

A Review on Seven Principles of Architecture

C.Koranteng¹, S.O. Afram¹, E. Ayeke^{1*}

¹Department of Architecture, Kwame Nkrumah University of Science and Technology, Kumasi.

Abstract:- This paper examined the extensive influence of seven selected theories in Architecture namely Vastu Shastra, Feng Shui, some Vitruvian principles, Essay on Architecture (Laugier), four elements of architecture (Semper), five points towards a new Architecture (Le Corbusier) and Green Architecture. It focuses first on its historical foundations, development of these concepts and its mode of application. The study also considered the significance of these theories in recent times and identified a comparative pattern language among the concepts. The methodology involved extensive literature review on the principles. The results revealed that Green Architecture is the longest surviving, design and building concept. Again, the study demonstrated that these principles regardless of their origin emphasize sustainability and the ability to imitate and apply the laws of nature in design and building. This implies that from the conception stage of design, the designer must consider the *complexities and beauties* of the site resulting in enhanced harmony between man, buildings and the natural environment.

Keywords:- Pattern Language, Environment, Natural, Design, Harmony, Sustainability

I. INTRODUCTION

When God said ‘*let there be light*’ in the book of Genesis, it symbolized the event of life on the earth (James, 2000, pg.1). And when He made man, it signified the beginning of man’s work as steward of the natural environment. Per human needs, shelter ranks among the prominent (Maslow, 1962). Over the centuries, man has evolved in the provision of shelter; from caves to sophisticated buildings of this age. The art and science of designing and construction has agitated a lot of arguments, though through many centuries different styles of design and construction had been adopted. The question of ‘what is architecture?’ is a thought-provoking question which has lingered over the centuries and propelled many who lived in time to explore, appreciate and carve boundaries for themselves on the subject. Dawkins (2010) believed that the experience of architecture is a private dialogue between the body, mind and the built environment. Monteagudo (2013) adds that architecture focuses on the human being and the meticulous use of design to provide services that meet the needs of man. Conway and Roenisch (1994) summarize architecture as the art and science of buildings concerned with aesthetic qualities as well as structure. The research borders on the questions relating to its historical underpinning, its development, application as well as relevance of these selected principles.

This paper first examines Vaastu Shastra (Vastu Shastra) and Feng Shui which is practiced predominately in India and China respectively (Mak and Ge, 2012; Shamsunder, 2012). According to Chen and Nakama (2004), these principles have been accepted and practiced by the western world since it was appreciated in a scientific context by Needham in 1956. Xu (2003) defines Feng Shui as an ancient discipline that influences the design and layout of buildings and cities. Vastu Shastra is a science that informs the construction and design of buildings like temples and Royal palaces (Khan, 2011). Vastu Shastra and Feng Shui principles are based on synchronizing the built environment with the natural environment (Tchi, 2014).

According to Jeanneret (1984), “*Architecture is the masterly correct and magnificent play of volumes brought together in light*” (as quoted in Curtis, 1996:pg.163). Monteagudo (2013) states that Le Corbusier developed the ‘*Les cinq points d’ une architecture nouvelle*’ also referred to as the ‘*Five Points of Architecture*’. These included: the supports (Pilotis), Flat roof (roof garden), free plan (open plan system), free facade, use of long horizontal windows (Daanico, 2013). In the book ‘*De Architectura*’, Vitruvius (c.15 BC) expressed the ancient thinking for the development of architectural quality, and set out a series of precise rules (Bech-Danielsen, 2001). Vitruvius listed the basic principles of architecture as *Order, Arrangement, Eurhythmy, Symmetry, Propriety, Economy* (Morgan, 1914). Laugier, an 18th century Priest, theorist and Architect interpreted the fundamental principles of architecture using the primitive hut (Longrigg et al., 2012; Čulafić 2010). Longrigg et al. (2012) comment that the purpose of Laugier’s essay, ‘*Essai sur Architecture, (1753)*’ was intended to capture the true spirit and structure of architecture. Without a set of principles, it would be difficult to distinguish between a good and a bad design (ibid). Čulafić (2010) also states that Laugier’s theory was based on principles respecting the concept of the primitive hut which focused on columns, entablature and pediment. Prior to the spread of industrialization, the early 19th century saw the emergence of the discipline of history (Karaiskakis, 2014). This served as a means of emancipating art and architecture from the late 18th century

doctrines of imitation (Karaiskakis, 2014). The period of the industrial revolution in the 19th century saw a spark of a new breed of architecture (Karaiskakis, 2014). Gottfried Semper, a German Architect approached the issue of architectural origins basing them on the hearth, mound, roof, and enclosure (Curl, 2000). Semper was fascinated by a Caribbean hut during the Crystal Palace exhibition in 1851 (Joveini, 2013). Semper theorized that the hearth was the point of socialization (Perry, 2012). Like Laugier's theory, the hearth is the core of the hut and gives significance to the mound, roof and enclosure (McKenan, 2013). Rettenwender and Spitz (2009) argue that before the evolution of these theories, the 'primitive' man had lived off the resources of land. Using natural materials for habitation, the 'primitive' man harmonized with the environment proving ancient man's disposition towards preserving the environment which translates as green architecture (Rettenwender and Spitz, 2009).

From the above, it is clear that these design principles present a hint of complementing and enhancing compatibility between the built environment and the natural environment. Many research papers and treatises such as *'The Symbolic Form of Architecture'*, Trimmer (1996) and *'Architectur, Essai sur l'art'* by Boullée (1793), have been written in relation to various design principles over the centuries but none offers a wider scope on the subject. In summary, the study focuses on identifying comparative thoughts between seven selected design theories.

II. MATERIALS AND METHODS

Considering the emphasis placed on a comparative study through analytic reasoning Borenstein et al.,(2009), the study employed the use of literature review as the tool for examining these principles of architecture. Seven architectural philosophies were studied namely from: Feng Shui, Vastu Shastra, Le Corbusier, Vitruvius, Green Architecture, Gottfried Semper and Marc-Antoine Laugier. A minimum of two philosophies were chosen from various classes categorized as: traditional, contemporary and individual theorists. Generally, these principles were chosen based on their influence in the modern approach to design across the world. The traditional principles were chosen due to their growing popularity in the western world; Feng Shui and Vaastu Shastra. The contemporary principles namely Green Architecture and Le Corbusier were adopted due to global acclamation and its indelible impact in design. The theorists; Vitruvius, Gottfried Semper and Marc-Antoine Laugier wrote discourses that shaped the pattern of the profession of architecture. Their influence though subtle, is still incorporated into the conceptual design process. Though Le Corbusier can be classified as a theorist, his principles has transcended from thought to influencing 20th century architecture and beyond. The study was primarily based on written literature sourced from books by seasoned authors, theses and journals. Alternative sources from where data was sought included conference papers, research reports, websites, blogs and review papers.

III. RESULTS

The study's research questions were categorized under history and origins, development of these practices (theories) and relevance in recent times. The following represent the results obtained from the study.

History and origin

Feng Shui literally means 'wind' and 'water' (Erlewine, 2007). In summary, it is defined by Xu (2003) as an ancient discipline that examines the sites of cities and buildings, and determines the layout and desirable arrangement of both exterior and interior spaces. Feng Shui is about 4000 - 6000 years old (Lam, 2008). Vastu Shastra on the other hand, can be described as living in harmony with nature and synchronizing energies with the forces of nature (Shamsunder, 2012). The science of Vastu Shastra is considered to be about 12,000 years old (MahaVastu, 2004).

Both Feng Shui and Vastu Shastra are traditional design practices that have endured the tunnels of time. Vastu is relatively older; and from the argument of Schmieke (2012) and Maestro and Maestro (2006), it has greatly influenced the art of Feng Shui. Schmieke (2012) asserts that about 3000 years ago monks crossed over the Himalayan Mountains from India, through Tibet and into China, carrying with them this ancient Vedic knowledge. Modified predominately by climate, Vastu Shastra evolved into Feng Shui (Maestro and Maestro, 2006). Maestro and Maestro (2006) believe that the influence of Vastu Shastra is the force that influenced other principles or science of design and construction. Monuments like the Egyptian and Mayan pyramids, Taj Mahal, Greek Parthenon and Roman Coliseum have largely been influenced by the science of Vastu Shastra; with regards to shape, proportion, measurements and alignment to the cardinal points (ibid).

From the data gathered, the contemporary theories that arrived later in the subsequent centuries have largely been influenced directly or indirectly by these traditional principles. Active and passive design considerations of the environmental factors such as wind, sunlight direction, building orientation on a plot resulted from the long existence and influence of Vastu Shastra. Apart from the traditional principles, most of the other principles evolved during the 17th century apart from the Vitruvian principle and Green Architecture.

This emphasizes the fact that the concept of Vastu largely affected the other principles. From the assertions of Attmann (2010) and Broadbent (2003), the history of Green Architecture is basically the history of mankind and even goes beyond the emergence of human beings. Green architecture is the longest surviving principle amongst other design principles. Green architecture is defined as an approach of designing that minimizes the harmful effects of the built environment and the human factor in order to preserve the natural environment by using eco-friendly materials and construction methods (Roy, 2013). From the data gathered, the contemporary theories that arrived later in the subsequent centuries have largely been influenced directly or indirectly by these traditional principles. Active and passive design considerations of the environmental factors such as wind, sunlight direction, building orientation on a plot resulted from the long existence and influence of Vastu Shastra. Apart from the traditional principles, most of the other principles evolved during the 17th century apart from the Vitruvian principle and Green Architecture. This emphasizes the fact that the concept of Vastu largely affected the other principles.

From the assertions of Attmann (2010) and Broadbent (2003), the history of Green Architecture is basically the history of mankind and even goes beyond the emergence of human beings. Green architecture is the longest surviving principle amongst other design principles. Green architecture is defined as an approach of designing that minimizes the harmful effects of the built environment and the human factor in order to preserve the natural environment by using eco-friendly materials and construction methods (Roy, 2013). The term Green architecture and sustainability were concepts that were revived in the 1960's particularly in the United States of America (Baweja, 2008). Before then, Le Corbusier had applied the green principle to the Villa La Roche in 1925 (Daanico, 2013). In the discourses of Semper and Laugier written in the 18th century, the theme of nature and harmony is explored and accentuated. *Green* is a concept that has always been in existence and has been used subtly in designs over the centuries. Due to advancement of technology, more sophisticated designs are made but the same concept of harmony with environment is primarily considered. Due to the impact of the built environment on the natural environment (Vierra, 2014), various certification systems have been applied to regulate the type of buildings introduced into the environment (Liaw et al., 2015). They include the Building Research Establishment Environmental Assessment Method (BREEAM) of the United Kingdom(UK), National Australia Building Environmental Rating system (NABERS), Taiwan's EEWH (Ecology, Energy saving, Waste reduction and Health) and the United States(US) Leadership in Energy and Environment Design (LEED) (Liaw et al.,2015).

Development of the principles.

Feng Shui is primarily based on four principles which are tied fundamentally to a concept called 'Qi' (chi) (Coleman, 2004). In Vastu Shastra, 'Pancha Maha Bhootas' are elements of nature namely Earth, Water, Air, Fire and Space which serve as the underlying principle of this science (Shamsunder, 2012). The Chinese who predominately practice Feng shui believe that the five elements of Chi are made manifest by the presence of fire, water, earth, wood and metal (Coleman, 2004). The elements of Feng Shui and Vastu Shastra bears resemblance to ancient Greek belief that the world is made up of four elements; fire, air, earth and water (Lam, 2008). Both Feng shui and Vastu Shastra assert that the elements must be in harmony to ensure the continued existence of life in the heaven, earth and human plane (Shamsunder, 2012; Moran et al., 2002).

Similarly like Feng Shui and Vastu Shastra, the concept of Green architecture also seeks to create harmony and balance between the built environment and nature (Roy 2013). Green architecture involves 'one whose construction and lifetime operation assures the healthiest possible environment while representing the most efficient and least disruptive use of land, water, energy and resources' (EPA, 2014: pg.1). These approaches have been created by man because of the extensive impact buildings have on the environment; a building's life cycle is usually characterized by the use of energy, raw materials and the emission of pollutants (Vierra, 2014). A green building design process must begin with an intimate understanding of the site in order to produce an architecture that embraces the site characteristics thus reducing the damage on the environment (Rettenwender and Spitz, 2009).

Le Corbusier, one of the most influential 20th Century Architect postulated five principles which influenced modern architecture namely the supports (Pilotis), flat roof (roof garden), free plan (open plan system), free facade and the use of long horizontal windows (Daanico, 2013; Monteagudo, 2003). Under each principle, Le Corbusier believed that a building must form part of its environment. Yet in the application of the pilotis, it was observed that this principle makes an interesting contrast to other design philosophies that seek to merge the dwelling with the earth, and to incorporate the experience of a tactile earth in a design (Korzilius 1999). But Le Corbusier's overall aim was to allow the automobile movement and the green continuity in the Villa Savoye design (Daanico, 2013). Secondly, there is the idea of bringing the landscape under the outline of the building creating a connection between the building (Villa Savoye) and the landscape (Korzilius, 1999). This position also allows a focal perception of the user from a height above appreciating all surrounding beauty and harmony (Korzilius, 1999). Stinga (2013) points out Le Corbusier believed in buildings that should give back

the space it takes up on the ground by replacing it with a garden (green) in the sky. Also, roof gardens serve as means of bringing nature to buildings; Le Corbusier opened the roof of the building to create an uninterrupted vista of the surrounding site (Daanico, 2013). The last three principles make use of a structural system called domino that allows free plan (open plan system), free facade and the use of long horizontal windows (Monteagudo, 2013). Again, the aforementioned principle allow for the maximization of space, allows enough lighting and ventilation in the space and frames the user's vision by the long horizontal windows (Korzilius, 1999; Jeanneret and Jeanneret, 1926). Holistically, it enhances thermal comfort for the users of the space.

In an opening quote from Semper (1851; pg. 1), he states that 'any discourse should first go back to the simple origin of the subject under review, trace its gradual development and explain the exceptions and variations by comparing them with their states'. From this thought, Semper based his discourse on a Caribbean hut at the Crystal Palace exhibition in 1851, from which he developed 'The Four Elements of Architecture'. These elements included the hearth, mound, roof, and enclosure (Joveini, 2013). According to Semper (1851), the hearth is the most important aspect of a dwelling. The hearth served as the focal point of socialization within the dwelling, the other elements contributes to the meaning and function of the hearth (McKenan, 2013). The enclosure, roof and mound provide comfort and security from external factors such as wind, rain and robbers among others. Though the manner of designing has evolved over time, the strain of imitating nature as inspiration still prevails. This is similar to the postulates of Laugier (1753). Marc-Antoine Laugier based the 'primitive hut' theory on the concept of imitating nature (Laugier, 1753). In his book 'Essai sur l'Architectur' in 1753 (pg.11), the Jesuit priest states '... by imitating the natural process, art was born.' Laugier's work attempted to establish principles of architecture; a standard to define good or bad architecture not based on tastes, whims or caprices (Longrigg et al., 2012). Laugier defined the premise of architecture as natural; simple and beautiful yet rational (Kotsopoulos et al., 2012).

According to Vitruvius c.50 BC, order, arrangement, eurhythm, symmetry, propriety and economy are the fundamental principles of architecture. Generally, it is observed that order must be the most important since it was the first to be mentioned (Lefas, 2000). Order is described as the creation of a hierarchy, the establishment of a rank among the elements constituting the work, by attributing the proper magnitude to each one of them (Lefas, 2000). The theme of harmony, uniformity and composition runs through Vitruvius' principles. The principle of economy involves the proper management of materials and site, as well as a thrifty balancing of cost and common sense in the construction of works (Brussat, 2010). The proper management of materials, cost and site is shaped by concerns regarding climate, site, and occupants (ibid). This principle also ties in with sustainability and green architectural practices in today's era (Bech-Danielsen, 2001).

Application

In Feng Shui, harmony is achieved through the use of colours (Wisconsin 2010) and the introduction of nature and water into the space (Faithi-Poor, 2011). These considerations affirm the need of incorporating 'green' into designs to ensure the well-being of the occupants (Sophina, 2013; Sustainable Tropical Building Design (STBD), 2011). The careful and tasteful use of colours also aid in improving comfort both psychologically and thermally; as it reduces the amount of heat in the space (STBD, 2011; Wisconsin, 2010).

Vastu Shastra emphasizes the need for correct orientation of a building, regulated by the 'Vastu Purusha Mandala' which serves as a typology of a Compass for determining an auspicious position a dwelling (Khan, 2011). In India, the North and East are ideal positions for orienting buildings since all positive solar energies come from this direction (Vedic Heritage Inc, 2014) but in China South ends are appropriate because cold winds and sand dust come from the North (Common Floor, 2009). The application of Vastu Shastra is determined by the orientation of plot and building, the use of Vastu purusha, utilization of proportional measurement, the six formuli of Vedic architecture, Character and aesthetics (Khan 2011).The aforementioned factors bear semblance to the Vitruvian principles of architecture. This resemblance could authenticate Maestro and Maestro's (2006, pg.7) assertion that '*... influence of Vastu can be seen in great architectural monuments that have withstood the ravages of time and the elements...*'. Vastu Shastra started as a science for the construction of Hindu temples but Feng Shui started as an art of placement of dead bodies to maximize the flow of energy to existing generations (Common Floor, 2009). Generally, Feng shui seems more popular because of its flexibility in the use of spaces. Spaces can be manipulated to achieve Feng Shui through the introduction of mirrors or flowers but Vastu Shastra is normally applied right from the beginning of the design (Tchi, 2014). A building is considered green when design strategies such as the use of green roofs, maximizing natural lighting through fenestrations, fins, skylights, atrium etc. are employed (STBD, 2011). These strategies have the overall objective of maximizing ventilation and natural light. Coincidentally, this aligns with Le Corbusier's five points towards a new architecture. Laugier, Semper and Vitruvius theories also aim at sustainability and balance between the built environment and the nature.

Le Corbusier's theory encompassed the use of long slender columns (pilotis) to uphold and free up the ground beneath to allow create space for relaxation or a garden. Also, the invention of the Domino system

permitted the use of a free plan that is not dependent on internal division of traditional masonry walls or partitions. Another consequence from the domino system resulted in the use of long horizontal windows that could span the entire facade. This allowed spaces to be uniformly lit. Again, the domino system promoted the use of the free facade which allows walls to be freed from their constructional role. Vitruvius (15 BC) believes that a building must have perfect proportions, balanced ratios between units of the members, must be attractive as well as economical in its construction. Laugier (1753) built on the ideas of Vitruvius, culminating all his ideas in the primitive hut which focused on the use of the column, entablature and the pediment. Many buildings of antiquity featured the use of these elements. A prime example includes the Supreme Court of America. Semper (1873) propounded the four elements of architecture; hearth, mound, roof and enclosure. The German architect postulated that the hearth serves as a communal place for socialization thus the use of living area is important. An example is seen in the falling water designed by Frank Lloyd Wright in 1935. The use of the mound is highlighted in the design of the Farnsworth house by Ludwig Mies van der Rohe in 1945. The roof and enclosure are elements that arise as a result of the protection and comfort of the indoor space. The various theories all aim at sustainability and balance between the built and natural environments.

Relevance

The traditional philosophies; Feng Shui and Vastu Shastra identified design considerations in the environment which aid in improving the comfort of man; modified climate, culture and construction. Theorists like Laugier, Semper and Vitruvius marked the path in the profession of architecture by drawing boundaries that suggested good and bad designs. Most importantly, they believed that nature was the source of man's inspiration for beauty and order in the built environment. This would eventually contribute to total harmonization of the built and natural environment. In regard to local architecture in Ghana, similar principles of design have been employed in various buildings. From the lowly mud, atakpame and courtyard houses among others to contemporary designs like the one airport square (Airport city, Accra) and the Unity Hall on KNUST campus, Kumasi.

In summary, an environment with all elements of nature in harmony affects man positively. Conversely, an imbalanced environment results in a threat to man's comfort and existence on earth.

IV. CONCLUSION

The findings of the study suggest that the synchronizing of the built and natural environment is the common thread of thought amongst the selected principles in architecture. Feng is about 6000 years old and it is predominately practised in China. Through many developments, it has matured into a science that deals with site planning, building and design to foster harmony between the built and natural environment. Sometimes called Indian Feng Shui, Vastu Shastra bears many similarities between Feng Shui. There are many assertions that Feng Shui is Vastu Shastra modified by climate and culture predominately. Vastu Shastra is about 12000 years old and has far reaching influence in other nations apart from India where it is predominately practised. It is the science that guides the design and construction of buildings in harmony with the laws of nature and the universe. Both design concepts deal with the use of 'life force' or 'life energy' and the use of the five elements of nature. Green Architecture deals with the harmonization of the site with its surroundings. The age of green architecture cannot be provided but by various arguments from experts in the field, 'green' is as old as the universe. Green is not defined as a colour rather it is the means of reducing the harmful impact of the built environment on the environment and its inhabitants. The cycle of the built environment is characterized by the use of raw materials, use of energy and emission of pollutants. Due to the continual degradation of the environment, many certification modules have been developed to regulate the type of buildings that are adopted into the natural environment. They include The US LEED (Leadership in energy and environmental design) programme and Taiwan's EEWH (Ecology, Energy saving, Waste reduction and Health). All these certification programmes are aimed at providing environmentally friendly environment for its inhabitants and to curb the damage and strain the built environment has on the natural environment.

One of the most influential Architects of the 20th Century in the person of Le Corbusier was born in 1887 in Switzerland along the Jura Mountains. Le Corbusier had a rich and formative childhood of art and music. Le Corbusier was predominately, influenced by L'Eplattenier, his school teacher to pursue architecture. Through his travels through Europe, he sought for a new order of architecture. By 1925, one of his significant works, La Roche was the epitome of his five postulates. Le Corbusier titled these five points in a manifesto called '*Five Points Towards a New Architecture*'. These five points included; the supports (pilotis), the free Facade, the open plan, use of long horizontal windows and flat roof. With these influences Le Corbusier developed principles that changed and improved the pattern of designing for the next century. Before Le Corbusier, many theorists and architects had also thought of a defined form and boundary by which architecture could be tailored. Laugier, also a Jesuit priest was born in 1711. The beginning of the Renaissance period initiated the imitation of these old styles and flamboyant ornamentation; disgusted by the trend, Laugier wrote

an essay titled '*Essai sur Architectur*' in 1753. In this essay, he outlined the principles necessary for a 'good' architecture in the analogy of a primitive hut. The principles included the use of columns, pediments and entablature. The essay was aimed at defining rules that would govern and differentiate a good design from a bad one. Semper postulated four elements that should serve as the building blocks of architecture. The four elements are the hearth, platform, roof and its supports. These elements were birth as a result of Semper's fascination of a Caribbean hut at the Great Exhibition in 1851 in London. Finally, Vitruvius represents one of the main voices of the classical period. According to Vitruvius, architecture is governed by the principles of order, arrangement, eurhythmy, propriety and economy. Vitruvius believed that any architectural piece must satisfy these conditions to produce an edifice of beauty, balance and sustainability.

The main objective of this dissertation was to propose a condensed theory of the studied principles. Also, the study was undertaken to understand architectural philosophies from their historical foundations, application and relevance in today's era. The result from the study demonstrates that these principles regardless of their origin emphasize sustainability and the ability to imitate and apply the laws of nature in design and building. Also, this lessons absorbed from nature should be applied such that it produces harmony between man, the built and natural environments. From the results, it is imperative that from the conception stage of design, the designer must consider the context and characteristics of the site. This goes a long way to enhance harmony between man, buildings and the natural environment. Also, the inclusion of more historical material into the Ghanaian architectural curriculum or syllabus would enhance the understanding of the student architect in developing concepts. This process of concept development would have firm and rich theoretical basis for designs. Finally, the study outlines the methods through which some principles came into being; this procedure could help Ghanaian Architects develop similar typologies of principles that could be uniquely Ghanaian.

REFERENCES

- [1]. Attmann, O., (2010). *Green Architecture: Advanced Technologies and Materials. Brief History of Green Architecture*, McGraw-Hill Professional. ISBN: 0071625011, 9780071625012.
- [2]. Baweja, V., (2008). *A Pre-history of Green Architecture: Otto Koenigsberger and Tropical Architecture from Princely Mysore to Post-colonial London*, PhD Thesis, University of Michigan.
- [3]. Bech-Danielsen, C., (2001). *Vitruvian Perspectives on Architectural Quality*. Available at: (vbn.aau.dk/files/75461458/Paper_Claus_Bech_Danielsen.docx) Accessed: 10/12/14.
- [4]. Bergdoll, B., (2000) *European Architecture. 1750-1890* .Oxford University Press, 2000.ISBN:0192842226, 9780192842220.
- [5]. Borenstein. M, Hedges L.V, Higgins J.P.T, Rothstein H.R (2009). *Introduction to Meta-Analysis*. Available at: ([http:// www.scribd.com](http://www.scribd.com)). ISBN: 978-0-470-050724-7.
- [6]. Brussat, D.,(2010). *Commodity, Firmness, and Delight, or Toward a New Architectural Attitude*. Available at :(<http://classicistne.wordpress.com/2010/12/13/commodity-firmness-and-delight-or-toward-a-new-architectural-attitude>.) Accessed: 29/07/2014.
- [7]. Coleman, M (2004). *Feng Shui Secrets Revealed*. Available at [http: \(www. butwhynow.com/fengshui/fengsecretsbook.pdf\)](http://www.butwhynow.com/fengshui/fengsecretsbook.pdf).Accessed:01/08/14.
- [8]. Daanico,P.,(2013). *Five points of Modern Architecture*. Available at: (<http://www.daanico.wordpress.com/2013/12/23/5-points-of-modern-architecture/>).Accessed:06/12/14..
- [9]. Dawkins,R.,(2010). *Engaging Sensibilities: An exploration into architectural techniques for multi-sensory environments*. Available at:(unitec.researchbank.ac.nz/.../pdf). Accessed :21/01/15.
- [10]. Erlewine, M., (2007). *The Art of Feng Shui, Big Rapids, Michigan*. ISBN: 978-0-9794970-4-9. Available at [http: \(www startypes.com\)](http://www.startypes.com). Accessed: 01/08/14.
- [11]. Faithi-Poor,K.(2011) *10 feng shui rules you should follow* .Available at: (<http://www.chictip.com/design-tips/10-feng-shui-rules-you-should-follow>).Accessed: 14/11/14.
- [12]. *Green buildings*, (n.d).USA EPA, Available at: (<http://www.epa.gov/greenbuildings/pubs/faqs.htm>).Accessed:05/09/14.
- [13]. Jeanneret, E., Jeanneret, P., (1926). 'Five Points Towards a New Architecture'. Available at: (http://www.learn.columbia.edu/courses/arch20/pdf/art_hum_reading_52.pdf). Accessed: 06/12/14.
- [14]. Joveini, F.S., (2013). *Thinking Ornament; The Naked Architecture II*. Available at: (<http://alexandria.tue.nl/extra2/afstversl/bwk/761266.pdf> Accessed : 16/09/14.
- [15]. Karaiskakis,D., (2014). *Tectonics, Aestheticism and the Poetic Metaphor*. Available at :(<https://www.scribd.com/doc/248470879/Architecture-Thinking-Building-Dimitrios-Karaiskakis2>). Accessed: 12/03/14.
- [16]. Khan, S., (2011). *Indian Feng Shui*, Available at (<http://issuu.com/sirajak/docs/vastu>). Accessed: 23/10/14.
- [17]. Korzilius,L.,(1999). *Vers une architecture and Villa savoye; five points of architecture*. Availableat:(http://http://www.lesterkorzilius.com/pubs/ma/vua_vs/09.htm).Accessed:06/12/14.

- [18]. Kotsopoulos,S.D., Casalegno,F., Hsiung,B., Graybill,W.,(2012).A Prototype Hut for the Post-Digital Age. Mobile Experience Laboratory, MIT, USA, Computer Science & Artificial Intelligence Laboratory, MIT, USA. Available at :(<http://mobile.mit.edu>).Accessed:13/10/14.
- [19]. Laugier,M.A.,(1753). Essai sur l'Architecture. Translated and with an introduction by Wolfgang and Anni Hermann. Herneßy and Ingalls, Inc. ISBN 0-912158-92-1.
- [20]. Lam, K.W.T., (2008). Recovering the sense and essence of place; the eastern practice of Feng shui and its role in Western Architecture, Waterloo.MA Dissertation, Waterloo -Ontario -Canada. Available at :(<http://uwspace.uwaterloo.ca/handle/10012/4172>)
- [21]. Le Corbusier., (1984). The Modular (translated by Peter de Francia and Anna Bostock). Second Edition. Faber and Faber limited, London. ISBN:3-7643-6188-3,0-8176-6188.
- [22]. Lefas,P., (2000). On the fundamental terms of Vitruvius' architectural theory. Available at: (https://www.academia.edu/1425749/On_the_fundamental_terms_of_Vitruvius_architectural_theory). Accessed: 20/01/15.
- [23]. Liaw, C., Huang, E., Tzai, H., (2015).Green Roofs and Green Building Systems. ISSN: 2248-9622, Vol 5. Available at :(<http://www.slideshare.net/ijeraeditor/1501027177-43571356>) Accessed: 04/01/15.
- [24]. Longrigg,A., Musing,M., Steele,L., Ozdemir,I.L., (2012). Marc-Antoine Laugier , 'Essay on Architecture'. University of Colorado Boulder. Available at: (<http://primitivehutb5.blogspot.com/2012/12/laugier-on-primitive-hut-story.html>) .Accessed:19/11/14.
- [25]. Maestro, R., Maestro, M., (2011). The Way of Vastu: Creating Prosperity through the Power of the Vedas: Achieve Success through Indian Feng Shui, Available at (http://vastu_chapter_1.com) Accessed: 21/07/ 2014.
- [26]. Mak, M.Y., Ge, J.X., (2012). Feng Shui: A Chinese Perspective of Sustainability. Global Chinese Real Estate Congress 2012, Annual Conference 3-5 July 2012, Macau S.A.R, China. Available at (<http://www.umac.mo/fba/gcrec2012/83974183/12203-Mak.pdf>).Accessed: 01/08/14.
- [27]. Mahavastu., (2012). MahaVastu handbook Methods and Practical Working Procedures of Vastu Shastra for Professionals. Available at (<http://www.mahavastu.net>) Accessed: 21/07/ 2014.
- [28]. Mckenan,E., (2013). The Four Elements of architecture: Gottfried Semper place in design 8 . Available at: <http://www.honors.ufl.edu/apps/Thesis.aspx/Download/2192>.Accessed :17/01/14.
- [29]. Monteagudo, J. A., (2013). Influence of Le Corbusier in modern architecture .Available at: (<https://www.ucviden.dk...pdf>).Accessed:16/09/14.
- [30]. Moran , E. Yu. ,J. Biktashev, V., (2002). The complete idiot's Guide to Feng Shui, second edition, Pearson Education Company -Indianapolis. ISBN: 0-02-864339-9.
- [31]. Morgan,M. H., (1914). Vitruvius Ten Books on architecture. Dover Publication, New York. ISBN:04862062459 ,9780486206455.
- [32]. Rettenwender, T., Spitz, N., (2009). The Principles of Green Building Design, Monterey Peninsula College INTD62 Spring 2009. Available at (<http://www.earthrisedesign.com/files/MPC-pub090709.pdf>). Accessed: 04/05/14.
- [33]. Roy, M., (2013). Importance of Green Architecture Today. Available at (<http://www.sari-energy.org>). Accessed: 04/05/14.
- [34]. SaralVastu., (2013). Divine Vastu, living in Harmony with the Earth, Available at (<http://www.divinevastu.net>) Accessed: 11/03/2013.
- [35]. Semper, G.,(1851).The Four Elements of Architecture and Other Writings translated by Harry Francis Mallgrave and Wolfgang Herrmann 2011. ISBN: 9780521180863.
- [36]. Schmieke,M., (2012). The most powerful Vasati tools to The Most Powerful Vasati Tools to Balance Spatial Energies,-the origin of Feng Shui 1p. Available at <http://M.Schmieke/Vasati/TheOriginofFengShui201p>). Accessed:28/05/ 2014.
- [37]. Shamsunder, M.,(2012). ISSUU-Vastu Architecture, Ancient Indian Method Of Construction, Vastu without demolition power of Yantra, faith and science. Available at (http://issuu.com/madurikaheranjals/docs/part_1) Accessed: 21/07/ 2014.
- [38]. Sophina,E.,(2013). Top 10 Feng Shui Tips. Available :(<http://www/care2.com/.../top-10-feng-shui-tips.html>). Accessed: 05/12/14.
- [39]. Stinga,A.,(2013).Villa Savoye: the five points of a new architecture.
- [40]. Available at: (<http://architecturehttp://ombuarchitecture.wordpress.com/2013/09/25/villa-savoye/>). Accessed:06/12/14.
- [41]. Suppes, P. (1991).Rules of Proportion in Architecture. Available at:(<http://suppes-corpus.stanford.edu/articles/mpm/307.pdf>). Accessed: 20/01/15.
- [42]. Sustainable tropical building design, (2011). Guidelines for Commercial Buildings, Cairns Regional Council (CRC).Available at :(http://www.cairns.qld.gov.au/__data/assets/pdf_file/.../BuildingDesign.pdf). Accessed: 24/10/14.
-

- [44]. Tchi,R.,(2014).Feng Shui and Vastu Shastra. Available at: ([http:// feng shui.about.com/.../ feng-shui-vastu-shastra.](http://fengshui.about.com/.../feng-shui-vastu-shastra)) Accessed: 18/11/14.
- [45]. The difference between Vastu and Feng Shui. (2009). Available at: ([http:// www.common floor.com/guide/the-difference-between-vastu-and-feng-shui-614](http://www.commonfloor.com/guide/the-difference-between-vastu-and-feng-shui-614)). Accessed: 18/11/14.
- [46]. Turner, P, (1971).The Beginnings of Le Corbusier’s Education, 1902-07. Available at: (<http://www.jstor.org/stable/3048831>).Accessed:27/11/14.
- [47]. Vierra, S, (2014). Green Building Standards and Certification Systems. Available at :(<http://www.wbdg.org/resources/gbs.php>). Accessed: 04/02/14.
- [48]. Wisconsin log Homes, (2010). Improving your life with Feng Shui. Available at: [https: \(www.wisconsinloghomes.com\)](https://www.wisconsinloghomes.com). Accessed: 14/11/14.
- [49]. Vedic heritage Inc., (2014). Available at ([http://vedic heritageinc.com](http://vedicheritageinc.com)). Accessed: 23/10/14
- [50]. Xu, J., (2003). A framework for site analysis on Environmental Principles. Available at: (<http://scholar.lib.vt.edu>). Accessed: 01/08/14.
- [51]. Zou, A., (2012). Feng Shui and burial, Feng Shui Article April 2012 - Singapore Feng Shui Centre. Available at (http://www.fengshui.com.sg/fs_and_burial.pdf) Accessed: 01/08/14.