

Guidelines for Sustainable Area Planning

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Abstract—It is seen that the regulations in our country that are presently being followed are in fact borrowed from the west and therefore they find no significance in our socio-cultural milieu. These regulations are 'straight jacket' and do not allow alternatives native to a place. Building byelaws is just a tool to achieve a improved quality of living. As a pre-requisite it is vital to have a vision of quality of life in our context to which the development controls must address. In many cases, the development control only acts as a support and the skill of the designer plays an important role in shaping the built environment. However, in today's world, due to increased environmental degradation on almost all the spheres of life, environmental considerations are gaining meaning. Importance of such consideration in building design is highlighted by large amount of energy being consumed by buildings.

This study focuses on the importance of performance based development control regulations and recognizes the parameters and indicators of human habitat in order to design and implement an environment friendly built habitat. Introduction of performance indicators and rating criteria is the need of the hour. Through this paper, an attempt has been made to identify and analyze the environmental performance indicators of Area Planning within the framework of Development Control Regulations. The paper will also study and analyze Chandigarh as case study on the selected parameters. Further, implementation strategies are suggested which would facilitate the governing bodies to initiate the changes at both planning level by the development authorities and building design level by designers.

1. INTRODUCTION

The key rationale of development control in human settlements was restricted to promote the health, safety, morals and general welfare of the community. In present day perspective, the purpose of development control, in addition to the above goals is to create a system of development so as to understand the form in which the urban development is conceived and secondly, to give designers' hand strength of law. The inadequacies of the building byelaws for directing and controlling any building activity within city's municipal jurisdiction is the subject matter of concern today. The Indian Standard Institution, while preparing the National Building Code, which was released in 1970, observed that - The current byelaws, wherever they exist are outdated, They do not cater to the use of new building materials and to the latest, development in building design and construction technology, They lack consistency, They are more specification oriented than performance oriented.

1.1 Need and Limitation for Standards

1. Standards, as byelaws were introduced in order to improve health and safety in 19th century.
2. Quality control is the parallel term used for standards in other fields.
3. Standards represent the better practice and secured source –Professionals and Government. It is also assumed that the roots of standards are research.
4. "Standards are instruments of good—but less because they induce or compel the better provision than because they can be used to reveal convincingly the state of affairs in any place, people will be able to see at once where things are wrong," (Woodford et.al., 1976).
5. "The standards are essential tools of control, is acceptable but main contribution can be towards improving them as a whole by rejecting some tools, introducing some new ones and refining others." (Woodford et.al., 1976)
6. The standards are comprised in rather artificial framework of factor concept. They are not distinct entities but somewhat they overlap.
7. Standards are not specific: Decisions about the quality of provision may depend on variable considerations—on spatial dispositions, management, choice of materials, etc. The standard solution is often not the best.
8. Aesthetic and social qualities: Some qualities of the environment are not quantifiable at all, or desirable only with huge complexity. For such it is not practical to have standards.

2. BUILDING PERFORMANCE APPROACH

"The concept of building performance is one which has only recently received any systematic study. The term 'building performance' implies that building can be defined and their performance assessed, but what is a building, how can its performance be measured, and against what is it to be compared? Even the briefest analysis of this field straight away reveals the very difficulties liable to be involved in transforming the notion of building performance into a useful

tool for the assessment of existing buildings and the specification and design of new ones”¹

2.1 The BPRU² Model-

The investigations undertaken and reported by the Building Performance and Research Unit concentrated on the development of methods for appraising existing and proposed buildings. One of its noteworthy achievements was the development of a conceptual model for buildings.

The model is comprised of five main systems:-

1. *The objective system*—the objective of the organization housed in the building.
2. *The activity system*—includes all those activities which adds and contributes to the accomplishment of the organization’s objectives.
3. *The environmental system*—the spatial environment (relates to the dimensional properties of spaces) and the physical environment (heat, light, sound, textures, etc.)
4. *The building system*—comprising the construction and services system essential to afford the required spatial and physical environment, together, with the equipment needed for the activity systems.
5. *The resource system*—represents the capital cost of the building system, the maintenance cost of the environmental system, and the operating cost of the activity system which, together, normally is set against the value of achieving the objectives of the organization.

2.2 The Performance Approach

The performance approach is defined as the practice of thinking and working in terms of ends rather than means and is concerned with what the building is required to do, rather than prescribing how it is to be constructed. Many standards are prescriptive in nature.³

The Performance based approach is a fresh subject in the Indian context. But there is a lack of theoretical basis on which a complete assessment could be based on. In such a condition, one has to first define the objectives for such an assessment and later base the work on them and then devise an appropriate method.

2.3 The Four Function Model-

1. The key thought following this model is that the “building problem” should be divided into the different functions of the building. Four general functions are identified as:-

2. *Climate modification*—which ranges from physiological needs through technical to micro climate conditions and their integration.
3. *Behavior modification*—concerned with the relationship between human activity and its spatial containment.
4. *Resource modification*—buildings as users of resources.
5. *Cultural modification*—related to symbolic function of buildings. These functions were conceived as representing the building as a whole, rather than parts of it as in current practice.

3. NATIONAL BUILDING CODE

The National Building Code of India prepared its code for ‘Development Control Rules and General Building Requirements’ in 1970. Since then, the revisions have been done as and when required. NBC explicitly states that “*this part deals with the development control rules and general building requirements to ensure health and safety of the public.*” Thus, environmental aspects were never considered as within the scope of the codes. However, since health and environment are intertwined issues, one can’t be dealt without looking into the other. Therefore, some aspects concerning environment are bound to be the part of NBC, but it necessarily means the concern is ‘minimum’ and not ‘most desirable’.

- Requirements for greenbelts and landscaping including norms for plantation of shrubs and trees,
- Fire safety regulations for high rise buildings;
- Requirements relating to noise and vibration, air filter, automatic control,
- Energy conservation for air conditioning; and guidance on the design of water supply system for multi-storied buildings.

Aspect like energy conservation and sustainable development have been dealt with through appropriate design, usage and practices with regard to building materials, construction technologies and building and plumbing services. Practices like rain water harvesting have been given their due place.

Areas covered in NBC⁴:

- Fire and Life safety
- Building materials
- Landscape planning and design
- Structural design
- Construction practices and safety
- Lighting and ventilation

¹ Thesis by Yogesh Bhatt, “Building Regulations: a performance based approach”

² BRPU- Building Performance and Research Unit by Wiley, 1972

³ http://www.academia.edu/9772629/Developments_in_Performance-Based_Building_Codes_and_Standards_The_Performance_Approach

⁴ NBC 2005 by BIS

- HVAC
- Acoustics, Sound and Noise insulation
- Plumbing services (water supply)

The Code contains regulations which can be immediately adopted or enacted for use by various departments, municipal administrations and public bodies. It lays down a set of minimum provisions designed to protect the safety of the public with regard to structural sufficiency, fire hazards and health aspects of buildings; so long as these basic requirements are met, the choice of materials and methods of design and construction is left to the ingenuity of the building professionals.

The Code also covers aspects of administrative regulations, development control rules and general building requirements; fire protection requirements; stipulations regarding materials and structural design; rules for design of electrical installations, lighting, air conditioning and lifts; regulation for ventilation, acoustics and plumbing services, such as, water supply, drainage, sanitation and gas supply; measures to ensure safety of workers and public during construction; and rules for erection of signs and outdoor display structures.

The National Building Code was meant to be a model of building byelaws for adoption by the local bodies after adopting it to the local conditions. The following may be taken up as appropriate objectives while formulating regulations:

- Efficiency: it is not only effectiveness in the sense of working but also economy
- Convenience of citizens: in respect of safety, security, freedom of movement, etc.
- Extension to new dimensions: considering new technologies (for e.g. solar heating, rain water harvesting, recycling of waste water, etc.)

4. GREEN / SUSTAINABLE BUILDINGS

Green building may be loosely defined as ‘the practice of maximizing the efficiency with which buildings and their site uses, generates and recycle energy, water and materials and minimizing and ultimately eliminating building impacts on human health and the environment, through better siting, design, construction, operation, maintenance and removal—the complete building life cycle’.. The concept of ‘green buildings’ is gradually gaining momentum in India. Green buildings are the structures that consume minimal resources (water, energy, power) during construction, operation and demolition stages. Green buildings are steadily increasing their footprint in India with an increase from 6,000 sq.m of green space in 2003 to 3,04, 800 sq.m by 2008⁵.

⁵ CII-IGBC homepage

The Green Building movement has gained tremendous momentum during the past 3-4 years, ever since the Green Business Centre embarked on achieving the prestigious LEED rating for their own centre at Hyderabad. The ‘Platinum Rating’ for the Green Business Centre building has sensitized the stakeholders of the construction industry. Today, several corporate and Government are considering Green Buildings in a major way. This has resulted in a spurt in the demand for green materials & equipment. The Indian materials and equipment manufacturers are now faced with the challenge to seriously look at green features to meet the growing demand for Green Buildings.⁶

5. GREEN BUILDING RATING SYSTEMS

In terms of how our planning regulations could incorporate environmental concern, in terms of green buildings or energy efficient approaches, there’s a study of various legislations which are already been in this field for some time and can be looked upon when redesigning of our regulations⁷. Various legislations and codes prevalent for green building include:

1. Leed
2. Griha
3. Eco housing

5.1 LEED (Leadership in Energy and Environmental Design)

The LEED Green Building Rating Systems are voluntary, consensus-based, and market-driven. Based on existing and proven technology, they evaluate environmental performance from a whole building perspective over a building’s life cycle, providing a definitive standard for what constitutes a green building in design, construction, and operation. The LEED system is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts. The system is a self-certifying system designed for rating new and existing commercial, institutional, and high rise residential buildings. It is a feature-oriented system where credits are earned for satisfying each criterion. Different levels of green building certification are awarded based on the total credits earned.⁸

LEED INDIA is a good approach for implementing energy efficient approaches in the country. The modal is adapted from US, and takes into account parameters which make buildings green. But, Indian industry in terms of energy efficiency is still not developed, awareness is very low and hence implementation is an issue with LEED. People don’t know what the rating system is and how it could lead to energy savings in the buildings. More amount of effort should be

⁶ Role of Green Buildings in Sustainable Construction- Need, Challenges and Scope in the Indian Scenario by Devarshi Tathagat, Dr.Ramesh D. Dod

⁷ Article By Krishnan Gowri, Ph.D., Member ASHRAE, in ASHRAE Journal, November 2004. “Green Building Rating System – An Overview”

⁸ Foundations of LEED by USGBC

incorporated to develop LEED INDIA at local level, crating awareness, where people can understand and decide

5.2 TERI GRIHA (Green Rating for Integrated Habitat Assessment)

The primary objective of the rating system is to help design green buildings and, in turn, help evaluate the ‘greenness’ of buildings. The rating system follows best practices along with national/international codes that are applicable to achieve the intent of sustainable architecture and building design. The green building rating system devised by TERI is a voluntary scheme. It has derived useful inputs from the upcoming mandatory voluntary building codes/guidelines being developed by the Bureau of Energy Efficiency, the Ministry of Non-conventional Energy Sources, the Ministry of Environment and Forests, the Government of India, and the Bureau of Indian Standards. The rating system aims to achieve efficient resource utilization, enhanced resource efficiency, and an improved quality of life in buildings⁹.

TERI has come up with this rating system-GRIHA, according to Indian climatic conditions. It’s similar to LEED rating system, but in terms of Indian climate. The problem with GRIHA is also the same, of awareness for implementing the system. Various seminars, programs have been launched by TERI to promote GRIHA, but the adaption level is even lower than LEED. Due to 2-rating systems, people also don’t know which one to choose and why. This leads to poor adaption. Some sort of coordination between the two must be there to ensure proper implementation

5.3 ECO-HOUSING

The institutional mechanism to rate Eco-Housing projects is developed around the Eco-Housing Cell set up by the Pune Municipal Corporation (PMC). Builders applying in for Eco-Housing certification are charged a fee to process their application. To certify a project as ‘Eco-Housing’ the developer submits his proposal to PMC’s Building Proposal Department. As a part of the program, a set of Eco-Housing assessment criteria have been developed for including a project in its fold. The criteria are based on local environmental issues and have a checklist of measures aimed at architects, builders, financial institutions, and homeowners. Designed to serve as a performance assessment tool, the criteria help quantify the environmental achievement of a building and provide a meaningful differentiation of buildings in the market place¹⁰.

Eco housing has been a recent development for residential land use in Pune. This system is extremely gaining importance in Pune, and is widening its reach. After success in Pune, it would later be incorporated in other Indian cities as well.

6. CASE STUDY: CHANDIGARH

The city is located in the sub-Himalayan plains of north-western India. It has geographical parameters of longitude 77 and latitude of 31 degrees.

6.1 Fact-File¹¹:

Population–642015 (Census 1991)

Area–114 sq. km.

Topography–the city is on the foothills of Shivalik ranges. Primarily, flat in nature.

Average rainfall–111.6 cm

Climate–it falls under the broad group of hot dry climate, subject to extreme of cold and heat.

Temperature–Summer : max. 46.50 C, min. 23.80 C

Winter : max. 22.00 C, min. (-)1.20 C

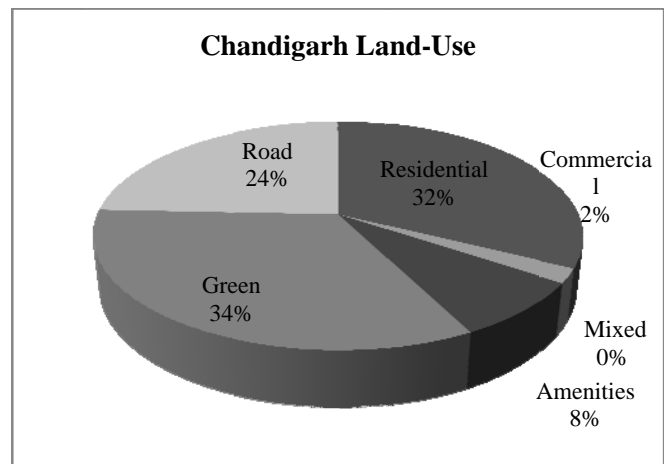


Fig. 1: City Development Plan, Chandigarh by JNNURM

6.2 City and Sector Planning

The houses in Chandigarh city are constructed on precut land plots of specific size, and are sold to prospective house owners, depending on their financial capacity¹².

Chandigarh has 30 sectors and around 5000 to 20000 inhabitants in each. Every sector has its maintenance-organization, the food provision, the schools (kindergarten and primary), the necessary artisans (repairs, etc), the daily leisure all traversing in the middle of each sector–it is the “V4”. The V4 gives the horizontal connection between the contiguous sectors.

The sector is surrounded by high speed roads with bus

⁹ GRIHA Manuals By Teri

¹⁰ Eco housing assessment criteria by IIEC

¹¹ http://chandigarh.gov.in/knowchd_gen_historical.htm

¹² Chandigarh, the City Beautiful: Environmental Profile of a Modern Indian City By V. S. Bhatnagar

stops and giving the eight entrances in the social group. The sector picked up for the study is Sector-40, which is predominantly residential with row housing, semi-detached and detached houses measuring around 800m x 1200m. Sector accommodates sports, schools, fields, walks and recreational facilities.



Fig. 2: Location of Sector-40 in Google-maps

6.3 Building Planning

Houses are laid in north east to south west direction. This sunlight is prevented from entering windows directly for long durations during the day¹³.

Local sand, mortar, and baked bricks have been expansively used in the city as the major construction material. The extreme use of cement has been discouraged as seen in private buildings, as most of the houses can be seen without outside layer of cement plaster. The use of sheet glass for wide windows has been encouraged, to let in largely scattered and reflected light.

6.4 Conclusions and Observations

1. There is an absence of rain water harvesting system in the city.
2. Chandigarh city with its row housing has the ability to reduce solar gains through volume effect and restricted height avoids the use of extra energy
3. At sector level, Chandigarh has a distinct vehicular and pedestrian ways
4. Chandigarh city has wide roads for trouble-free access of vehicular traffic.
5. City has a regular grid of roads with a strong hierarchy which makes it adaptable to car traffic and presents flexibility for different kinds of uses.
6. Mixed land use; having reduced trip length for work

7. Cycling network in place; having reduces fuel consumption of the city.
8. All the possible amenities are part of the area; makes the city Accessible and Walkable.
9. City has lots of green spaces, which provide for breathing area that plays an vital role in controlling the micro-climate of the region.

It is essential to connect development controls explicitly to a set of performance standards.

7. IMPLEMENTATION STRATEGY

7.1 Strategy at Building level

1. *Energy Audits*—It is to evaluate a system in terms of the increased energy intake due to wear and tear of system. It is basically to check the maintenance of the system with time¹⁴.
2. *Tax incentives*—It could be given in form of rebates in house taxes if the building consumes lesser energy and recycles nearly all of its waste. Energy audits could further help in defining the tax rebates.
3. *Other incentives*—Incentives could be given, like *Floor area ratio (FAR)* of balconies in residential land-uses can be computed over and above the Master Plan allowable FAR, subject to a cap of 10% in order to create Green City ambience.
4. *Performance contracting* —An energy service company (ESCO) finances the implementation of energy saving measures in a building. The building owner is therefore spared the cost of upgrading and replacing the existing plants and equipment. When the improvements result in running costs savings, the building owner benefits and in return the ESCO receives a share of the cost savings over a prescribed period¹⁵

7.2 Strategy at Cluster and Sector level

1. *Transfer Development Rights (TDR)*—In order to offer incentive for developers to provide open spaces and public greens, the instrument of TDR must be introduced.
2. *Popularizing Public Transportation System*—On one hand, an efficient mass rapid system should be in place and on the other to enhance the use of public transport, schemes should be in place to charge single car occupant during peak hours.

¹⁴ Energy Efficiency improvements in Commercial Buildings; http://www.undp.org/content/dam/india/docs/energy_efficiency_improvements_in_commercial_buildings_project_document.pdf

¹⁵ Energy Efficiency improvements in Commercial Buildings; http://www.undp.org/content/dam/india/docs/energy_efficiency_improvements_in_commercial_buildings_project_document.pdf

¹³ Chandigarh; the City Beautiful: Environmental Profile of a Modern Indian City, Bhatnagar, V.S., A.P.H. Publishing Corporation, N. Delhi

3. *Encouraging and helping the Local bodies*—The local bodies should be given incentives and other grants for reducing the energy consumption and considering environmental concerns within their boundaries. This would include energy and water management at cluster levels.

8. CONCLUSION

Local government private development incentive programs vary from place to place, and depend upon many factors including the local government's administrative structure, existing policies, type of development to be incentivized, and the resources and funding available. Any jurisdiction looking to implement a green building incentive program will need to take these factors into account as well as the legislative constraints of the area. Additionally, local governments may want to consider implementing awareness and educational programs in order to familiarize the local development community with green building techniques and practices.

This study could be concluded on the note that cities are a distinctive function of Human habitat, composed of sectors and clusters. To make them environmental friendly, definite changes have to be incorporated in the structure of development control policies; those are more performance oriented in nature. The regulation components should be planned such that they provide scope of introducing new ideas and techniques.

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