

Form Based Regulations as An Effective Tool to Build Green Cities and Improve Quality of Living

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ABSTRACT

In the race for development especially in the urbanizing part of the world, much damage has been done to the natural resources, culture, identity, health, and its consequences are rampant in the Quality of Life of the people. It is imperative that we build systematic tools to regulate the development in a manner it is conducive to life and co-existence of all living beings in the current complex territorial system of urban environment. Urban Planning as a discipline has been in vogue for several decades now, and the interpretations of the traditional descriptive regulations in most circumstances have not brought the intended structured change to the urban environment. The Form Based Regulations will prove to be a viable alternative in providing the requisite structure and framework for development considering its versatility and clarity it can provide in shaping the urban environment at all scales without losing the merits of traditional building codes.

KeyWords: Green Cities, Form Based Regulations, Green Urbanism, Sustainable Urban Planning, Public Realm, Quality of Living

INTRODUCTION

Urban regulation in India has been widely aided by development control regulation predominantly confining to zoning and land use mechanisms. The context of the building in relation to one another, the block size and form, the street linings, positioning of the infrastructure is usually less attended and is often unregulated adding up to the urban anarchy. Such traditional planning tools have segregated land-uses to residential, commercial, industrial and public uses. They have been instrumental in promoting unfriendly communities, unsafe roads for pedestrians and never cherished diversity. Most cities witness a lost opportunity in terms of the usage of waterways and its edges, heritage and public open spaces within the city. The aspects instilling a public realm such as the building street relationship, walkability, safety of pedestrians, security, heritage conservation, and identity building are higher order asks which adds to the quality of life in a neighbourhood. A regulation which organically builds identity, infuses public realm, economic viability and improves the quality of life of the people is the need of the hour.

CONCEPT OF GREEN CITIES

It is important to understand the context of the Green City and its positioning as a probable urban planning model of the future. In most cases it is studied synonymous with the sustainable development which represents an ideal situation in terms of the sum of all planning goals. Eco friendliness is a part of the green city concept and several studies have been carried out in this front. Several terminologies such as new urbanism, green urbanism, organic urbanism, biophilic city, smart city, sustainable city, eco-city and green city have emerged sharing the same mission in some form or the other with green city concept. All these concepts strive to ensure an urban development conducive to nature, climatic responsiveness, urban management and eventually improving the quality of life of the people who inhabit them.

The biodiversity in urban areas and its ever-expanding edges is always on the threat and the significance of the urban open spaces, waterways, green cover, drainage systems can never be undermined. But the scope of Green Cities should expand beyond and cover sustainable practices of building environment, energy, transport, linkages, networks, mobility and lifestyle of people and governance within its ambit and ensure a wider sustainable intent.

INDICES GREEN CITIES

Several indices and rating systems were developed to evaluate the larger urban developments and cities as per their Green Merits. Some of the popular indices and measures widely used are the Green City Index, Low carbon city index, CASBEE for Cities, LEED for neighborhoods.

Green City Index series measures cities on approximately 30 indicators across eight to nine categories depending on the region. It covers CO₂ emissions, energy, buildings, land use, transport, water and sanitation, waste management, air quality and environmental governance combining both quantitative and qualitative measures.

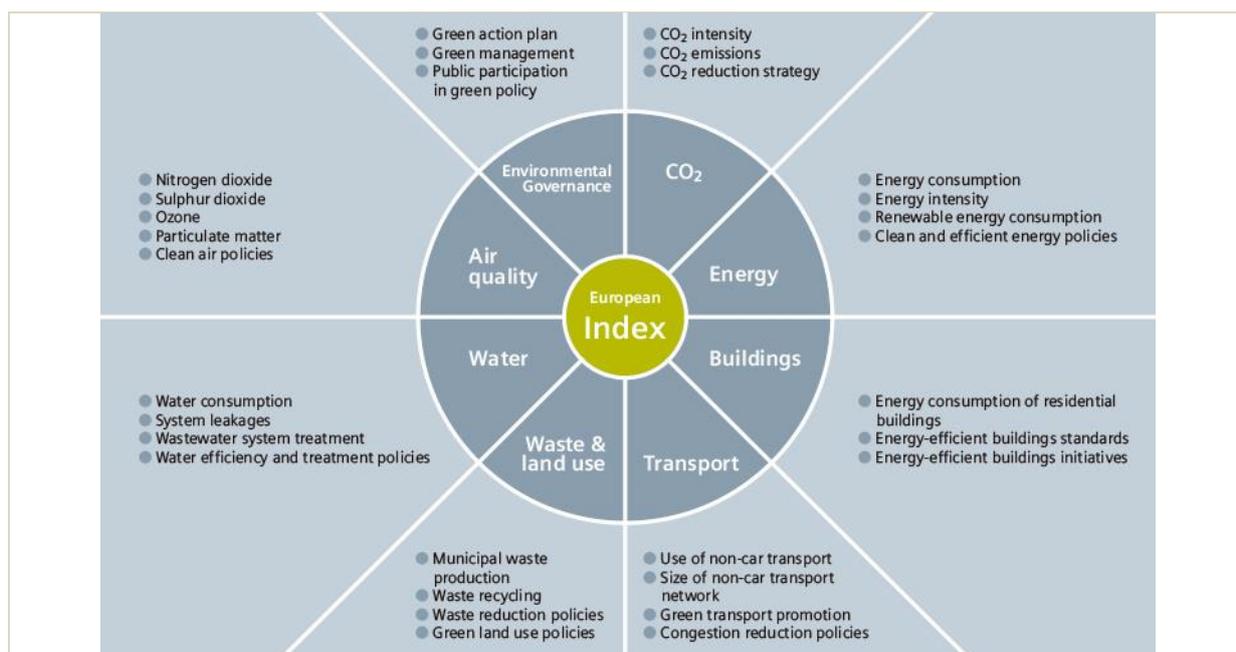


Fig 01: The European Green City Index evaluates 16 quantitative and 14 qualitative indicators.

Source: 2012 European Green City Index Report

The Comprehensive Assessment System for Built Environment Efficiency (CASBEE) for Cities helps to understand sustainability conditions of cities across environmental, social and economic aspects. It measures the sustainability of cities according to quality criteria against the environmental load of the city defined as CO₂ emissions per capita per year. The resulting sustainability qualification supports cities in the development of effective sustainability measures.

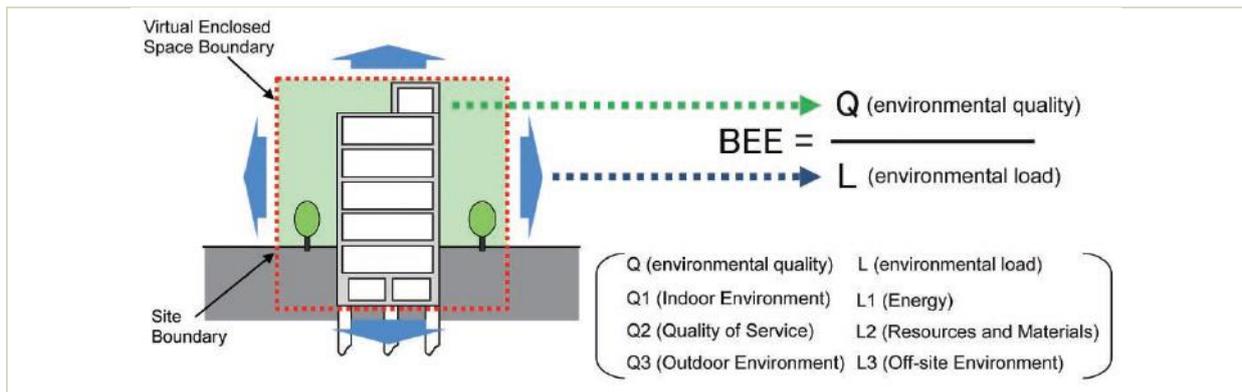


Fig 02: Setting of the spatial boundary for CASBEE assessment and the definition of Built Environment Efficiency (BEE)

Source: <https://www.ibec.or.jp/CASBEE/english/>

The CASBEE for Urban Development (CASBEE-UD) tool is a standalone version developed for the assessment of partial or whole groups of buildings on a smaller scale than CASBEE for Cities.

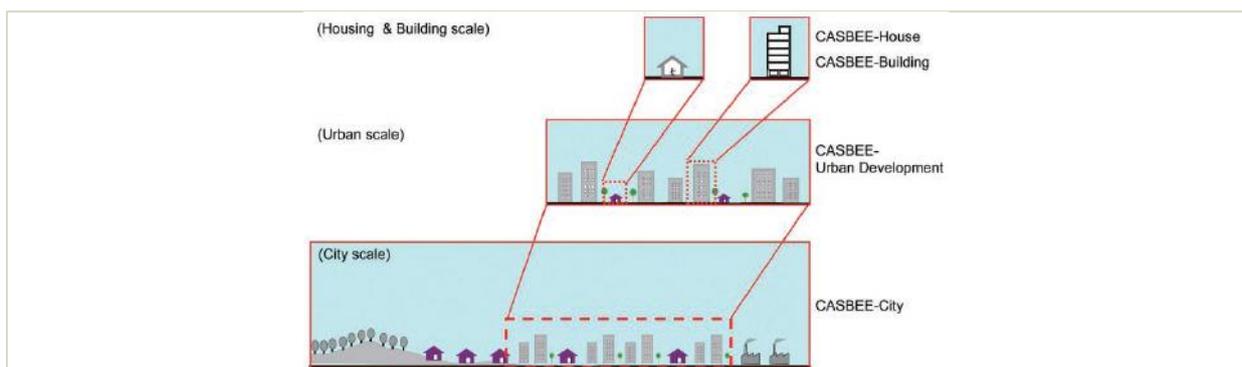


Fig 03: Stratified structure of a scale of defined areas for CASBEE assessment

Source: <https://www.ibec.or.jp/CASBEE/english/>

LEED-ND was designed to reflect the key aspects of neighborhood sustainability. Understanding these concepts and their relationship to each other can provide citizens with guidance and technical prowess as they work in their own neighborhoods and communities.

This section of the guide provides a snapshot of neighborhood sustainability by summarizing the key strategies of the LEED-ND Rating System, which is organized into three basic sections:

- Smart Location and Linkage (SLL)—where to build
- Neighborhood Pattern and Design (NPD)—what to build
- Green Infrastructure and Buildings (GIB)—how to manage environmental impacts

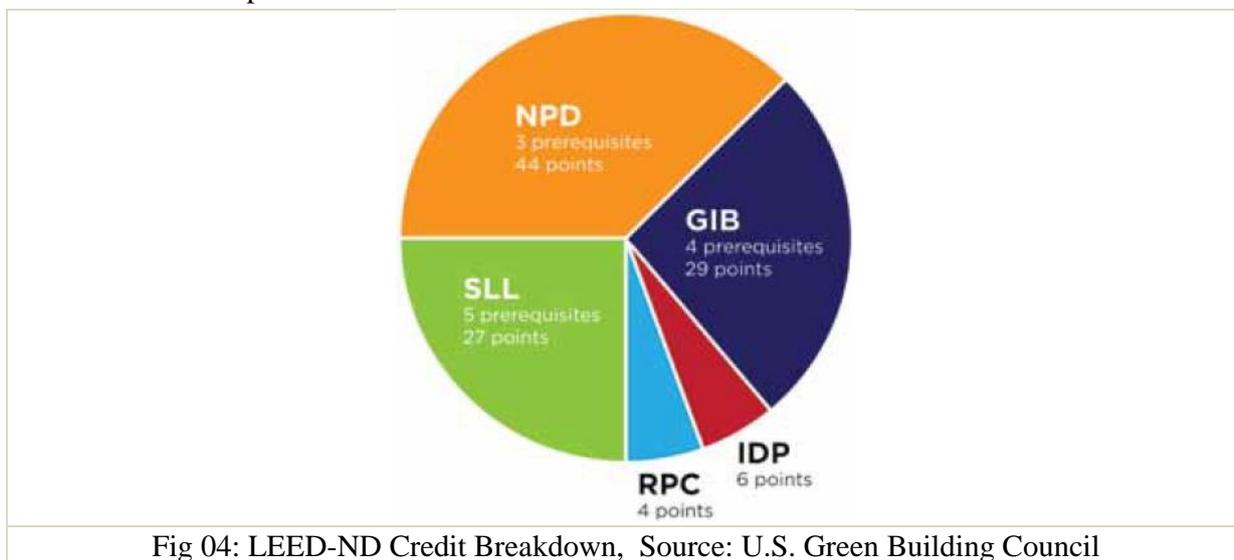


Fig 04: LEED-ND Credit Breakdown, Source: U.S. Green Building Council

Singapore which has championed green practices has laid out a Green Plan with the following five key pillars.

- City in Nature: to create a green, liveable and sustainable home for Singaporeans;
- Sustainable Living: to make reducing carbon emissions, keeping environment clean, and saving resources and energy a way of life;
- Energy Reset: to use cleaner energy and increase energy efficiency to lower our carbon footprint;
- Green Economy: to seek green growth opportunities to create new jobs, transform industries, and harness sustainability as a competitive advantage
- Resilient Future: to build up Singapore’s climate resilience and enhance food security.

The deliberation on the subject of Green Cities makes it clear that the notion of Green is much bigger than the concept of Ecology and increasing green cover of the urban areas. It encompasses Nature, Lifestyle, Mobility, Transportation, Economy, Management and Resilience within its ambit of discourse. Any building regulations framed should inherently allow for progress in all these discussed subjects.

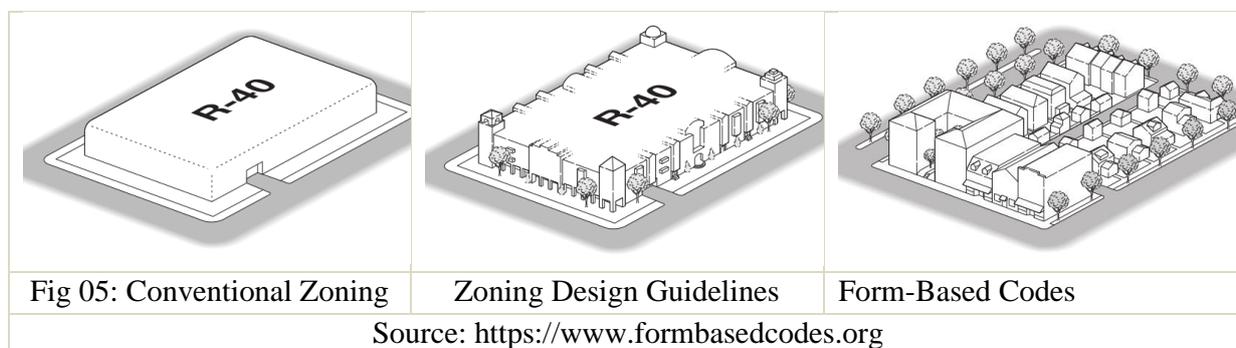
REGULATING URBAN DEVELOPMENT

Scale of Study

For any study, it is appropriate to determine the scale at which we are focusing to make a change. It is also important that the interventions and proposals are scalable. For the sake of the study, the scale of the neighbourhoods as described in LEED ND can be adopted. A neighborhood is more than territory within a boundary drawn on a map. At best, it is a place with its own unique character and function, where people can live, work, shop, and interact with their neighbors. The most sustainable neighborhoods tend to exhibit high levels of walkability, a sense of place, social cohesion, stability and neighborhood resiliency amidst changing economic and sociopolitical conditions. The scale of intervention has to both connect at the micro level and the macro level. Both the LEED ND and the CABSEE is able to fulfill this significant criterion.

FORM BASED REGULATIONS

Form based codes are a method of regulating development to achieve a specific urban form. Form-Based Codes create a predictable public realm by controlling physical form primarily and land uses secondarily, through city regulation.



- Conventional Zoning is able to control Density use, FAR (floor area ratio), setbacks, parking requirements, maximum building heights
- Zoning Design Guidelines covers the Conventional zoning requirements and additionally regulate frequency of openings and surface articulation of the buildings
- Form-Based Codes cover the parameters of both the Conventional Zoning and Zoning Design Guidelines. Additionally it is able to regulate the street character, building types (or mix of types), build-to lines, number of floors, and percentage of built site frontage.

Form-based codes address the relationship between building facades and the public realm, the form and mass of buildings in relation to one another, and the scale and types of streets and blocks. The regulations and standards in form-based codes are presented in both words and clearly drawn diagrams and other visuals. This does not mean that the FBC does not consider the incompatible uses and land use in its disposition. The priority of the FBC is in regulating the building form and its relationship to the street creating the desired public realm. The incompatible uses are discouraged and naturally eliminated. The Form Based Codes even details out the building programs in the Ground Floor and the public interface. It should also be understood that the form-based code is a tool. The quality of development outcomes depends on the quality and objectives of the community plan that a code implements.

The Form Based Code Institute stipulates five main elements of form based codes

- **Regulating Plan :** A plan or map of the regulated area designating the locations where different building form standards apply.
- **Public Standards :** Specifies elements in the public realm: sidewalk, travel lanes, on-street parking, street trees and furniture, etc.
- **Building Standards:** Regulations controlling the features, configurations, and functions of buildings that define and shape the public realm
- **Administration :** A clearly defined and streamlined application and project review process
- **Definitions:** A glossary to ensure the precise use of technical terms.

FBC AT THE NEIGHBOURHOOD & BUILDING LEVEL

It is pertinent to illustrate through examples that Form Based Codes at the neighbourhood level is able to improve the overall character of the built and public open spaces literally improving the quality of space in terms of lighting, ventilation and thermal comfort. The FBC has a specific ability to articulate the contextual positioning of the building in the territory considering the common benefit of the community. Such specific responses which the conventional regulations have always left to the end user discretion are enumerated below under specific heads

FBC on Greenery

Staying close to nature has been one of the prime focusses of the any green agenda. Singapore has constantly pioneered the greening of Urban public spaces and has now extended the efforts to incorporating the greenery in the Urban Form at all scales. The Singapore regulatory authorities have arrived at the Landscape Replacement Areas (LRAs) which are provisions of greenery provided on the first storey or upper levels of the development. The diagram below shows the various types of LRAs that could be incorporated within a development



The LRA requirements are calibrated by location, GPR and development type. A development may count Sky Terraces, Communal Planter Boxes and Covered Communal Ground Gardens (see Greenery sub-tabs) amongst other features, towards meeting the LRA requirement.

Ong,2002 introduced the concept of GnPR to regulate the amount of greenery in the building site. Based on the Leaf Area Index (LAI), a widely used measure of the health of natural ecosystems, the GnPR is essentially the average LAI for a given built site. The primary benefits of GnPR are that it corresponds to the LAI of a natural ecosystem and it is numerical, which means it can be easily calculated, measured and regulated. (Ong,2002)

The combined regulatory measures of the LRA and the GnPR ensures effective greening measures at the site level. Building greenery to measurable terms and illustrating the means of integrating greenery in building form can be one of the potential strengths of Form Based Codes.

FBC as a Cultural Response

Significant learning can be garnered from our traditional built form owing to their direct response to climate of the region with a sensitive understanding of community cultural practices.

The concepts of public versus the private, the threshold spaces, cultural and religious behaviors were reflected in the built form. Seasonal activities, natural systems of ventilation and lighting were explicitly manifested through the vernacular practices of a region.

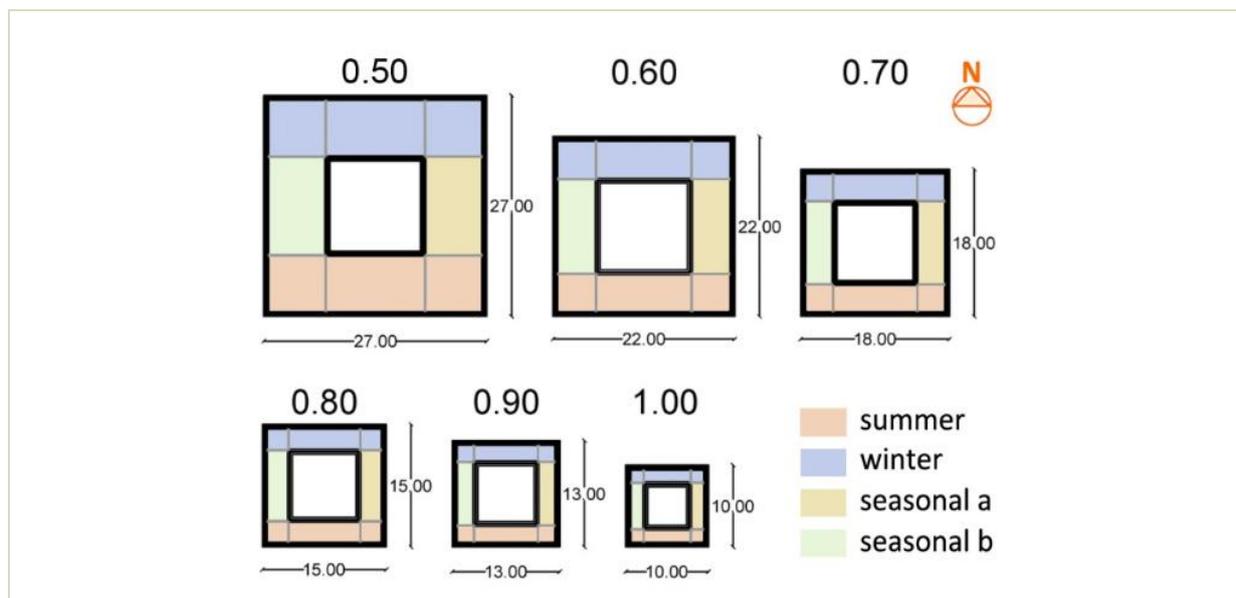


Fig 07: Reference building form alternatives generated from central courtyard plan with selected A/V ratios

Source: ErdemirKocagil, G. Koçlar Oral (2016)

In a study by Erdemir (2016) the traditional courtyard houses were analysed to conclude the area to volume ratio. The built form not only gives a reference on the typology of forms, but also an indication of the everyday and seasonal activities within the buildings. Such references when incorporated within the building regulations will be a vital reference for a cohesive and a responsive development. Such stipulations on the form, proportion and the building types can be a simple but effective tool to eliminate incompatible building types and materials.

FBC on Energy Response

The basic quality of any building is to provide comfort to the occupants and this largely comes from being responsive to the locational context and the climatic response to the territory. The building form is one of the primary attributes of the building in ensuring the thermal comfort. The typology, orientation, envelope along with the rightful choice of building materials can guarantee the energy performance of the building or development. Every building should work towards a mandate of satiating indoor climatic comfort of the users through passive means without the deployment of mechanical heating and cooling in a building.

Exhaustive work have been made in preparing the Energy Conservation Building Codes (ECBC 2017) in India. To take it one step forward and recommending the acceptable building form for different locations will ensure the intent of the codes into reality.

FBC on Economy

The common theoretical affirmation is that of avoiding conflicting usage which promotes businesses and improves revenue. The form based codes allows for greater variety of housing types by promoting mix uses and promoting denser compact development. The fiscal impacts

neighbourhoods that have adopted FBC have been studied and found to positively alter the property tax and sales tax generation. The results of study conducted by Jacob M. Howard , 2018 in 47 cities with populations between 50,000 and 200,000 thousand that had adopted form based standards between 1984 and 2009 have established that a statistically significant positive relationship existed between the presence of form based standards which were implemented citywide and observed property tax revenue both in total and on a per capita basis.

FBC on Public Realm and overall Quality of Living

The Form Based Codes are able to stipulate street level interaction with the building frontage and thereby build a healthy public realm. The Form Based Code addresses both the public realm and also regulate private development ensuring appropriate human scale and building to street proportion.

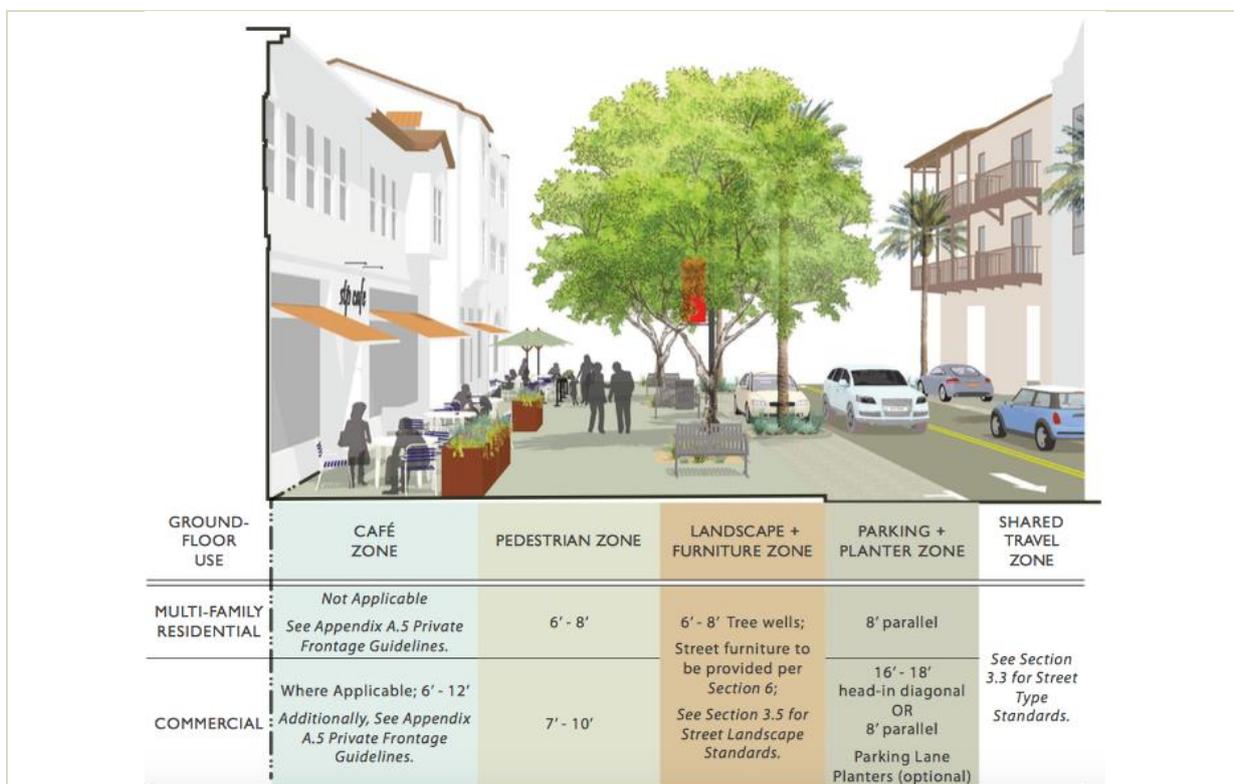


Fig 08: Public Frontage Standards for commercial sidewalks in Palm Desert, CA. (Image: Sargent Town Planning)

Source: <https://www.formbasedcodes.org>

Carefully scripted Form Based Codes can create walkable neighbourhoods which carry a strong sense of identity. Such neighbourhoods are able to ensure the right mix of programs for everyday use within a proximate distance and also create a safe, comfortable and interesting walk which are the required components of a lively street.

CONCLUSION

It is pertinent for green cities to take cognizance of people and their behavior within its framework. The codes that emerge out of the green city notions should also shape a sustainable

built environment and the lifestyle of people. To ensure this, a comprehensive code which connects all scales right from the dwelling unit, street, neighbourhood and the city is required.

The conceivable built environmental system should strive to achieve energy conservation, biodiversity, sustainable transit system, mixed land use, economic growth along with creating a safe and lively public realm.

Form Based Codes will be able to reverse the alignment of development to the climatically responsive building forms both at the neighbourhood level and the building level. The stipulates at the building level will ensure the architectural elements responsive to the climate rather than using generic borrowed designs and materials. Infusing technologically proven techniques for orientation, building form, energy conservation and fenestration controls will ensure a Green community organically. Techniques of integrating open spaces and greenery within the built environment evokes interest and variety intriguing interest among the adjoining buildings while at the same time ensuring strong connections to the abutting streets. Public infrastructure and utilities can be well incorporated within the FBC creating a neighbourhood identity and seamless connect in terms of service provision and maintenance.

These Form Based Codes will be able to construct a predictable public realm by controlling physical form primarily, by encouraging a mixed-use development that can compliment one another without conflicting interests. Such regulations will be able to ensure a healthy relation between the buildings and the street and foster a safe and comfortable walking and bicycling needs. Careful planning will also ensure an increased economic viability and land value in the neighbourhood.

The Form Based Code should be concise and well-illustrated avoiding ambiguity and serve as regulatory tool achieving the sustainability goals at the same time making the community aesthetically pleasing and building a diverse public realm. The descriptive format of conventional codes shall be replaced by Form Based Codes with illustrations and supportive annotations. Such FBC can be a very effective tool in articulating developments with a clear vision and intent. It determines and reinstates the character of a neighbourhood. The endeavor should be towards building an environmentally responsive urban development promoting a healthy lifestyle with sustainability as a governing paradigm. There may not be a common solution for all places, therefore a different set of codes must be established for each neighbourhood considering their unique identity, cultural values and a deeper understanding of the notion of public realm of the neighbourhood.

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