specific intent" (Anderson, 1973, pp.127-128).

Freedman (1979) accepted that Feng Shui is based on self-evident propositions and the expertise of scientific men and called it "mystical ecology". He explained that since Chinese see the universe as being alive with forces, any building is an intervention in that universe, composed of the physical environment and men; therefore, every act of construction disturbs a complex balance of forces within a system made up of nature and society.

Nemeth (1993) searched further for cross-cultural understanding through the interpretation of geomancy maps. He recognized that "cosmographic interpretations of geomancy maps can both teach Western peoples and remind East Asians that in the organization of human activities in physical space, principles that engender productive economic, ecological, and ethical relationships may be governed by a natural law" (Nemeth, 1993, p.94).

Bruun (1995) argued that Feng Shui is a system of statements on the man-nature relationship in an environment of holistic thought. He explained that according to Feng Shui, man and landscape are linked together in a system of "immanent order". Nature consists of balanced forces, reacting to any interference imposed on it, and this reaction immediately resounds in man. As in any large organism, everything is interdependent and pulsating with energy, penetrating and embracing every single part.

## **COMPARISON OF SUSTAINABLE DESIGN AND FENG SHUI**

The sustainable development concept includes many areas such as waste and recycling, energy, water, building design, emission, indoor environmental quality (IEQ), alternative transport, landscaping, and about everything that revolves around human activity, and aims to eliminate negative environmental impact while continuing to be completely ecologically sustainable completely through skilful and sensitive design (McLennan, 2004). However, many of these ecological sustainable design concepts are quite similar to the traditional views that

were derived from the eastern philosophy and Feng Shui principles and practice. Dong and Zuehl (2009) recognized that there is a set of five fundamental concepts for sustainable development. They are:

- (1) Constructivism
- (2) Circular design (McDonough's "Cradle to Cradle" concept)
- (3) Energy efficiency
- (4) Balance between natural and the built environment
- (5) Thinking global and buying local

The principles and practices of Feng Shui are aimed at creating a harmonised built environment for people to live in, and it represents a traditional Chinese architectural theory for selecting favourable sites, as well as a theory for designing cities and buildings (Lee, 1986). There are two main schools of thought and practice in Feng Shui: the Compass School and the Form School. The Form School approach has been well recognized and widely accepted by Feng Shui researchers as it comprises the scientific bases in the analysis of built environment (He, 1990; Cheng & Kong, 1993). The Form School established a holistic approach that allows integrated components and elements to be considered for the built environment (Mak & Ng, 2008). The five fundamental concepts of Feng Shui in terms of environmental design are summarized as below.

### **(1) Unity between Heaven and Human**

This is the fundamental principle of Feng Shui, means the harmony between the universe, earth and human energy. Energy is valued in both the physical and the invisible forms known as "Qi" (natural energy or breath of life) in traditional Chinese Feng Shui culture. Feng Shui Designs are aimed at a balanced and harmonious environment that can produce an ample amount of good Qi and filter out the bad Qi (Skinner, 1982).

### **(2) The Five Elements Cycles**

Ancient Chinese believed that in the universe, including heaven, earth and human beings, everything has an attribute according the five fundamental groups of substances. These five elements are fire, water, metal, wood and earth. The characteristics of each of these five elements and their mutual relationships are based on observed natural phenomena, and their relationships are identified as productive and destructive cycles (Walters, 1989).

### **(3) Yin and Yang Harmony**

The ancient Chinese believed that in everything there are two opposing parts: Yin and Yang. This concept is about balance and harmony within a space designed to create balance in the users' life when engaging in the space (Feuchtwang, 1974).

### **(4) The Form School Model**

The Form School is primarily based on the verification of the physical configuration of mountains and watercourses surrounding sites and buildings. The factors comprising the basics of the Form School approach were known as the "Five Geographical Secrets", namely, dragon, sand, water, cave and direction (Lip, 1979). Contemporarily, the Form school approach has been recognized as having a scientific basis in the analysis of the built environment (He, 1990; Wang, 1992; Cheng & Kong, 1993; Mak & Ng, 2005). The combination of these five Feng Shui geographical factors and the four emblems (the green dragon, white tiger, black tortoise and red bird symbolising the four cardinal directions) produce a classic Feng Shui model. This model has been interpreted in diagrams of spatial organization of auspicious mountains and watercourses in most of the classic Feng Shui literature (Shang, 1992; Cheng & Kong, 1993; Han, 1995; Yi et al., 1996; He, 1998) as shown in Figure 1.

### **(5) Balance between Interior and Exterior Spaces**

When describing the built environment, most of the Feng Shui texts categorized space into "Outer Form" (exterior) and "Inner Form" (interior). According to Lee (1986), the Outer Form can be identified as the location of the site, conditions that surround the site, the topographical conditions of the site and its shape. The Inner Form can be identified as the layout of the building, the elevations of the building, and elements of building. The concept of a Feng Shui model is to provide a balance the interior and exterior spaces.

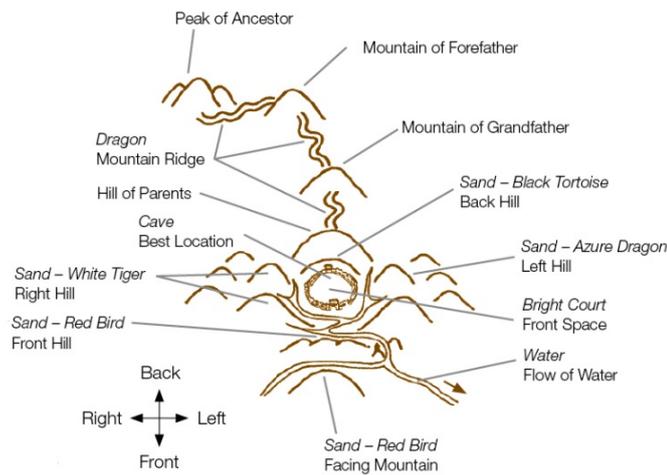


Figure 1: Feng Shui Model (Source: Yi et al., 1996)

The five fundamental concepts of sustainable design can be compared with the five Feng Shui concepts in terms of environmental design. When comparing the concepts of sustainable design with Feng Shui, there are both similarities and differences. Firstly, the concept of constructivism translates well into the principles of harmony between universe, earth and human in Feng Shui. The ideal environment for Feng Shui is also for these three aspects as they intersect and overlap. These three circles can be found in sustainable design as social contexts, environmental and human as shown in Figure 2.

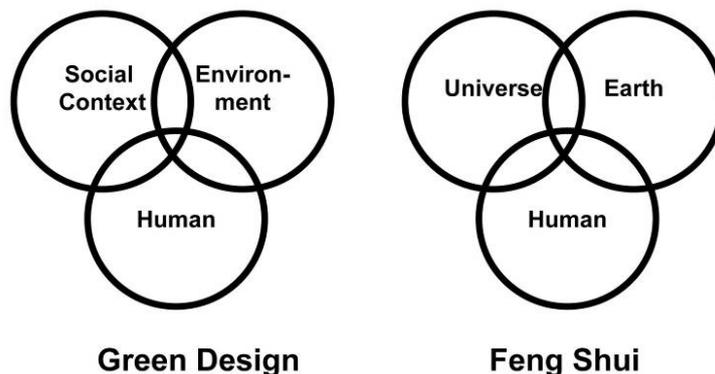


Figure 2: Comparison of the Principles of Green Design with Feng Shui (Source: Dong & Zuehl, 2009)

The second principle of Feng Shui is the productive and destructive cycles of five elements, which is similar to the circular design or McDonough's "Cradle to Cradle" concept (McDonough & Braungart, 2002). The third Feng Shui concept is the balance and harmony between Yin and Yang, which also matches with the concept of sustainable design of balancing between natural environment and the built environment. For the fourth and fifth concepts in sustainable design, the energy efficiency and buying local concepts are focused explicitly on the sources and consumptions of natural resources. However, the Feng Shui concepts of Form school model and balance between interior and exterior spaces are focused on the physical form and spatial arrangement of the built environment. Table 2 summarized the comparison of sustainable design concepts and Feng Shui concepts.

Table 2: Comparison of Sustainable Design and Feng Shui concepts (Source: Mak & So, 2015, p.152)

Sustainable Design Concepts	Feng Shui Concepts	
<i>Balance and Harmony</i>		
<ul style="list-style-type: none"> <li>Constructivism</li> </ul>	<ul style="list-style-type: none"> <li>Unity between heaven and human</li> </ul>	
<ul style="list-style-type: none"> <li>Balance between natural and the built environment</li> </ul>	<ul style="list-style-type: none"> <li>Yin and Yang harmony</li> </ul>	
<i>Cycles Pattern</i>		
<ul style="list-style-type: none"> <li>Circular design</li> </ul>	<ul style="list-style-type: none"> <li>Five Elements cycles</li> </ul>	
<i>Sources and Consumption of Natural Resources</i>		
<ul style="list-style-type: none"> <li>Energy efficiency</li> </ul>	<i>Physical Form and Spatial Arrangement</i>	
<ul style="list-style-type: none"> <li>Thinking global and buying local</li> </ul>		
<i>Physical Form and Spatial Arrangement</i>		
<ul style="list-style-type: none"> <li>Form school model</li> </ul>		
<ul style="list-style-type: none"> <li>Balance between interior and exterior space</li> </ul>		

### MODERN SUSTAINABLE BUILDINGS IN SYDNEY

Previous case studies have revealed that modern sustainable buildings in Sydney created an open central atrium as a prime feature to satisfy criteria from both sustainable design and Feng Shui consideration, which is similar to the traditional application of Feng Shui practice to the courtyard houses in China (Mak & Ge, 2010, 2012). In this study, 31 Green Star rated office buildings in Sydney are investigated from the Feng Shui perspective.

According to the Green Building Council of Australia (GBCA, 2014), there are total 272 projects in Office Design category certified in 4/5/6 stars Green Star categories (included V1, V2 & V3). Although Victoria and Queensland got more 4 and 5 star projects, New South Wales got 17 projects with 6 star Green Star office design, which is the highest number of projects amongst other states. The distribution of these projects in Australia are shown in Figure 3.

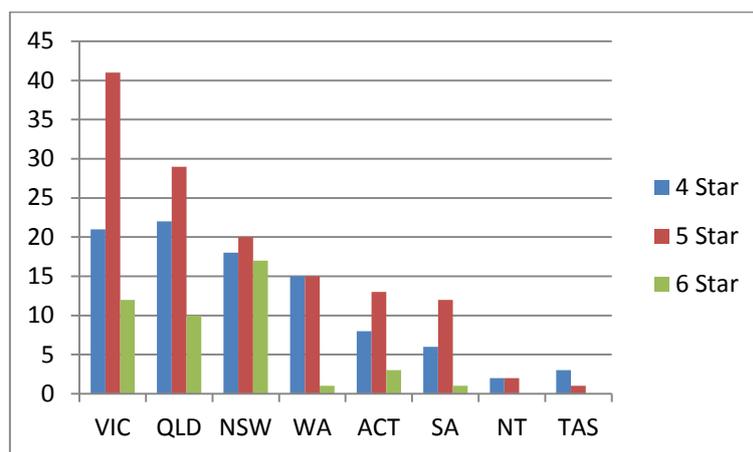


Figure 3: Categories of Green Stars certified projects in Office Design category in Australia

(Source: Adopted from GBCA, 2014)

In NSW, there is a total of 55 office design projects certified by GBCA with 4 to 6 star Green Star, however, only 41 office design projects in NSW have provided with detail factsheet to disclose their Green Star score and their achievements in sustainability. Out of these 41 projects, 31 are located in Sydney metropolitan areas. In this study, site investigations are carried out to these 31 projects. The locations and Green Star categories of these 31 certified projects are outline in Table 3.

Table 3: Locations and Categories of certified Green Star Projects in Sydney metropolitan area.

Office Design - Green Star	4 Star	5 Star	6 Star	Sub-Total
<b>Sydney Metropolitan Area</b>				
Sydney City	6	3	7	16
North Sydney	1	1	1	3
Macquarie Park	2	3		5
Olympic Park	1	1		2
Parramatta	2	3		5
<b>Total</b>	<b>12</b>	<b>11</b>	<b>8</b>	<b>31</b>

(Source: Adopted from GBCA, 2014)

As mentioned above, the Form School approach of the Feng Shui knowledge has been accepted to analyze the modern built environment (He, 1990; Wang, 1992; Cheng & Kong, 1993; Mak & Ng, 2005). Therefore, the concept of the Feng Shi model derived from the Form School approach was used as a yardstick in this analysis of the 31 Green Star certified office design projects. A simplified scoring system based on the five geographical secrets has been constructed to evaluate the physical form and spatial arrangement of these Green Star certified projects. Each of the five geographical secrets bore a score ranging from 0 to 2 points. As a result, a maximum total score of 10 represented a complete satisfactory to the concept of the Feng Shui model. Similar scoring scales of the five geographical secrets from Form School approach have been used by Xu (1990) to evaluate the ancient tomb sites in China, Tam et al. (1999) to evaluate property locations in Hong Kong, and Mak (2009) to evaluate interior layout of lounge room by architects in Hong Kong and Australia.

In this study, the simplified Feng Shui scoring scales have been developed in the urban contexts which consisted of: DRAGON - the supports from other buildings, SAND – the relationship with surrounding buildings, WATER – the flow of circulation spaces at entrance, CAVE – the balance with interior and exterior spaces, and DIRECTION – the orientation of windows, as shown in Table 4. A maximum score of 10 points represent that the project satisfies all the Feng Shui criteria, where as a minimum of 0 points means that the project does not satisfy any of the Feng Shui criteria. A middle score of 5 points means the project only satisfy half of the Feng Shui criteria.

Table 4: A Simplified Feng Shui Scoring System for the Sustainable Office Buildings

DRAGON - Support	SAND - Surrounding	WATER - Flow	CAVE - Balance Space	DIRECTION - Orientation	SCORE
2 Backed with other buildings	2 Embraced by surrounding buildings	2 Large circulation space in front	2 Large atrium or courtyard provided	2 Dominant distant view in NW / N / NE /E directions	Highest score = 10
1 Some connections with other buildings	1 Supported by surrounding buildings	1 Small circulation space in front	1 Small atrium or courtyard provided	1 Some distant views from any direction	Middle score = 5
0 No linkage to other buildings	0 Building in isolation	0 No circulation space in front	0 No atrium or courtyard provided	0 No distant view	Lowest score = 0

Site observation has been carried out for these 4 to 6 star Green Star certified projects. The details of these 31 Green Star certified projects and their score to each categories of the Feng Shui scoring system are calculated. The mean scores for both Green Star and Feng Shui according to Green Star categories are summarized in Table 5. The results indicated that higher Green Star mean score also achieved a higher Feng Shui mean score.

Table 5: Feng Shui Mean Score of Green Star Certified Projects in Sydney Metropolitan Area

Green Star				Feng Shui						
Office Design	No. of Certified Project	Mean Score	Standard Deviation	Dragon	Sand	Water	Cave	Direction	Mean Score	Standard Deviation
<b>4 Star</b>	12	<b>51.7</b>	3.23	0.6	0.9	1.1	0.7	1.6	<b>4.8</b>	0.94
<b>5 Star</b>	11	<b>63.6</b>	4.18	0.7	1.2	1.4	1.1	1.7	<b>6.2</b>	0.98
<b>6 Star</b>	8	<b>82.1</b>	3.94	1.0	1.4	1.9	1.9	2.0	<b>8.1</b>	0.64

The correlation coefficient is the most commonly used statistic to measure the degree of relationship between two variables and describes the extent of linear relationship (Klugh, 2013). The relationship analysis will be performed using correlation analysis and using correlation coefficient as the indicator of the strength of the relationship between Green Star score and Feng Shui score. When combined all 31 projects across all categories in the correlation analysis, **the correlation coefficient is 0.857**. This is a strong correlation between the Green Star score and Feng Shui score. It means that the concepts of sustainable design of modern office buildings using the Green Star rating system has a strong correlation with the principles and practice of Feng Shui using the Form School approach.

## CONCLUSION

This paper has compared and contrasted the concepts and practices between western sustainable design and Chinese Feng Shui through investigations of 31 Green Star certified office buildings in Sydney. The findings have suggested that both concepts are the same in terms of focusing sustainable development, that is, to minimize the impact on natural environment. The distinct feature of sustainable design put greater emphasis on the measurement of physical attributes such as the efficient use of water and energy, whereas Feng Shui is unique and the emphases are on the balance of Yin Yang, exterior and interior, the relationship between human and surrounding environment. Through the analysis of 31 Green Star certified office design projects in Sydney metropolitan areas, the Green Star score has a strong correlation with the Feng Shui score. These results indicated that the higher Green Star rated of sustainable office buildings achieved higher similarities with Feng Shui concepts. These findings provide a framework for Feng Shui concepts to be considered and applied into the modern sustainable buildings that will enhance the effectiveness of sustainable development.

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