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# Vaastushastra: A Guide to Sustainable Building and Settlement Design

Avlokita Agrawal<sup>1</sup>, Naman Mirajkar<sup>2</sup>, Devavrata Singh<sup>3</sup>

<sup>1,2,3</sup> Indian Institute of Technology, Roorkee, India

**ABSTRACT:** Sustainable design of buildings and cities seems to have evolved out of necessity, such that the stress on environment is relieved. If we look at the ancient Indian treatise on architecture called Vaastushastra, sustainability appears to be at the core of the practice even when the environment was not as stressed as today and resource consumption rate was much slower. These ancient texts detail out the process of building design and town planning considering all scientific aspects of modern engineering and beyond. The prescriptions are laid out in a religious language and were supposed to be followed as by laws. This research is aimed at analysing the ancient texts of Vaastushastra and drawing parallels with contemporary sustainable building rating schemes. Though the technological advancements which find mention in today's times are nowhere to be seen in ancient text; yet the responsiveness towards environment through passive design has been remarkably demonstrated. Other interesting features dealt with in the Vaastushastra are variations based upon climatic/local context and also spatial organization which in particular finds no mention in contemporary rating systems. Vaastushastra also talks about some economic and social aspects which are ignored in the sustainable building design tools used today. Hence it could be concluded that many aspects highlighted in Vaastushastra; if included in contemporary ratings would lead to a more comprehensive and robust rating tool.

**Keywords:** Vaastushastra, sustainability, rating systems, prescriptions.

## INTRODUCTION

Vaastushastra literally means the 'Science of Architecture' (Apte, 1965). There are two words which are closely related to this, "Vastu" and "Vaastu". While both can be considered to deal with energy, the word *Vastu* deals with pure and subtle energy and *Vaastu* refers to the type of energy embodied in the materials which is more physical (Agrawal, 2009). Though today the word Vaastu is being used to refer to buildings in general.

There are many different scriptures like the *Manasara*, *Mayamata*, *Brihat Samhita*, *Samarangana Sutradhara*, *Rajvallabha Mandanam* etc. which were referred almost religiously by the practitioners of this profession and over time some of them were considered as the go-to reference for topics related to architecture, village/town planning and sculpting. Contemporary understanding of Vaastushastras has derived their fundamentals from the *Sthapatya Veda* a particularly famous *Upaveda* (Müller, 1859). These scriptures over time have undergone many transformations due to contextual influence, invasions and also owing to the fact that this knowledge was handed down verbally until the time they were actually recorded. The Vaastushastra as a whole is a treatise on dwellings which takes into consideration many aspects which are considered to be the core of the idea of sustainability in architecture today.

The compiled and recorded version of Vaastushastra deals with four major topics, namely: *Bhoomi* (related to the Earth/Site), *Prasada* (the Buildings), *Yana* (the modes of transport) and *Sayana* (the Furniture) (Agrawal, 2009). Each of these is very important individually and is also dependent on each other in most cases. For examples: the wrong choice of site or its features can lead to making a perfectly built structure inefficient or even in some cases a total failure from various perspectives.

As mentioned above, the scriptures mostly consist of instructions to proceed with the process of developing a built environment. The most important part of these texts could be considered its underlying social essence along with the explicitly stated instructions or prescriptions which can be physically manifested and verified, presented in a religious language.

## SUSTAINABLE BUILDING RATING SYSTEMS

There are a number of present day sustainable building rating systems that are followed today. They are different for different geographical locations and building practices. Of all of these, the various LEED Guidelines developed by the United States Green Building Council can be considered to be one of the most comprehensive and widely followed set of guidelines around the world including India.

India has developed its own rating system based on the different kinds of practices that are prevalent in the

Indian context. The Indian Green Building Council (IGBC) under the Confederation of Indian Industries and the Green Rating for Integrated Habitat Assessment (GRIHA) under the guidance of The Energy And Resources Institute (TERI) have come up with guidelines and codes for the purpose of sustainable habitat design in India. Even though these codes were developed in India with the Indian context in mind, they were mostly developed by taking the international standards into consideration and therefore show the traits of those codes e.g. the structure and amount of importance placed on the various sections.

These codes when developed for the main purpose of use in India did have the potential to be specifically tailored to the Indian environmental, social, economic, cultural context, but fail to do so. This is where we can learn from the ancient texts on Vaastushastra as to how they incorporated all of these aspects into the prescriptions that could be adapted as per the context and were at the same time more socially and economically end user oriented than the contemporary sustainable building rating systems.

### THE PRESCRIPTIONS

When Vaastushastra was practiced, the prescriptions were considered to be a version of bye laws for planning, design, and construction of the built environment which made use of religious pretexts to ensure compliance (Chakrabarti, 2003). Though many of the prescriptions were masked with religious pretence most of the prescriptions were directly stated and in some cases implied. This research paper focuses on these direct and indirect prescriptions to get an understanding of their relationship to the modern day idea of sustainability. The prescriptions with architectural significance can be divided into three different types, which can be better understood classified under four sub-types as represented in the relationship diagram shown below.

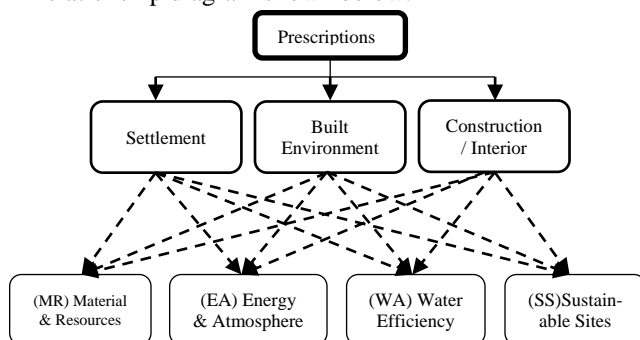


Figure 1: Diagram showing the relationship between the three types of prescriptions and their subcategories.

Any of the three scales of prescriptions can be related to any one or more subcategories simultaneously.

This gives us an idea of the aspects of sustainability these prescription point towards.

Based on various texts related to the Vaastushastra the relevant prescriptions are selected, listed and their types and implications are marked. These are then compared to the guidelines indicated by the various sustainable building rating systems widely accepted today. These prescriptions are simplified as much as possible for the ease of understanding and comparison. These prescriptions when compared to the guidelines provided in the present day sustainable building rating systems, give us an idea of the depth of thought that went into the creation and evolution of these scriptures and also their validity in today's context. Even though the social and economic aspects of these prescriptions are not directly specified in the selected cases they can be directly implied like in the case of using only wood for construction of residences of the common man, the placement of the main entrances to the east etc. Unlike in the present day sustainable building rating systems the prescriptions in the Vaastushastra consider the social and economic situations of the end user. The texts on Vaastushastra also imply various important processes and situations to be ensured, to maintain good mental and physical health of the architect and also suitable remunerations for the people involved in the process so as to make sure they participate willingly.

Vaastushastra also stresses the point that although the prescriptions laid down by it are mandatory they are to be applied after consultation and strictly under the supervision of the architect as he is the most knowledgeable and can and will make necessary changes to the prescriptions as required (Dagens, 1995). To increase the ease in adaptation to different climatic and social contexts the texts provides various options and range of values to work with. This is one of the most important reasons for the survival of these texts and its usage even after thousands of years when they first came into existence.

Described below are a few selected prescriptions from the Vaastushastra texts which have been divided into three categories of different scales of built environment and then marked to show the subtype they relate to. The texts on Vaastushastra do not provide justification for the prescriptions given in them, as they were considered to be thoroughly researched and tested before recording; also the religious nature and the dire penalties described for defaulters of the text made sure the prescriptions were strictly followed.

This rigidity observed in the texts leads one to believe that these texts were not adaptable to different conditions and scenarios; however, depending upon architect for most decisions as he was considered to be

the most knowledgeable brought to decide upon deviation as desired. The different standards and rating systems mentioned in the tables below are the ones that are most commonly referred to in India for the purpose of architectural design. These include standards from the Bureau of Indian Standards, the sustainable building rating systems and guidelines prescribed by the Indian Green Building Council, the United States Green Building Council (LEED) guidelines and Urban Regional Development Plans Formulation and Implementation guidelines.

*Table 1: Built Environment Scale prescriptions from the texts.*  
 (Acharya, 1946), (Acharya, 1996) , (Dagens, 1995), (Agrawal, 2009)

Sl. No.	Prescription from Vaastushastra & (Subtypes)	Sustainability Implication	Code	Code Criteria
1	Courtyard must be at the centre of the residence, open to sky and without obstructions with open gallery all around (EA), (SS)	To maximize the use of open space and to help in regulating daylight and natural ventilation inside the building.	LEED BD+C - SS 5.2	Site Development – Maximize Open Space
			IGBC - New Buildings- SA Credit 3 & EE Mandatory Req. 1	Minimize energy consumption by making use of passive architectural strategies like courtyards etc.
2	There should not be any common walls or columns in between two residences.(SS)	For structural safety, privacy and the ease of maintenance.	LEED BD+C - SS 5.2	Site Development – Maximize Open Space
3	Rooms should be constructed all around the courtyard and Entrance door is most preferred in the Eastern direction.(EA), (SS)	To receive proper ventilation and lighting in habitable rooms.	LEED BD+C - IEQ 8.1	Achieve daylight in 75% of regularly occupied spaces.
			IGBC - New Buildings - SA Credit 3	Minimum daylight illuminance of 110 Lux in at least 50% of the regularly occupied spaces.
4	Larger buildings must have thicker walls. (MR), (EA)	Due to the nature of load transfer in un reinforced load bearing system.	IS 1905: 1987	Table 11 - Height to thickness ratio of free standing walls.
5	Thickness of the wall must be proportional to the width (w) of the building [1/16 * w]. (MR), (EA), (SS)	Larger buildings have larger spans thus requiring more stability.	IS 1905: 1987	Load bearing buildings up to 4 storeys, are stable if height: width of building does not exceed 2.

6	Height of the plinth must increase with the increase in the size of the building. (SS)	Increased height of plinth to transfer the load of thicker walls effectively.	-	Load bearing structures is to have a strong base and efficient transfer of loads.
7	Ventilators must be placed in the Northern direction. (EA), (SS)	To bring in diffused light from the north and also to exhaust hot air from inside by routing them with prevailing winds.	IS 2440: 1975	Maximize the daylight in regularly occupied spaces.
			IGBC - New Buildings - IEQ Mandatory Req. 1	Minimum fresh air ventilation on external surfaces where they can be carried off easily.
8	Doors at the upper levels must be located exactly above the doors on the lower levels. Height of the upper floors and consequently the doors must be lesser than the lower floors. (MR)	Defining a suitable load transfer path. If this was not done the building would reach a slenderness ratio which would be unsafe for multi storied buildings.	IS 4326: 1993	Table 4 - Guidelines on the Size and Position of openings - Door and window openings in walls reduce their lateral load resistance and hence,
9	Verandas must be provided on all side of the residence. (EA), (SS)	To shade the external walls from direct radiation	SP 41:1987	Veranda open on three sides is preferred as it increases air circulation.
			IGBC - New Buildings - EE Credit 2	Reduce the heat gain into the building and hence reduce the use of active cooling systems and hence reduce energy consumption.
10	Chajja (sunshade) must be projected equally on all sides of the building. (EA), (SS)	To provide shade on windows and walls.	IGBC - New Buildings - EE Credit 2	Reduce the heat gain into the building and hence reduce the use of active cooling systems and hence reduce energy consumption.
11	Stone must be used in the construction of temples, public buildings and palaces but not common residences. (MR), (EA), (SS)	Using stone in buildings has higher environmental impact.	IGBC - New Buildings - BMR Credit 1	The material chosen for construction must be easily locally available as well as easily replenish able.

*Table 2: Settlement Scale prescriptions from the texts.*  
 (Acharya, 1946), (Acharya, 1996), (Dagens, 1995), (Agrawal, 2009)

Sl. No.	Prescription from Vaastushastra & (Subtypes)	Sustainability Implication	Code	Code Criteria
1	The Site must be sloping towards East, North or North-East in that order of preference. (WE), (SS)	To allow the drainage of water according to the prevailing wind directions (NE to SW) such that winds pick up moisture while entering the site.	IGBC - New Buildings - WC Credit 3	Rain water harvesting must be designed in such a way that at least 'one day rainfall' may be captured.
2	The Site should be facing preferably North, East, West and South in that order of preference. (EA), (WE), (SS)	In that order of preference to maximize day light during the day.	IS 2440: 1975	Maximize the daylight in regularly occupied spaces.
			IGBC - New Buildings - EE Credit 2	Same as before.
3	No trees should be planted inside a building. (SS)	To prevent damage to the structure caused by roots and branches.	IGBC - New Buildings - SSP Credit 4	The native vegetation that is interfering with the construction work can be transplanted in a different area.
4	Huge trees like Fig, Bargad, Peepal, Kapitha etc. are to be planted around the buildings preferably. (EA), (SS)	To help in providing shade around the building as all these trees have dense foliage and are native trees.	IGBC - New Buildings - SSP Credit 4 & 5	Preserve and encourage the plantation of vegetation native to the region and keep a min. of 75% of natural vegetation on site.
5	Milk Bearing, Thorny, Fruit giving and trees with Yellow flowers are not to be planted around a building. (SS)	As milk bearing trees are relatively weak and are prone to breakage, thorny trees are dangerous and fruit bearing trees often have social issues.	-	The social relevance of having weak, dangerous or fruit bearing trees in one's site has not been touched by any of the present day rating systems.
6	The shapes of the settlement must be as prescribed (e.g. Nandyavarta, Karmukha, Padmaka etc.) (EA), (SS)	Considering the proximity to various related activities and the shape and sizes of the roads and pathways.	URDPFI Guidelines, 2014 - Volume 1	Table 4.2 - The R4 and R3 roads must be in designed and located to provide the shortest connection to the basic amenities.
7	There should be one main entrance on each side of the settlement preferably. (SS)	For ease of access / egress from all sides.	URDPFI Guidelines, 2014 - Volume 1	The R2 and R1 roads must be in designed so as to provide the best connectivity to the whole village from all sides.
8	The entrance must not be in the centre of each side. (SS)	For better circulation as depicted in figure	URDPFI Guidelines, 2014 - Volume 1	The R2 and R1 roads must be the arterial roads with heavy traffic and since these roads will be in the centre, direct access to it can lead to congestions.
9	The Main Roadways inside the settlement or town must go from North to South and East to West. (SS)	To provide equal access and alignment from all sub arterial and feeder roads which are designed preferably in four cardinal directions just like the buildings.	LEED ND - Neighborhood Pattern and Design - Pg. 69	Provide Community Connectivity - Good ideas for community connectivity include basic grid pattern streets vs. cul-de-sacs or gated areas.
			IGBC - Green Townships - Transportation Planning - TP Credit 2	Provide interconnected road and street network to facilitate transport efficiency and ease of connectivity.
10	A ditch with ramparts must be dug around the settlement and barricades must be erected outside the ditch. (SS)	For safety from invaders and wildlife.	-	The Safety and Security of the sites, buildings and the end users are related to their context.
11	The site for the settlement must be located close to a clean and useable water body. (WE), (SS)	For purposes of settlement sustaining itself.	LEED ND - Neighborhood Pattern and Design	Site with community connectivity must be within walking distance of basic services.
12	The width of the roads must be a minimum of one Danda and its multiples thereafter. 1 Danda = 1.9812 M (SS)	One Danda is enough space for a cart and move safely without disturbing the surroundings and its multiples thereof signifies the number of lanes.	LEED ND - Neighborhood - Site Design & URDPFI Guidelines, 2014 - Volume 1	Narrow roads minimize the environmental impact and also have the economic benefits. & R2 and R1 roads must be designed to accommodate the traffic.

*Table 3: Construction Scale prescriptions from the texts.*  
 (Acharya, 1946), (Acharya, 1996), (Dagens, 1995), (Agrawal, 2009)

Sl. No.	Prescription from Vaastushastra & (Subtypes)	Sustainability Implication	Code	Code Criteria
1	Walls should be thick at the base and thickness must reduce as height increases. (MR), (EA), (SS)	To increase the stability of the walls and define a proper load bearing path.	IS 1905: 1987	Table 11 - Height to thickness ratio of free standing walls.
2	Plaster on the wall must be of even thickness. (MR), (EA)	For structural durability.	IS 1661: 1972	The rendering coat shall be uniformly carried to the full length of the wall.
3	Broken bricks must not be used at joints. (MR)	As the use of such bricks would weaken the joint.	IS 3414: 1968	Load bearing walls with cross walls at intervals. Traditional type of one-brick thick or more are recommended.
4	Three different brick sizes are prescribed for use as per wall thickness. (MR), (EA)	To maintain masonry joints while having variation in sizes.	IS 1077: 1992	This standard lays down requirements for dimensions and physical requirements of common burnt clay building bricks used in buildings.
5	Square columns are most preferred in residences. (MR)	The square form is easy to create and has very good stability.	IS 15284: 2003	Stone columns should be installed preferably in a square or equilateral triangular pattern which gives the densest packing.
6	An Apron and a platform must be constructed around the building with a minimum width of 60 cm and height of 1/8 <sup>th</sup> of building height respectively. (MR), (SS)	To safeguard against rain, driving rain, splashing and seeping moisture.	NBC 2005	Wherever the dampness of a site or the nature of the soil renders such actions necessary, the ground surface of the site between the walls of any building erected thereon shall be rendered damp-proof.

9	Chajja (sun shade) must have a width equal to 1/5th the height of the storey. (EA), (SS)	To ensure that proper shade and protection	IGBC - New Buildings - EE Credit 2	Reduce the direct heat gain into the building and hence reduce energy consumption.
10	Jharokas (screened spaces) must be present in a building. (EA), (SS)	To help in passive cooling of air.	IGBC - New Buildings - EE Credit 2	Same as above.
11	The preferred material for construction of columns in residences of the common folk is wood. The prescribed material for furniture design is also wood. All the openings (doors and windows) must have thick wooden shutters. (MR), (EA), (SS)	Locally available, economical, easy to replenish, renewable, workable and replaceable if need be. To ensure opening schedule depending upon weather to regulate indoor environment.	LEED BD+C - MR 5	Use building materials or products that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of the project site.
			IGBC - New Buildings - BMR Credit 1	The material chosen for construction must be easily locally available and easily replenish able.
12	Hollow walls made of brick are prescribed to be used wherever needed according to the climate. (MR), (EA), (SS)	To help in passive cooling.	IS 3952: 1988	Hollow bricks are light in weight and being hollow, impart thermal insulation to the building.
			IGBC - New Buildings - EE Credit 2	Reduce the heat gain into the building and hence reduce energy consumption.

### THE CONCLUSION

The prescriptions in the Vaastushastras are divided into different categories namely: the prescriptions for common residences, the prescriptions for the settlements, the prescriptions for temples and royal palaces and the prescriptions for iconography and the section on penalties (Acharya, 1996). These were the present day equivalent of guidelines for different sectors

in the field of architectural design. In the table above the most applicable suggestions from the rating systems and related standards are mentioned adjacent to the prescriptions from the Vaastushastras to make the analogy of past to present clear.

Some prescriptions like the one which talks about building a moat around the site of the settlement mostly do not have any direct present day equivalent as they are related to the society and conditions related to its safety prevalent at that time. Since these were the only guidelines that were available at that time they were supposed to be more comprehensive and interdisciplinary in nature.

From the analogy above a conclusion can be derived regarding these texts that they considered socio-economic and environmental implications of every action in situations where they are forced to act against any of these they always make a point to compensate for the deed. For example when a tree is cut a provision is made to replant one immediately or choose one that will not have a large impact, to maintain the balance in nature.

Another important aspect of these texts related to Vaastushastra, is that even though they were recorded long ago, they advocated the idea of sustainable living as a default and did not even consider a case other than being sustainable. The rules and instructions that are dictated in the present day sustainable building rating systems are an addition to the basic standards adopted for the purpose of building in the field of architecture which in most cases were not written with sustainability in mind. In comparison the Vaastushastras did not have different texts for these purposes and thus incorporated all their ideas into this one set of scriptures.

Therefore it can be concluded by saying that the Vaastushastras, even though old, were a comprehensive set of texts based on the idea of social, economic and most importantly environmental sustainability equipped with a versatility to be considered useful in any part of the region it was intended to be used in.

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