

Effective Site Planning For Sustainable Development

I.P. Singh and Minakshi Jain*

Department of Architecture,
National Institute of Technology, Hamirpur (Himachal Pradesh), India

Abstract

Site Planning involves the organization of built mass with the outdoor spaces to meet human needs and desires while protecting, conserving or enhancing natural environment and processes. However, the creation of spaces that meet social, environmental, cultural, aesthetic and practical requirements of the people in the best possible way define the Effective Site Planning. The analysis of site helps in the assessment of potential and constraints of the site. Site analysis is more helpful when it is done prior to planning. The study and analysis of the site in terms of its physical features forms the basis of the site planning. Site planning examines the potentiality of the site for development through site analysis. Information about slope, soils, hydrology, vegetation, land ownership, orientation etc. are assessed and mapped. If site planning is efficient and effective at building level or city level it can result in sustainable environment.

Keywords: Site planning, ecology, bio-diversity, site analysis, nature's morphologies, cultural, built mass, open spaces

***Author for Correspondence:** Email ID: minakshi@nith.ac.in

INTRODUCTION

We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect.

The land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics -Aldo Leopold.

G. Tyler Miller Jr. (2006) categorizes perception of resources into four land-use ethics^[1].

1. Economic is the land seen as a commodity, i.e., a piece of real estate to be developed purely for short term financial gain.
2. Ecological is the land seen as a resource, whose environmental qualities can be beneficially exploited without disrupting its inherent characteristics.

3. Aesthetic is the land appreciated purely as a visual picture, much like a stage setting.
4. Arbitrary is the land seen merely as two dimensional areas demarcated by boundaries.

Attitudes of people and environment relationships have given different cultural perception of the resources. Perception and usage of the site is attributed to the characteristics, value and priorities attached to it. There is a strong need to judge what factors deserve priority depending upon a particular situation. Each site is unique and entails its own specific characteristics in terms of its location, orientation, topography, vegetation, bio-diversity, geological characteristics, ground and surface water and the surrounding areas. A detailed study of the site is undertaken to decide its suitability for the intended design programme. Site planning encompasses

the critical process of research, analysis and synthesis involving the multidisciplinary approach of the fields such as Architecture, Urban and Regional Planning and Landscape Architecture etc. Site Planning is the process of establishing a coherent scheme to organize buildings, open spaces and infrastructure on a site keeping in mind its inherent natural character, its relationship with the surrounding areas, and activities required by the proposed design programme. Harvey M. Rubenstein defines it as the art and science of arranging the uses of portions of land. These uses are designated in detail by selecting and analyzing sites, forming land use plans, organizing vehicular and pedestrian circulation, developing visual form and material concepts, readjusting the existing landforms by design grading, providing proper drainage, and developing the construction details necessary to carry out the projects^[2].

By determining the potentials and constraints of the different areas of the site, the optimal location of the physical blocks can be assessed and space that works within these blocks can be designed. On development Ian Mcharg, the author of the book “Design with nature” has commented that we build where we should farm, cut forests where we should grow them and Design forms where we should follow nature’s morphologies^[3].

WORLD POPULATION SCENARIO

The following year wise data for the World population is recorded.

1. Billion in 1804 years
2. Billion in 1927 (123 yrs. Later)
3. Billion in 1960 (33 yrs. Later)
4. Billion in 1974 (14 yrs. Later)
5. Billion in 1987 (13 yrs. Later)
6. Billion in 1999 (12 yrs. Later)
7. Billion in 2010 (11 yrs. Later)
8. China and Indian have population over 1 billion

Scenario of Indian Population

Urban India had population of 285.39 million in 2001. As per the researchers and statistics, India will become the most populated country by 2036. India is the second most populous country on Earth with over 1.2 billion people. It has 27.8% urban population and 72.2% of the total population resides in rural areas. But About 43% of the urban population of India lives in cities and 57% live in urban agglomerations (towns). India has 86% of the total population living in villages and town society. Greater Mumbai with 16.37 million is the most populous city. By 2050, Indian population will be closer to 1500 million with 50% living in Urban India.

Increased population requires more housing, educational institutions, commercial centers, industrial buildings, shopping malls, multiplexes etc. Cities are fast emerging as grey cities, the way they use land, consume resources, create high energy demand, generate waste, create ecological problems, destroy natural habitat and add to pollution. One of the most important components responsible for the rise in the energy consumptions levels is the ill-conceived and ill- designed buildings; without caring for land use and site implications. There is an urgent need to make cities sustainable converting existing grey cities to green Cities.

Pattern of land use planning has considerable energy implications. Whereas pure land use planning increases energy consumption, the de-centralization and mixed land use reduce consumption of energy thus, evolving layout plans with energy as the focus.

Historically, four basic models of site planning are-

1. Fixing the space
2. Defining the enclosure
3. Sense of order
4. Form of axial

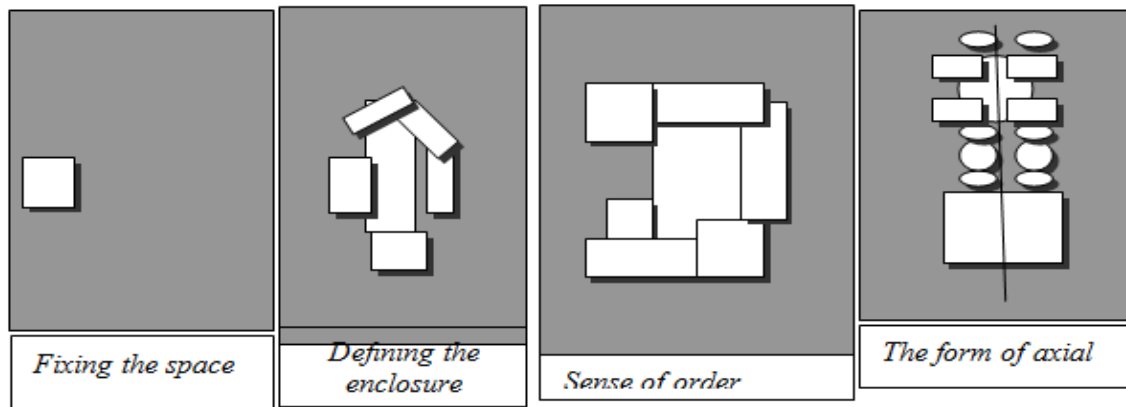


Fig. 1: Four Basic Models of Planning.

METHODOLOGY

Site Analysis

Site Analysis involves the study of the site in terms of its natural factors, cultural factors and aesthetics^[4].

It primarily deals with basic data of a specific site. The building blocks then can be designed and placed to take advantage of the best features of the site, while many site related problems can be prevented.

For example, proper orientation of building helps in passive solar heating during winters and reduces heat gain during summers. Precious plants and other site features that might otherwise be lost can be retained. Built mass, its material and form can be blended with the site characteristics. The three general principles for aesthetics of sustainable design are

Conservation: Shaping things to be efficient with resources.

Attraction: Shaping things to appeal to human desire.

Connection: Shaping things to fit in their context.

Site Analysis and Building Programme

The factors that we need to know about the site, prior to its development can be summarized as follows

1. What happens on the land, e.g., topography, vegetation, surface water etc.

2. What happens under the ground, e.g. geology, water table, etc.

3. What happens around the site, e.g. visual and other features linked with the surroundings and its access etc.

These factors impart the site its uniqueness and distinctive character. Whenever a site is to be developed for a particular building programme; two sets of factors are to be considered.

Use Factors: Relating to the proposed use of the site i.e. the building programme

The site planning process involves the fitting of various physical components depending upon their use on the site. To do this, the site factor has to relate to the use factors by analytical techniques such as sieve or matrix. The objectives of the site planning are: To plan the development in such a way; that the siting of built up is governed by the geomorphological features of the site. To make optimum use of the site by placing building blocks so that open space is complementary to the built space and serves necessary outdoor functions most appropriately. The space between buildings is made a positive element in itself.

Site Factors: Relating to the characteristics of the site i.e. Site Analysis

1. The listed Site factors are: Topography,

- Vegetation, Microclimate, Hydrology, Geology, Access, Surroundings, Visual, Historical, Drainage, Soils etc.
2. Site analysis should help in deciding what must be preserved and what can be changed; it should assist in site planning decisions such as: Identification of areas suitable for buildings; Identification of characteristic of site which are to be preserved and which can be exploited for the future use of the land; Location of building to articulate space within the site; Location of various uses within the site, e.g., Parking, service areas, recreation zones, etc.; and the integration with the preserved and proposed
 3. Good site planning attempts to emphasize and exploit the characteristics of the site, this may strengthen the identity of the site and impart to it a sense of place, the historical continuity between what has gone before on the site and what is proposed.
 4. The analysis of site factors should indicate how the landscape characteristics of the site will affect building development and vice-versa. Distinctions may be made between those factors which are within the site (on site) and those which are outside the site (off site) but still affect development on the site.

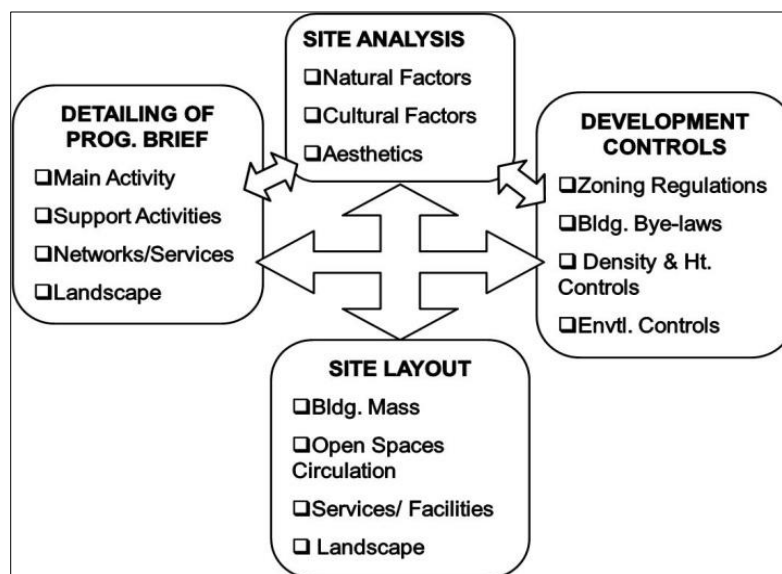


Fig.2: An approach to Evolve Efficient Layout.

SITE PLANNING OBJECTIVES

The success of development can be judged by the quality of the relationship between building, site and the surroundings. The designer's response to the site determines the quality of architecture and is a function of: How much is known about the site; how well the site is understood; and how well what is known and understood has been used.

Site plan locate objects and activities in space & time. These plans may concern a

small cluster of houses, a single building and its grounds, or something as extensive as a small community built in a single operation^[4]. There is a need to re-look at density pattern, zoning regulations, building regulations with focus on energy conservation. Operation of human settlements has large energy implications therefore energy consumption within cities can be reduced by effective site planning. The identified objectives of the Sustainable Site Planning are

1. Making the best use of built and

natural Environment for the social and economic benefits of the community.

2. Identification and protection of existing landscape assets i.e., Land/Soil, Water and Vegetation
3. Equal opportunity, community participation, conservation of biodiversity and ecological integrity.
4. Soil and Water conservation measures need to be integrated into design.

These kinds of landscapes may imply a drastic departure from the accepted vision of a 'beautiful' landscape.

SUSTAINABLE SITE DEVELOPMENT PRINCIPLES

The principles of Sustainable site development are-

1. Making cities more compact. Traffic priority given to pedestrians and the cyclists, thus reducing the carbon foot print.
2. Evolving Master Plans / Development Plans with energy conservation as focus.
3. Adopting shape / size of cities involving minimum travel / minimum length of road network.
4. Avoiding grid iron pattern; but where used- super imposed by diagonals road network.
5. Using shapes for promoting minimum travel and mass transportation.
6. Using mechanism of low rise high density pattern.
7. Efficient use of land especially with respect to the ground coverage. (Increased coverage poses greater challenges to the creation of 'efficient landscape', for achieving credits for a green building).
8. Optimizing planted areas in relation to roads, parking and hard surfaces.
9. Grading to negotiate designed levels with a minimum of civil/structural elements.
10. Optimizing the use of cut/fill material within the site.
11. Preference to native trees in

comparison to Exotic trees and Lawns.

12. Choice of porous paving materials and minimize edge details (kerbs and pipes).
13. Efficient landscape is more similar in appearance to the traditional orchards and Vana's/Baghs etc., such as densely planted trees as opposed to the rolling picturesque lawns of English gardens.

SUSTAINABLE SITE DESIGN

Sustainable site design is one of the most critical tools for incorporating green infrastructure into development projects. It is a site plan that has the least environmental impact while still meeting the clients' project goals." (Loehrlein)^[5] Green infrastructure serves to protect water quality in streams, lakes and wetlands and thereby can meet community needs and regulatory requirements. Specifically, sustainable site design incorporates stream buffers, bio-swales, rain gardens, reduced hard surfaces and low impact development practices into a network of green spaces. Green infrastructure can be incorporated into new, redevelopment or retrofit projects. Unfortunately, many communities have found that their own development codes and standards which can actually work against this goal. For example, local codes and standards often create needless impervious cover in the form of wide streets, expansive parking lots and large-lot subdivisions and they often require excessive clearing and grading.

1. The integration of green infrastructure using a nested approach is normally done at 3 different scales
 - a. Project or site level.
 - b. Municipal/watershed scales.
 - c. Regional scale.
2. Incorporating green infrastructure into the site design requires integrating its principles into site planning. This will optimize land use, pedestrian and vehicular circulation and access, natural resource preservation and

protection, parking, natural systems. Planning principles differ from design techniques.

EFFECTIVE SITE PLANS-AN OVERVIEW

Efficient landscapes are responsive to the site characteristics, culture, ecology and climate of the place.

The Efficiency in designed site plan can be brought by energy consciousness, ecology, enhancing and Preserving Earth's amazing biodiversity, establishing a perfect built form and open space relationship, Rehabilitation of degraded forests, taking care of the site characteristics without disturbing the natural habitats. A few of the examples of Efficient Landscapes over a different period of time are discussed here.

Falling Water House

It was designed by an American Architect Frank Lloyd Wright in 1935 in rural south western Pennsylvania is built partly over a waterfall.



Fig. 3: Falling Water House,
Pennsylvania.

Falling water house is a popular work of Wright because of its sensitivity to context i.e., built form responds to the rocky site - minimize damage to natural elements done during construction. *Time Magazine* shortly after its completion referred it as Wright's "most beautiful work." It is also listed among *Smithsonian's* Life List of 28

places "to visit before you die. It was designated a National Historic Landmark in 1966.

Kastura Villa, Kyoto Japan

It is located in the western suburbs of Kyoto, Japan, is one of the most important cultural treasures in terms of efficient site design. Le Corbusier and Walter Gropius, visited Villa in 1953, found inspiration in the minimal prefabricated Architecture and integral relationship between the lake, villa and its garden.



Fig. 4: Kastura Villa, Kyoto Japan.

Sanskriti Kala Kendra

Located in South Delhi designed by M. Shaheer, has been a favourite and effective Site planning project. An elegant and precise composition of grass terraces, shallow water bodies, Plazas and courtyards interwoven with paths, interspersed with mature trees and surrounded by groves.

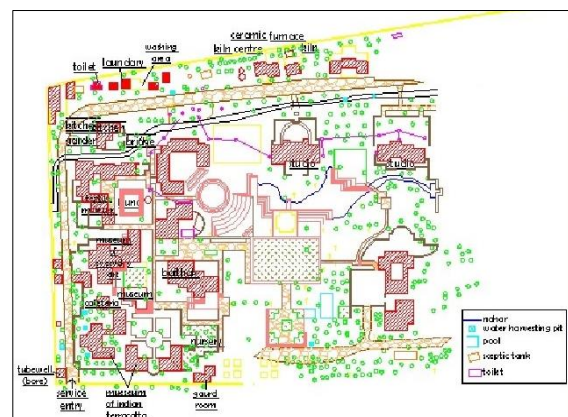


Fig. 5: Site Plan Sanskriti Kala Kendra,
New Delhi



Fig. 6: Sanskriti Kala Kendra, New Delhi.

The architecture and the landscape are so interwoven that it is difficult to decipher territorially where Architecture ends and the landscape begins. The project is strongly influenced by the traditional environment and their treatment of open spaces.

Sangath, Ahmedabad

BV Doshi's own office creates a landscape context as it seems to emerge from the circumstance of the site.



Fig. 7(a): Main Block, Sangath, Ahmedabad.



Fig. 7(b): Site Plan, Sangath, Ahmedabad.

The landscape responds the vagaries of nature in the hot & dry climate of Ahmedabad. Lawn and vegetation cover all around create favorable microclimate by absorbing solar radiation and providing cooler passage of air through humidity^[6].

Norbulingka Institute, Dharamshala

The Institute rests in the lap of nature, snow-capped Dhauladhar mountains ranges of lesser Himalayas at Dharamshala, being at the back drop; integrate so well that the building and the nature together creates an environment which is sustainable in true form. Norbulingka Institute provides training, employment and basic care for many qualified Tibetan refugees.



Fig. 8: Site Plan of Norbulingka Institute, Dharamshala (HP).

Here, the concerned individuals find a suitable environment and necessary resources to preserve and develop the Tibetan arts and literary tradition. It is a vibrant community living and working to protect the endangered culture under the watchful eyes of His Holiness, the Dalai Lama.

CONCLUSION

Sustainable design is all about to make optimum use of the site by placing building in such a way that open space is complementary to the built form and serves necessary outdoor functions in the most appropriate locations. The space between buildings is to be made a positive element in itself. Efficient site planning is responsive to the site characteristics, culture, ecology and climate of the place. The efficiency in site planning can be brought by energy consciousness, ecology, enhancing and preserving Earth's amazing biodiversity, rehabilitation of degraded forests, taking care of the site characteristics and without disturbing the natural habitats.

REFERENCES

1. Miller G.T. *Living in the Environment: Principles, Connections and Solutions*. Brooks Cole, USA; Cengage Learning; 2008.
2. Rubenstein H.M. *A Guide to Site & Environmental Planning*. New York: John Wiley & Sons Inc.; 1980.
3. Mcharg Ian L. *Design with Nature*. USA: John Wiley and Sons Inc.; 1995.
4. Lynch Kevin A., Hack Gary *Site Planning*. Cambridge MA, London: MIT Press; 1962.
5. Loehrlein M. *Sustainable Landscape : Principles & Practices*. CRC Press Taylor & Francis group.
6. Majumdar M. *Energy-efficient buildings in India*. TERI & MNRE, India: 2001.
7. <http://www.greatbuildings.com/buildings/Fallingwater.html>
8. <http://www.japaneselifestyle.com.au>
9. www.sanskritifoundation.org
10. http://en.wikipedia.org/wiki/World_population
11. <http://www.scribd.com/doc/80272010/Sanskriti-Kendra#scribd>
12. <http://sue.bdp.net/2014/a-borrowed-garden/>