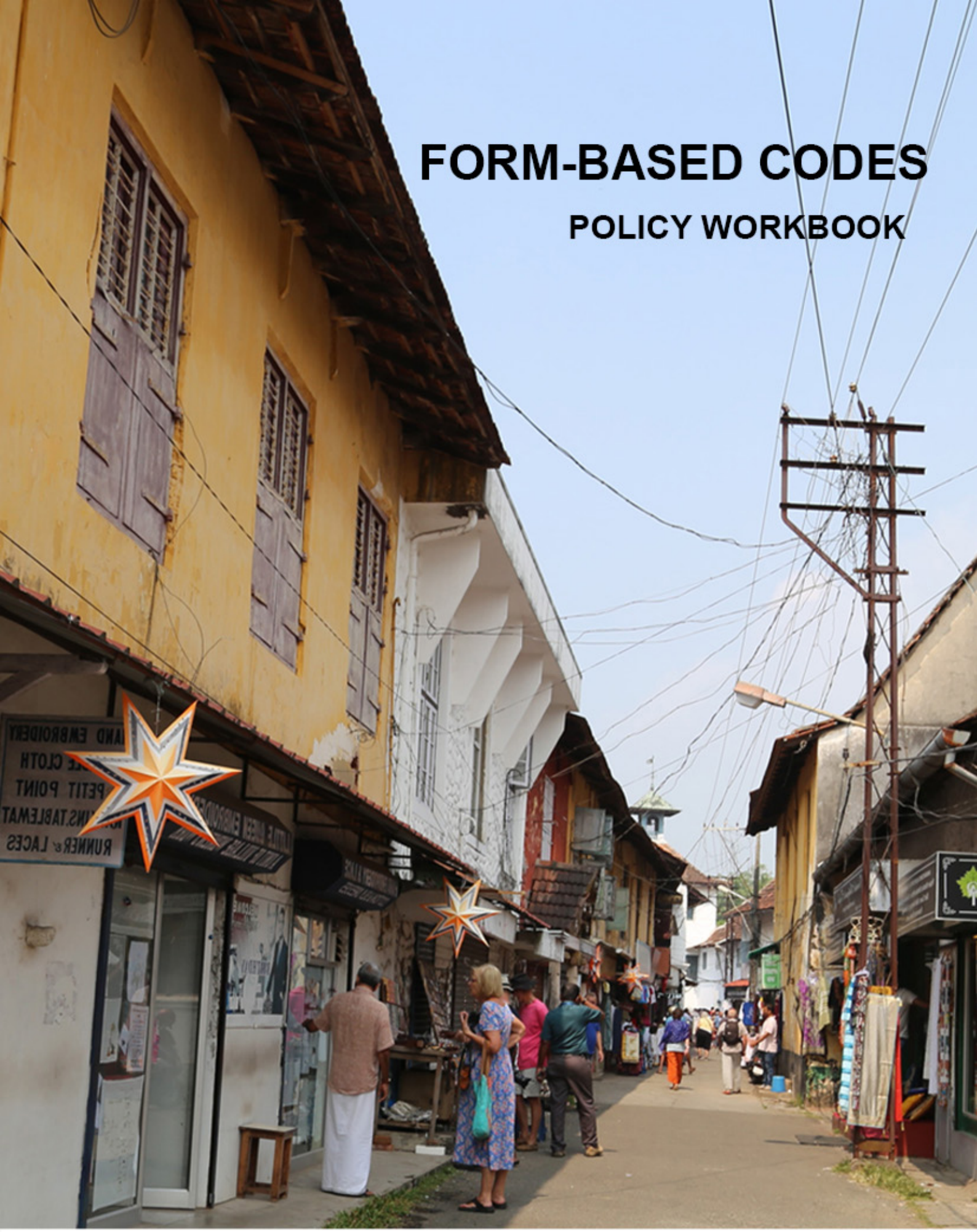
FORM-BASED CODES

POLICY WORKBOOK



Smart City
MISSION TRANSFORM NATION

Ministry of Housing and Urban Affairs
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ABOUT MINISTRY OF HOUSING AND URBAN AFFAIRS (MoHUA)

The Ministry of Housing and Urban Affairs is the apex authority of Government of India to formulate policies, coordinate the activities of various Central Ministries, State Governments and other nodal authorities and monitor programmes related to issues of housing and urban affairs in the country. The Smart Cities Mission was launched by the Ministry in 2015 to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

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The World Resource Institute is a non-governmental global research organization that aims to protect earth's environment and provide for the needs and aspirations of current and future generations, including but not limited to improving the quality of life in cities, by developing and scaling environmentally, socially, and economically sustainable urban transport solutions, with capabilities to identify and implement such solutions in over fifty countries including within Europe, United States, Mexico, Brazil, Indonesia and India.

TABLE OF CONTENTS

CHAPTER 1
INTRODUCTION

1.1. India's Developing Trend

The current planning process in Indian cities emphasizes rigid land-use, zoning and development controls that fails to recognize the unique urban fabric, fine-grained mix of uses, potentials and constraints of different areas or neighborhoods within the city needing area-specific solutions and interventions.

The existing planning process emphasizes land use separation and blanket building development control regulations, whereby, ignoring local contexts and ground realities. This is often also the reason why in Indian cities, prescriptive parameters are regularly flouted by development interests looking to maximize the use of their land and thereby profits, irrespective of infrastructure, social and economic requirements and goals of the city. As a result, the livability of cities has degraded with unplanned urbanization, congestion and environmental degradation.

Image 1 | **Typical urban development scenario in India**

To address these dynamic conditions of urban areas, concerned authorities tend to resort to frequent land use changes and building regularization schemes to legalize the course of development. On a regional and national scale, the lack of integration of spatial and economic planning has increased the skew in the hierarchy of settlements where, benefits of economic planning and development schemes have not been fully realized.

The number of million plus cities/urban agglomerations increased from 35 in Census 2001 to 53 in Census 2011, & estimated to be 70 by 2031

Therefore, it has become imperative to look at alternative ordinances, standards and best practices to adopt an approach that acts at the local level and involves the community; is transparent in its formulation and implementation; promotes predictability in outcome; and meets the development needs of the community and city.

1.2. Brief History of Zoning Regulations

To understand the relevance of Form-Based codes, it is necessary to understand the history of zoning and how it came about. The earliest zoning laws originated in the early 20th century in the United States of America. The initial measures of regulation were based on the authority of cities to exercise their police power, i.e. protection of public health, safety and welfare.

Therefore, the earliest regulations were intended to avoid and minimize undesirable consequences of uncontrolled development. Initially, this was done on grounds of health and safety, by requiring separation of buildings to allow for ventilation and sunlight in living spaces and, for preventing the spread of fire. For practical purposes then, the building height was limited to the reach of local firefighting equipment. The codes then mandated separation of uses so that incompatible uses, such as residential and industrial, do not end up next to each other. This exclusive categorization and then separation became the universal basis of zoning. Some of this separation of use was also perception or bias-driven. For example, multi-family dwellings were believed to be an inferior category of use.

The adverse impacts of conventional zoning regulations were not realized until the post-World War II era in the 1950's, when rapid economic and housing growth began to highlight the shortcomings of segregation of land uses. The want for single-family homes led to the

development of suburbs and the distinction between land uses meant that people had to travel significant distances for work or leisure. This pattern of development made provision of public transport and other amenities costlier and more inefficient and streets began to be designed for motorists and less attractive for pedestrians. As the problem became apparent, various communities tried to develop modifications that would help address the problem but often-times, this led to the code becoming more complicated and difficult to understand and implement.

Image 2 | **Housing in Hacney in East End London**

Source: www.alamy.com

Concepts such as performance zoning and incentive-based zoning were tried in many communities, but the underlying issues that conventional zoning had fostered, persisted and the resultant neighborhoods lacked in character and quality. The reason for this was that community needs and aspirations differed. While some communities wanted regulations that will help revitalize downtowns or business districts, others wanted tools to help protect the existing characteristics of a particular area or make it more walkable. Still others, needed to accommodate higher densities and increase the supply of built-up area when land was scarce. The conventional tools of zoning failed to provide for these differing scenarios.

In the 1980s a group of planners and architects following the principles of Smart Growth and the Charter for New Urbanism, which promoted mixed-use, walkable and sustainable communities, came together to formulate and test an alternative to conventional zoning. This alternative started looking at communities from variations in scale, character and intensity of development rather than segregation of uses. The code for Seaside, Florida, emerged as one of the first applications of this alternative - the Form Based Code, a term coined by Carol Wyant.

1.3. Form-Based codes - a new approach

Form-Based Codes (FBC) are turning a page in zoning history and offer a new approach to development regulation. They are a planning and zoning tool for regulating development, using physical form as the organizing principle, rather than segregation of land use as in conventional codes. They aim at contributing to a better quality of life by fostering predictable results in the built environment and a high-quality public realm.

FBCs address the relationship between the form and mass of buildings - in relation to one another as well as the public realm - and the scale and types of streets and blocks. FBCs are community vision based and prescriptive, to support the creation of 'place' as envisioned by the community.

FBCs are customizable, with the ability to formulate and regulate a unique vision, to build upon and enhance the characteristics of the area.

Image 3 | **An illustration of FBC development**

Source:www.urbancincy.com

With the aim to create inclusive and context specific development, FBCs primarily focus on urban form and its elements like building height, placement and interaction with the street. It also includes recommendations for the development of streets and blocks to create an integrated network and encourage cycling and walking, along with efficiently accommodating automobiles and mass transit. FBCs can regulate an appropriate mix of compatible uses and building types to support creation of diverse, vibrant spaces, as also, on-street and off-street parking for the benefit of pedestrians and adjacent uses.

Finally, because FBCs regulate these elements to adhere to the community's vision, they can provide a streamlined development and approval process with little or no subjective review, thus encouraging appropriate development in line with the community's vision and its development needs.

While FBCs are positioned as a new, alternate process for designing city neighborhoods, the principal components of FBCs (coordinated built form, walkable streets, accessible community spaces etc.) have been adopted in many of our cities since the pre-colonial era. For a city looking to adopt FBCs as a tool to guide urban development, it is imperative to understand the basis on which the codes can be formulated. The following ten terms are the basis for formulation of FBCs for any city.

a. Vision-centered
FBCs are formulated as part of a Master Plan, considering both public and private interest in developing a common vision. Hence, they are adopted with complete confidence and lesser resistance by elected representatives and key decision makers of the city.

b. Purposeful
Conventional codes are unfocussed. FBCs are priority driven and focus on those areas which are prone to change and have the potential to be developed in future. Hence, the redevelopment and changes that would render these areas more functional and inclusive, are clearly defined.

c. Contextual
All codes are carefully calibrated based on specific physical, social and ecological conditions. This helps conserve the existing features of the area while providing for more variety in potential development.

d. Regionally diverse
The 'one size fits all' idea of conventional zoning is replaced with commitment to creating a difference. FBCs reflect the environmental and cultural conditions prevailing in different parts of the country, which helps determine the building form and nature of activities in cities.

e. Consequential
Urbanism is not an exercise of beautification but a process of economic growth. FBCs typically deliver a strategy for improvement of the local economy calibrated to opportunities in the place. They are operated in the interest of bolstering the fiscal health of the community.

f. Precise
FBCs are designed to be typological in nature. Experience-driven, contextually derived metrices are formulated as opposed to abstract gauges like Floor Area Ratio (FAR). This type of growth guarantees compatibility among buildings and other city-making ingredients which can create replicable and scalable models (in similar contexts).

g. Integrated
The current autonomy that is built into the planning process often results in individual agencies working at odds with community interest. Urban projects are often dominated by built form as the key focus, to make use of the maximum built-up area possible, often denying the public realm. FBCs are set up to coordinate the infrastructure, built form, and public spaces so there is complementarity.

h. Binding
FBCs are cast in terms of standards that are obligatory and not guidelines that are optional. Standards provide development direction proactively and reward adherence to community vision that they represent. As citizens begin to trust that their code routinely generates harmonious fabric, the contentious nature of current planning process is diminished. Especially, uncertainty about the neighbors' intention is minimized.

i. Comprehensible
Zoning codes have evolved into massive and complicated documents which are hard to read, comprehend and apply. FBCs aim to be simply presented in a balance of words, diagrams and tables, which are clear to citizens and professionals with no need for interpretation from lawyers and other technical experts.

j. Adjustable
FBCs should be revised regularly and calibrated in light of evolving economy, changing context and community objectives. They are detailed in a way that small changes can be easily incorporated and the community it applies to, can take ownership of its implementation.

1.4. Contextualizing FBC

The FBCs approach is relatively new in the Indian context. The idea was primarily developed in the USA as a concept for defining a new language for harmonious development, as well as for encouraging higher densities and walkability. However, it is interesting to note that most FBC components like nature of built form, street typologies and coordinated social fabric or economic character have already been incorporated in Indian planning in different ways (both historically and in contemporary planning). Since there is no 'one size fits all' approach to formulating FBCs, it must be developed based on local context, geography and other influencing factors.

Image 4 | **Diversity of development and activities in the Indian context**

Key factors that influence the FBC process are:

a. Development context
The nature of built form and activities in the influence area which can help delineate the FBC area and develop codes accordingly.

b. Stakeholder vision
This is a key factor which helps define the direction of growth for the FBC area. The stakeholder workshops organized at different stages of the process help shape the development codes based on the vision. This in turn creates lesser resistance during implementation.

Image 5 | **An expert addressing the community during consultation process in Bengaluru**

c. Scales of FBCs
The different scales of intervention i.e. street, area and city level, in combination with the vision helps determine the extent of intervention and the elements of FBCs.

FBCs explored in this context as design standards (height, ground coverage and setbacks or build-to lines) enable anyone to make reasonably accurate predictions, recognize violations, and feel secure in their investment decisions - a pressing need in the cities of India.

1.4.a. Where and when are FBCs appropriate?

The Form-Based Codes approach is appropriate to consider in the following circumstances:

- For fine-grained communities and cities where the 'one size fits all' approach does not work and a micro-scale, customized and effective regulatory tool is desired.
- Where the focus is on holistic neighborhood/ block development and local imperatives and community vision must be considered.
- Where the community/city is so dynamic from a social, economic, environmental standpoint that typically 20-25-year timeframe Master Plans become quickly redundant.
- Where ease of administration is required and where predictability in built results and

transparency in future outcomes is desired.

- Where the focus is on creating a vibrant live, work, play environment and high-quality public realm along with economic, social and environmental sustainability.
- Where a comprehensive approach that considers market forces, infrastructure carrying capacity and the public realm is considered.

In Indian cities, FBCs have the potential to find successful application around mass transit station areas, areas of historic importance, older neighborhoods facing development pressure, business districts, environmentally sensitive areas; special districts and urban neighborhoods.

1.5. Difference between FBCs and Conventional Codes

The key differences between conventional zoning and development codes and FBCs are enumerated below in Table 1.

Table 1 | **Difference between Conventional Zoning and Form-Based codes**

	CURRENT ZONING/DEVELOPMENT CONTROL REGULATIONS	FORM-BASED CODES
1	Focus on land use segregation as the organizing principle and based on parameters like FAR	Focus on how development relates to local context, community and is based on compatibility of uses
2	Top-down broad-brush approach, applicable city-wide	Bottom-up approach with area-specific codes in response to local context; applied at district / local area levels
3	Often encourages excessive land consumption and automobile dependency. Inefficient.	Encourages a mix of land uses, often reducing the need to travel extensively as part of one's daily routine. Drives efficiency.
4	Ends up focusing on what uses are not allowed, rather than meeting community needs	Focuses on community assets and what they require
5	Preparation process includes minimal public/stakeholder participation. No community input or disclosure during review/ approval or after	Community input, public participation, interaction, property owner notifications, are an integral part of the process
6	'Planning' perspective and fragmented - looks at components (such as buildings, streets, trees) separately	'Urban Design' perspective, integrated - looks at components together and in relation to each other
7	No periodic revision (1-5 yrs.) reflecting any changes to Master Plan and Z/DCR and incorporating reference to other adopted plans, regulations, guidelines	Periodic or annual review which is simple to integrate; integrates with other standards/ordinances/plans
8	Presented in the form of text, numbers and tables; lacks ease of comprehensibility. Also making it easier to flout, difficult to monitor and enforce.	In addition to text, also illustrates graphically (maps, sketches etc.) making it clearer, easier to decipher. Easier to enforce and identify non-conformities.
9	Different departments for review and sanction of development proposals.	Special dedicated body to guide applicants, interpret, review, approve and monitor development proposals
10	Mandates NOC from various agencies but there are no mandatory requirements to comply with environmental impact assessment (EIA), traffic impact assessment (TIA), etc.	Mandates review and clearance from different departments – compliance with EIA, TIA are mandatory for projects above a particular size.

CHAPTER 2
FBC WORKBOOK

2.1 Need for FBC Workbook

FBCs have the potential to emerge as a powerful alternative to conventional zoning and building regulations. They focus on comprehensive development and aims for economic, social and environmental sustainability, while ensuring community involvement. Given that FBCs are a relatively new concept, most cities that are willing to explore an alternative to conventional zoning often-times lack expertise and the time necessary to develop the codes. Given the population growth Indian cities will be absorbing in the coming years and the relative redundancy and lack of efficacy of conventional codes, it is vital for cities to understand the scope and approach of FBCs, as well as the extent and impact of their application in their context.

The 'Form-Based Codes' Workbook will act as a knowledge repository and stepping stone for cities looking to prioritize people-centric development and thereby, willing to explore FBCs as development regulation.

The Workbook consisting of eleven chapters, addresses the stages of selection, design and implementation of FBC projects. Chapter 1 establishes the premise of FBCc and their need in the context of India's planning paradigm. Chapter 2 establishes the need for the guide book. Chapter 3 addresses the organizing principles which guide the FBC process and codes. Chapters 4 to 10 establish the different stages of scoping, followed by design and implementation of FBC projects using relevant illustrations and diagrams. This is also supported by a discussion on finance and administration of FBC projects.

2.2 Aim and objectives

The FBC Workbook aims to function as a reference document for cities who are willing to initiate or adopt the FBC process. The Workbook will inform city officials, consultants, as well as the other stakeholders involved at various stages of FBC planning and implementation. The objectives of the Workbook are as follows:

- To educate city governments on how to understand and evaluate the need for FBCs for their cities.
- To provide a step-by-step methodology to identify, design and implement FBCs.
- To help gauge the amount of outside assistance (consultants) needed, financial and administration support required for the exercise.

2.3 Who should use this Workbook

The Workbook is intended to be primarily used by key administrative bodies and the planning and development authorities of the city. However, since FBCs are a community-led approach that considers private players and other stakeholders, it will also be useful to:

- City implementation agencies
- Local elected representatives
- Consultants/Stakeholders working on FBC projects
- Citizens, CBOs and NGOs
- Private stakeholders like developers, housing associations, institutions and
- Local decision makers can also refer this guide book to understand the process of FBC and adopt the principles in developments driven by them.

2.4 Scope and limitation

The Workbook provides a methodology for adopting FBCs in the context of Indian cities. This has been derived through rigorous research and experience of other cities, as also learnings from the current Indian regulatory mechanisms. The document cross-references other case studies and multiple guidelines and standards (street guidelines, zonal regulations) to serve as a plugin into the current Indian regulatory regime to avoid 'reinventing the wheel'.

Considering the diverse context of Indian cities, and the nature of FBCs being contextual, the stipulations are not specific, but are meant to establish the intent and methodology behind developing and adopting these codes.

CHAPTER 3
FBC PRINCIPLES AND ELEMENTS

FBCs consist of a series of orderly maps/plans that specify the form of development within a given geography. The elements/specifications are as follows:

Regulating/Concept Plan - A plan or map of the regulated area designating the locations where different building form standards apply, based on clear community intentions regarding the physical character of the area being coded.

Public Space/Street Standards - Specifications for the elements within the public realm (e.g., sidewalks, travel lanes, on-street parking, street trees, street furniture, etc.).

Building Form Standards - Regulations controlling the configuration, features, and functions of buildings that define and shape the public realm.

Architectural Standards- Regulations controlling external architectural materials and quality.

Administration - A clearly defined application and project review process.

Definitions - A glossary to ensure the precise use of technical terms.

Form-based codes may sometimes include:

Landscaping Standards - Regulations controlling landscape design and plant materials on private property as they impact public spaces (e.g. regulations about parking lot screening and shading, maintaining sight lines, ensuring unobstructed pedestrian movements, etc.).

Signage Standards - Regulations controlling allowable signage sizes, materials, illumination, and placement.

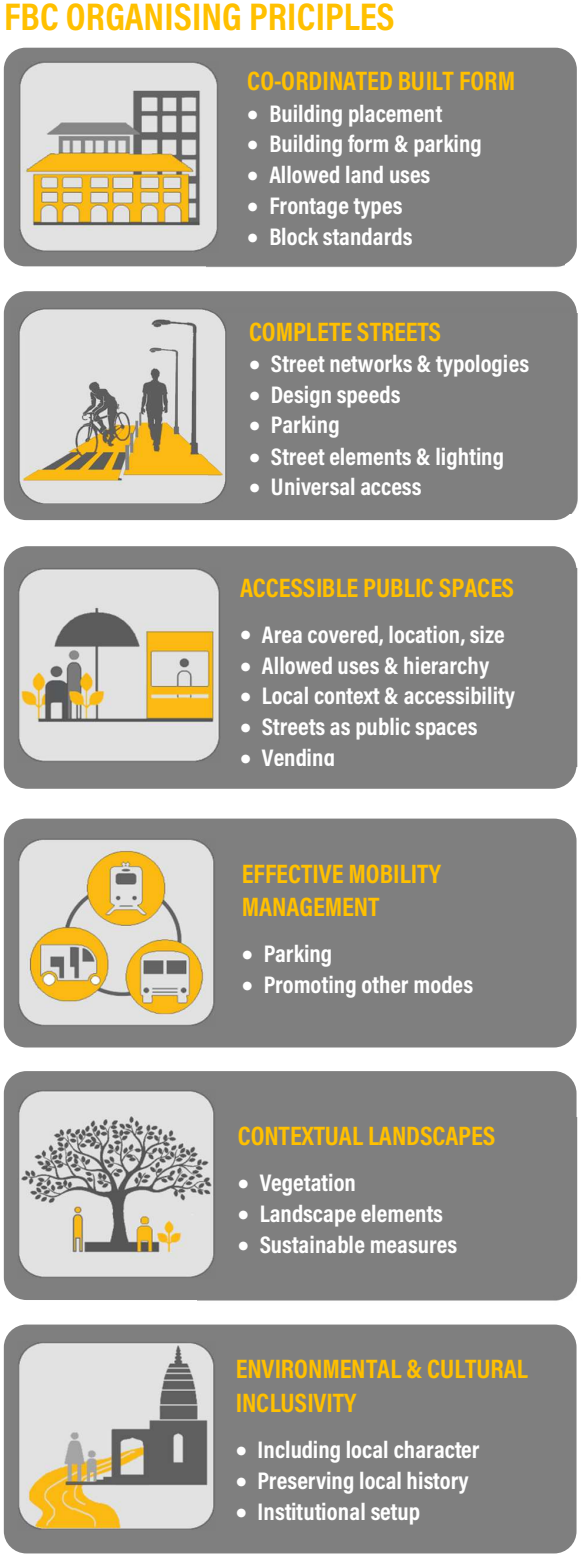
Environmental Resource Standards - Regulations controlling issues such as storm water drainage and infiltration, development on slopes, tree protection, solar access, etc.

Annotation - Text and illustrations explaining the intentions of specific code provisions.

3.1 Organizing principles

The organizing principles act as guiding elements that define planning and implementation of FBCs. These principles are derived from research and best practices of FBCs from around the world and can be contextualized for application in Indian cities. Once the city creates a vision for the chosen FBC project, it can pick and choose principles to be adopted which can help in realizing the vision and determine the design components.

Figure 1 | **Organizing principles of FBC codes**



3.1.a. Coordinated built form

This principle addresses the important characteristics of the building and its correlation with the surroundings, while giving an identity to the type of building and creating harmonious development in the area. These codes typically focus on the types of buildings that may be allowed in a context, and elaborate aspects like:

- Building form
- Building placement
- Height and nature of built form

Image 6 | **Builtform typology and morphology in Jodhpur, India.**

Source: Flickr - Zen Skillicorn

3.1.b. Complete streets

This principle essentially focuses on creating multi-modal streets that are designed and operated to enable safe, attractive, and comfortable access and travel for all users and modes, including pedestrians, bicyclists, intermediate public transport, motorists and public transport. The principle focuses on three key aspects:

- Identifying and developing streets as vibrant urban public spaces.
- Defining and developing vending spaces.
- Relating built form to the street edge with detailing of parameters like height, frontage type and build -to-line.

Image 7 | **A universally accessible street with amenities in Bengaluru, India.**

Source: WRI India

3.1.c. Accessible public spaces

Public spaces function as lung spaces in a community/development contributing to both the environmental as well as socio-cultural aspects of the city. This principle promotes assessments to identify the ecological, cultural and recreational public spaces of the city that can be enhanced through conservation, density control, land use planning and public space design.

Contextually designed and located in the form of open spaces, parks and other civic spaces, these spaces help create livable neighborhoods. The principle focuses on three key aspects:

- Developing the green and open spaces of the city
- Identifying and developing streets as public spaces
- Defining and developing civic and gathering spaces

3.1.d. Effective mobility management

Mobility demand management implies creation of strategies to reduce travel demand (especially that of single-occupancy private vehicles), or to redistribute this demand in space or time. This could be achieved by -

- Rationalizing the different transport modes and their routes
- Promotion of public transport, IPT (Intermediate Para Transit) and NMT (Non-Motorized Transport)
- Managing off-street parking (within the development) and on-street parking

Image 8 | **Road with dedicated Bus Rapid Transit lane in Indore, India.**

Source: WRI India

3.1.e. Contextual landscapes

Landscape functions as another critical component for achieving an ecologically balanced and people-friendly environment in the FBC area. This principle focuses on both public spaces i.e. streets, as well as the private setback spaces of the properties. It is important to guide the character and typology of landscape in the private realm as it affects the street edges.

Image 9 | **A neighborhood park in Bengaluru with local tree and plant species.**

Source: WRI India

3.1.f. Environmental and cultural inclusivity

The cultural landscapes reflect the elements of heritage, environment, socio-cultural characteristics and the need to preserve and incorporate them as a part of FBC area. Embedded in the principle is the concern for unique cultural and societal iconography of regions and their importance. Their incorporation into the spatial order of urban settings should be promoted.

Cultural landscapes can be categorized in two ways-

Tangible components - measurable components and physical assets of heritage and environment

Intangible component - Non-measurable and abstract elements of socio-cultural components.

Image 10 | **Historical and enviromental inclusivity, Ahmedabad, India.**

Source: WRI India

Image 11 | **Cultural inclusivity on streets of Ahmedabad, India.**

Source: WRI India

3.2 Regulating plan

The process of identifying principles for a chosen FBC area is followed by application of FBC components in the area. The regulating plan hence, acts as a bridge between the two, to translate the larger vision of the community to a tangible plan incorporating zones where the FBC codes are applied.

Regulating plans have 3 main purposes -

Administrative
The boundaries created for different zones with a supporting index which defines the possibilities of development, helps determine the rules of the design of the respective site or area. This allows a person interested in developing, options on a specific site and refers to the zones in the regulating plan in accordance with the text in the code document.

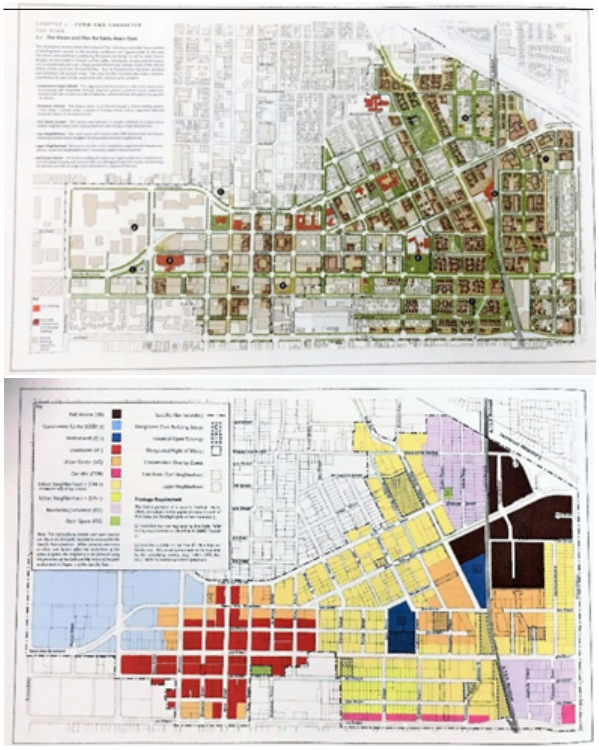
Direct regulation
The regulating plan can indicate the actual development requirements. For example-street frontages having shops in the ground floor and residences in the upper floors to create active edges, defining corner plots or first row of buildings in highly intensive commercial areas, etc.

Planning
The regulating plan is an exercise in urban design. Defining zones of development help define the differences in the form and character in each zone, which in turn helps to determine the configuration of streets and public spaces.

In developing a regulating plan, the area is first designated with sections or zones. The regulating plan then designates physical areas or lots to which specific regulations apply. Because of the specificity that is necessary for the application of FBCs, unlike conventional zoning maps, the regulating plan applies the codes within the framework of streets and blocks. This also enables creation of seamless transitions between blocks and zones rather than having abrupt differences.

In a conventional zoning code, the primary difference between zones are the different land uses they allow. FBCs on the other hand, determine zones on building density or development intensity and form (e.g. building type, height, setback) and their relationship with the public realm; while paying less but careful attention to the differences in land use.

Image 12 | **An illustration plan (above) and a regulating plan (below) for Santa Ana downtown renaissance**



Source: Form-Based codes - A guide for planners, Urban designers, municipalities and developers.

3.3 Co-ordinated Built Form

The codes play a key role in determining the outcomes on the ground. Building form standards are necessary to create desired built form, to address the street interface and to develop a healthy and vital public realm through good urban design. The guidelines help define basic parameters governing building construction, including the building envelope and certain required/permitted elements, such as balconies, stoops and street walls.

Figure 2 | **A demonstrative example of FBC codes**

Source: TOD Manual, WRI India

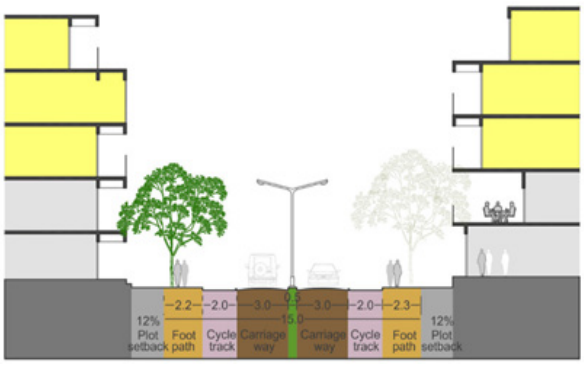
Note that all the standards provided are indicative of the respective code. The cities however, are supposed develop code based on the local context.

Built Form standards consist of the following sections

3.3.a. Building Placement

These are standards which regulate the placement of buildings (particularly the front edge of the building) in reference to the street edge. The placement of these buildings provides a foundation to preserve or establish the character of the FBC zone. Building placement standards include the build-to line, setback, and widths of lots, etc.

Figure 3 | **Development regulations guiding the building placement in relation to the street.**



Source: Indiranagar report, EMBARQ India

Since FBCs are primarily intended to regulate the character and quality of streets, the location and size of the buildings should be regulated to shape the urban form based on the desired vision.

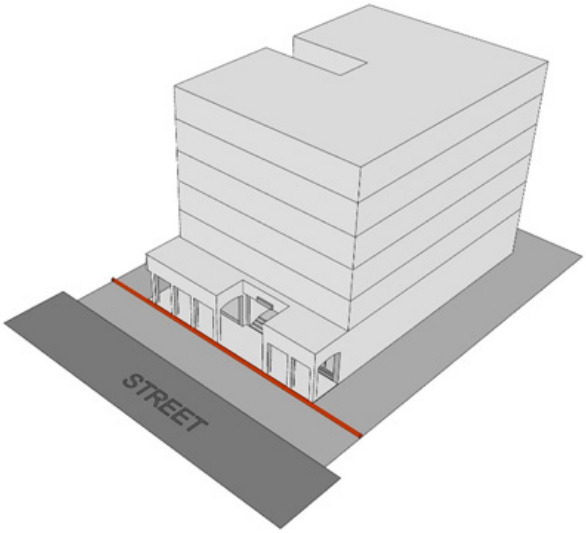
However, the regulations should also consider the relationship between the buildings in terms of privacy and creation of semi-private spaces like parking, informal activity areas, transition areas, etc. This is usually the first element to be regulated since it provides the foundation for establishing the urban character of the zone.

Listed below are elements which contribute to determining the placement of the building in any given area, based on the vision created. These elements must be configured carefully based on the local context and zoning to create the most effective built form.

i. Build-to Line (BTL)

A line parallel to the property line where the façade of the building is to be located. The regulated distance is from the property line or Right of Way (ROW), to BTL. It prescribes a consistent plane of building facades along building frontages, including thoroughfares, frontages and sometimes alleys.

Figure 4 | **Building indicated with build-to-line**



Tips for design and implementation

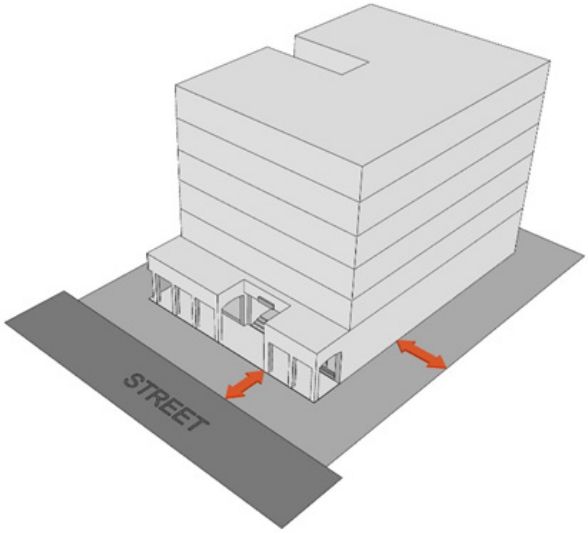
Use BTL wherever there is a need for consistent building plane or a defined edge.

- For corner plot consider BTL for front and the edge.
- Do not allow for excessive landscaping between building and the sidewalk in urban areas.

ii. Setback

The distance from which the building must be separated from the property line or ROW, typically defined and regulated as minimum. The setbacks help determine the relationship of the buildings with the street and the surrounding buildings. Based on parameters and international best practices, at least 33% of the street facing building facade should be located on the setback line. The intent is to maximize eyes on the street while taking into consideration the urban location, without compromising on light and ventilation requirements. The proposed setbacks are based on plot width and depth as in a Master Plan. Typical parameters include front, rear and side setbacks.

Figure 5 | **Building indicated with setbacks**



Tips for design and implementation

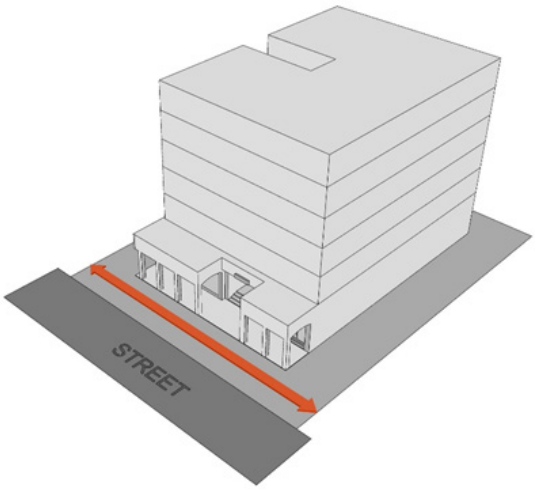
- Consider ways setbacks can be used to transition between different types and intensities of uses. For example, no setback in commercial areas, introducing transition landscapes in residential areas, etc.
- Use road widths, their intensity and nature of use to determine setbacks.

iii. Maximum lot width

The largest allowed distance between plot corners along the front ROW is known as the lot width.

This can be very useful to help preserve the character of the existing neighborhood and areas in city cores where such typology generally exists, and thereby create appropriately scaled development in new neighborhoods with mixed land uses. As a building cannot be wider than the lot, regulating maximum lot width helps ensure that new buildings will be appropriately scaled to the desired urban form.

Figure 6 | **Building indicated with maximum lot width**



Tips for design and implementation

- Use this in redevelopment scenarios where sub dividable plots still exist and the need for preserving the existing character of buildings is the main goal of the vision
- Use this in newly developing areas around historic precincts to ensure new buildings are in scale with existing ones.

iv. Minimum lot width

The smallest allowed distance between plot corners along the front ROW is the minimum lot width.

This is generally applicable for suburban, peri-urban areas and ecological sensitive areas where a right proportion of built vs open spaces is required. It helps to maintain the desired proportion of buildings in relation to open spaces.

Tips for design and implementation

- Do not use this in high density areas (city cores, commercial centers) where there is a higher density requirement.

Figure 7 | **Building indicated with minimum lot width**

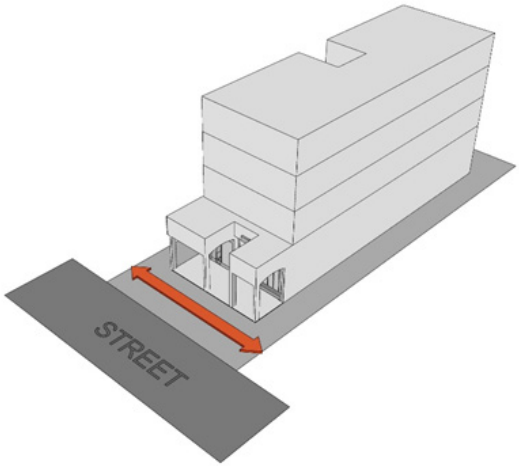
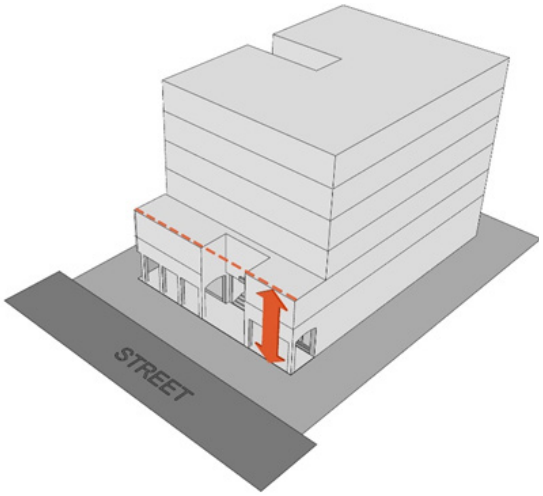


Figure 8 | **Indication of minimum building height**



3.3.b. Building Form

Building form standards play an important role in defining the urban form as well as public spaces, establishing the character of the FBC area. Functioning as the 'walls' of the street, the building facades are regulated for height to ensure appropriate proportion in relation to street width. Regulating buildings of varying heights and proportions based on the desired vision can help achieve a rich urban form through harmonious development. The size, hierarchy and placement of all the buildings are regulated to ensure an appropriate morphology and smooth transition between different scales of built form. While conventional zoning regulates only maximum size of the buildings, FBC also prescribe minimum size of the buildings which can help create a desired urban form. The following elements define the building form standards:

i. Minimum Building height

The shortest allowed vertical distance between the sidewalk and top point of reference for a building facade along front ROW.

This helps ensure the building has minimum height to ensure its visual and functional harmony in relation with its surrounding development.

Tips for design and implementation

- Regulate this based on number of stories than only by measured height (mts or feet)

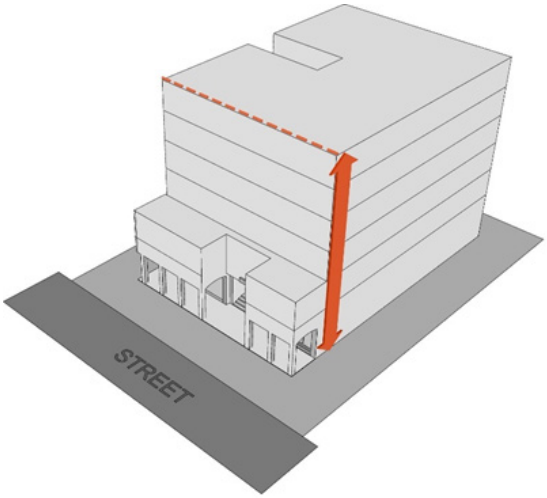
ii. Maximum Building Height

The largest allowed vertical distance between the side walk and top point of reference for a building facade along front ROW

This helps achieve appropriate scale for desired urban form. In most FBCs, the height is defined by floors rather than dimensions. This helps builders achieve larger floor-to-ceiling heights, to help create better streetscapes rather than squeezing more built up space, through lesser heights and more number of floors.

Since FBCs are developed with a vision of creating a human centric development, for buildings up to 4 storeys, heights can be proposed to maintain human scale and for buildings higher than 4-5 floors, a step back method can be used to achieve the desired visual appeal.

Figure 9 | **Indication of maximum building height**



Tips for design and implementation

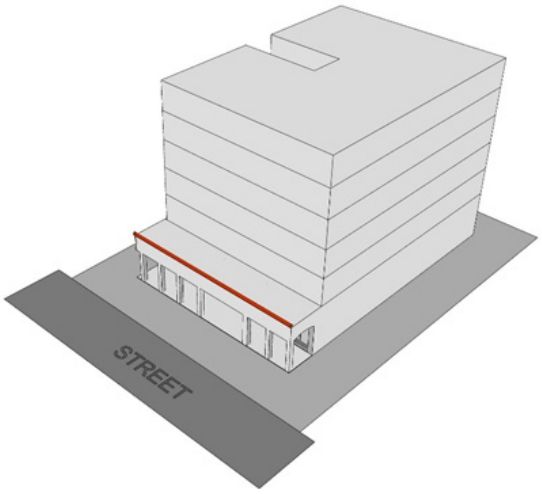
- Building height derived based on parameters such as light, ventilation and development rights, helps define the building form in a more accurate manner.
- Mezzanines greater than 2/3 of the floor area footprint shall be counted as full storey. Basements up to a 1.2m height above average ground level shall not be counted as a storey.
- Take care of privacy while designing windows and balconies for taller buildings with closer spacing.
- Ensure adequate setbacks in proportion to the building heights to provide precautions for fire safety.

iii. Ground floor finished level height

The vertical distance allowed between the sidewalk (or other common reference point) and the top of the finished floor of the ground level, regulated as minimum and maximum.

An appropriate ground floor height helps define an appropriate relationship between the public and private realm. Regulating minimum height for a residential building is necessary to ensure privacy for the residents, while providing maximum height for commercial areas helps create an active transition from the street to the built spaces.

Figure 10 | **Indication of ground floor finished level height**



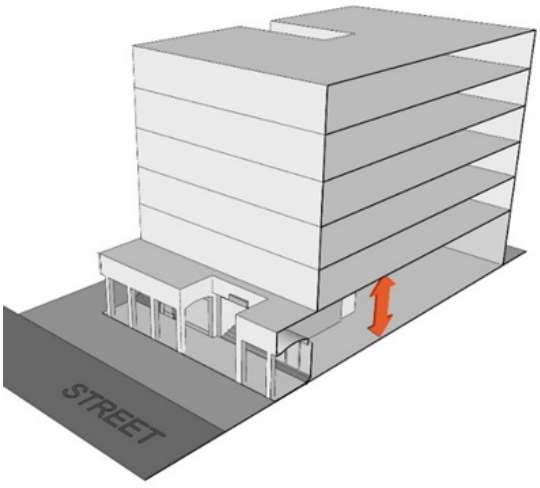
Tips for design and implementation

- Ensure privacy for residential units in areas where they are placed on the edge of the street.

iv. Minimum Ground floor ceiling height

The minimum allowed vertical distance between the finished floor and ceiling on the ground floor of the building. Typically used in urban areas, this helps ensure the spaces are tall enough to be viable for retail spaces. This is also a critical regulation in areas where new development is built in character with its historic architecture.

Figure 11 | **Indication of Minimum Ground floor ceiling height**



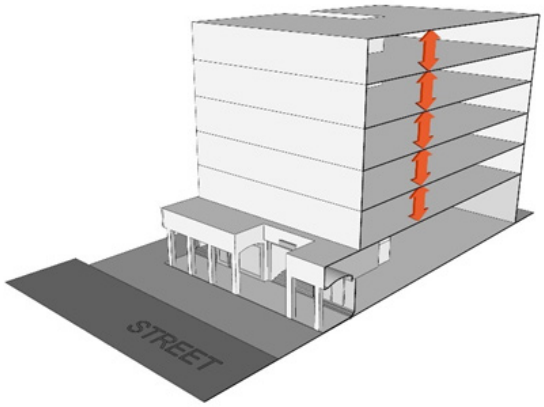
Tips for design and implementation

- Generally, shopfronts require a minimum of 12 ft height, although 15 ft is ideal. 10 ft recommended for residential areas.

v. Minimum upper floor ceiling height

The smallest allowed vertical distance between the finished floor and ceiling on all the floors of a building above ground floor. Typically used in heritage precincts, this helps ensure the new buildings are regulated in relation to the existing historic built form. It also helps to allow more natural light into otherwise densely designed urban areas.

Figure 12 | **Indication of Minimum upper floor(s) ceiling height**

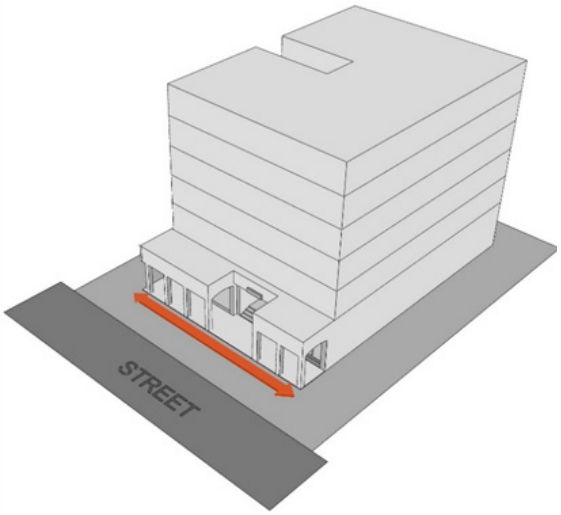


vi. Maximum building width

The largest allowed distance between a building's two sides, measured along the front ROW.

This is helpful in maintaining the scale of the buildings, to ensure a cohesive scale with existing built form. This helps prevent out of scale buildings in the city core and helps control the proportion of buildings in large plots in green field development areas, as per the intended vision.

Figure 13 | **Indication of maximum building width**



Tips for design and implementation

- Determine the width by measuring the width of the widest existing building. This can help benchmark the width for new interventions.
- When it is likely that the new buildings need to have a larger width than the measured width of the existing building, consider regulating that wider buildings be designed to be read as separate buildings, each with a maximum width.

vii. Maximum building depth

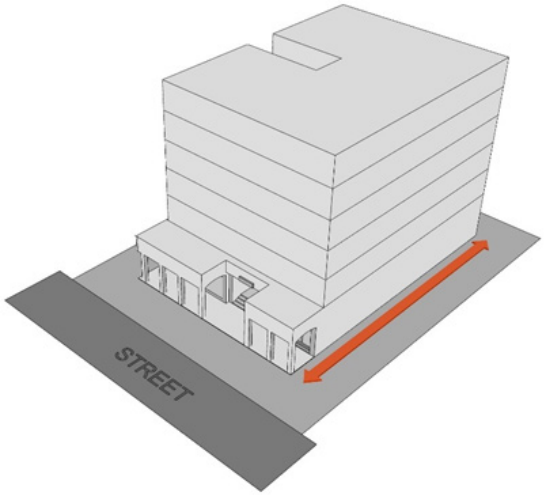
The largest allowed distance between a building's front facade and rear elevation.

This replaces the building footprint and FAR of conventional zoning to better regulate the density of new buildings based on desired urban form and morphology.

Tips for design and implementation

- Determine the depth by measuring the width of the deepest existing building during documentation and verify it on the field.

Figure 14 | **Indication of Maximum building depth**

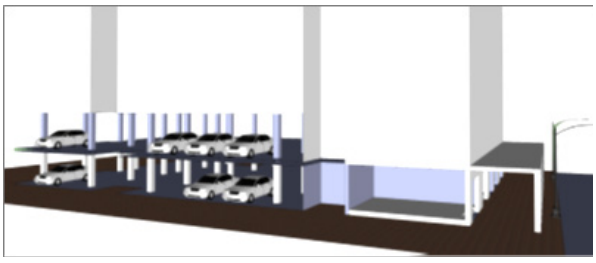


viii. Parking

Parking is one of the most contentious issues when developing FBCs and must be addressed appropriately. If not designed properly, this is often one of the most obstructive elements that discourages pedestrian movement. If not planned well, it leads to under-utilization of space, which in turn affects the relationship between built form and street scape.

The impacts of parking on the quality of a place can be mitigated with appropriate requirements and good design. The best way to achieve this, especially, in an urban setting, is by placing the parking in the basement or in the center of blocks, lining them with retail or active uses along the streets. The sizes of the parking slots and the travel lanes are also regulated.

Figure 15 | **Parking designated in the rear part of the building with active frontage.**



Source: TOD Manual, WRI India

Tips for design and implementation

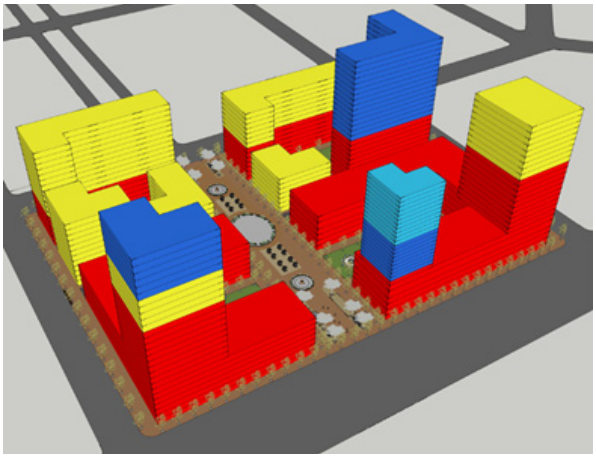
- Never allow parking in front of the building
- Regulate a maximum width of 60 ft along side streets to break the monotony of long dead street edges.
- Encourage shared parking

Parking also comprises of on street parking and focused methods of managing street parking. The details of off-street parking and other transit related aspects are covered in the mobility management section.

3.3.c. Allowed Land uses

Despite using built form and public spaces as parameters to define the nature of development, FBCs also use land use in a different and more controlled manner, unlike the conventional codes.

Figure 16 | **Mixed Land use allotted to a cluster of buildings in a plot.**



Source: TOD Manual, WRI India

The first step of regulating through land uses is similar to conventional codes i.e.,

- Through listing of number and type of existing land uses with no room for assumptions or for unmentioned land uses.
- By limiting certain land use types in certain zones.
- By identifying land uses permitted or conditional in each zone.

Communities play an important role in determining the land use as against the conventional regulations defined in the masterplan. They can assist in defining zones around sensitive areas or may wish to pursue the economic development goals by distribution and clustering certain uses in various parts of the community.

The land use is determined through inputs from the people of the community to determine allowed uses, or activities the community desires in each zone. Once the opinions are collated and finalized the permitted uses are administratively cleared.

Other uses may be appropriate to the zone and are typically referred to as 'conditional' land uses. Because some of the worst consequences of conventional zoning, such as urban sprawl, result from segregation of land uses, FBCs provide more flexibility in the number and type of land uses allowed in mixed use zones by listing them in a more generic form.

Tips for design and implementation

- In areas that must be revitalized, don't restrict the ground floor to retail, to have a shop front occupied by a service use rather than have it sit vacant.
- Understand the nature of surrounding built form along with activities to determine the nature and mix of land use. Particularly, when using a combination of residential, commercial and retail use.

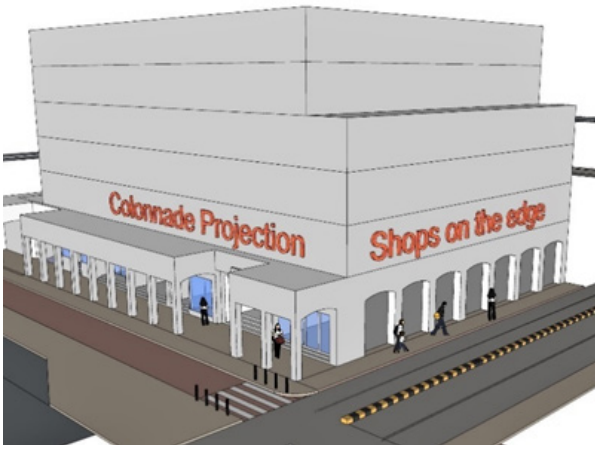
3.3.d. Frontage type standards

This code refers to the nature of interaction between a building facade and the street. This is derived based on the typology of the FBC area and building use in correlation with street type and use.

The code is developed by using a combination of built form and street elements. The built form elements i.e. chajjas, balconies, bay windows, front porches, balconies etc. may extend over the build-to line (the distance between the property line and the building facade) or at times, the street elements i.e. the footpaths, trees, landscaping help determine the nature of activities. The combination of the two elements leads to the development of a contextually rich urban form.
As with most of the built form standards, the regulations for the frontage must be determined based on the initial studies and documentation of the nature and frontages of the existing buildings. There are certain frontage types that should be allowed and encouraged by the code. In turn, the aspect of setback and projections should be taken care off, to ensure desired implementation.

3.3 e Building type standards

Figure 17 | **A design of a Universally accessible and safe street.**



Source: Safe Access Manual, WRI India

The definition of the building type in the urban design context is different form the architectural context, which is defined solely by use or function. Instead, for FBCs the definition is primarily driven by physical form of the building followed by its function. Regulating the built form using FAR and built up area lets the developer max out the buildable envelope allowed for the plot and apply architectural skin as a mere aesthetic element. In contrast, using building type as a primary parameter results in creating a coordinated mix of buildings resulting in a harmonious built form.

Sensitive application and integration into the built form regulation can help improve the quality of built environment.

i. Integrating building types into the code

Building types can be integrated into FBCs in following three ways

Building types as organizing principle
These could be used in smaller neighborhoods with similar built form. The regulations can be created as a principle by combining the elements of building form and building type.

Building types as land use
Because buildings types are determined by their form and use, they are organized and assigned to regulating zones by their use.

Building type standards

The most evolved approach for large-scale application of FBC is to list the allowed building types by regulating plan, in the building form standards. This approach offers flexibility in achieving a diverse urban form but must be implemented carefully to consider interaction between the building form standards and building type standards.

The typical elements in each building type include

- Nature of building
- Required plot size
- Pedestrian access
- Frontages
- Vehicular access
- Services
- Open space
- Landscape
- Building size and massing

Each of the above-mentioned elements have be regulated either individually or in relation to one another.

3.3.f. Block standards

To address larger project sites (typically larger than two acres) and encourage the creation of walkable neighborhoods, form-based codes may include block and subdivision standards to guide the division of large development sites into an interconnected network of new streets that follow the code's public space standards and smaller

blocks that meet the code's standards for maximum block perimeter and length.

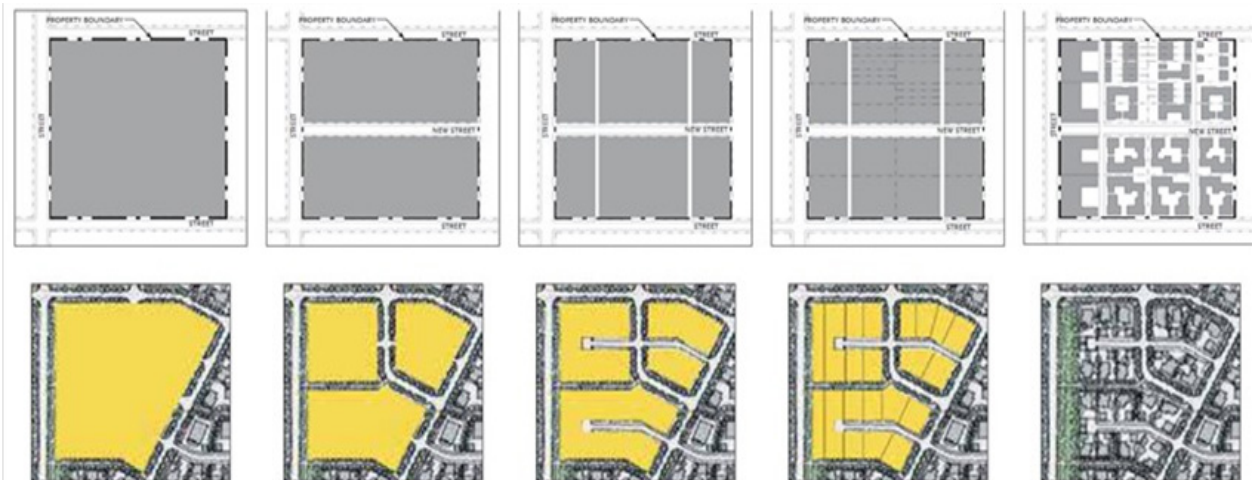
The steps involved in the creation of the block are as follows:

- **Introduce streets:** Streets taken from public spaces standards should be integrated into the site to break the site down into blocks that meet the established regulations.
- **Introduce alleys:** These act as important access-ways for pedestrian and NMT movement as they remain segregated from main streets.
- **Introduce lots:** This finds primarily application in green field areas, where a large plot is sub divided to smaller plots that will integrate with allowed building types and their standards.
- **Introduce building types:** A mix of land uses and building types are introduced to achieve fine-grain urbanism.

3.4 Complete Streets

Streets act as the backbone of neighborhoods and contribute to a large percentage of public space in any given area. They function both as vehicular and pedestrian corridors and as the community's primary public spaces and the configuration of streets, plays a significant role in shaping the urban character of a place. Hence, standards

Figure 18 | **Block design and components**



Source: Form-Based Codes:A Step-by-Step Guide for Communities.

that address these features are an essential component of form-based codes. The absence of robust street design and high-quality public spaces can adversely impact other components of FBCs.

Unfortunately, existing streets in most of the urban cores of Indian cities have narrow footpaths, unmanaged on-street parking and prioritize high speeds for vehicles. This has prevented the revitalization of pedestrian pathways and NMT in these areas.

The design of streets has been approached through engineering methods, primarily, through the calculation of vehicular intensity. However, given that pedestrians and cyclists form an average of 36% of the modal split in most Indian cities, their comfort and safety should be the key focus, along with efficient flow of motor vehicles and other considerations such as storm water drains, parking and landscape. Moreover, instead of considering streets in isolation, they need to be designed as an integrated network with careful design of junctions.

FBCs regulate streets by creating a set of street templates approved through street standards which are then assigned to physical locations through the regulating plan. The process is typically preceded with documentation of existing streets in the area and adopting appropriate good design elements into new designs.

Following are a list of components which cater to an efficient street design. However, the list is not limited and could be adopted based on ground conditions.

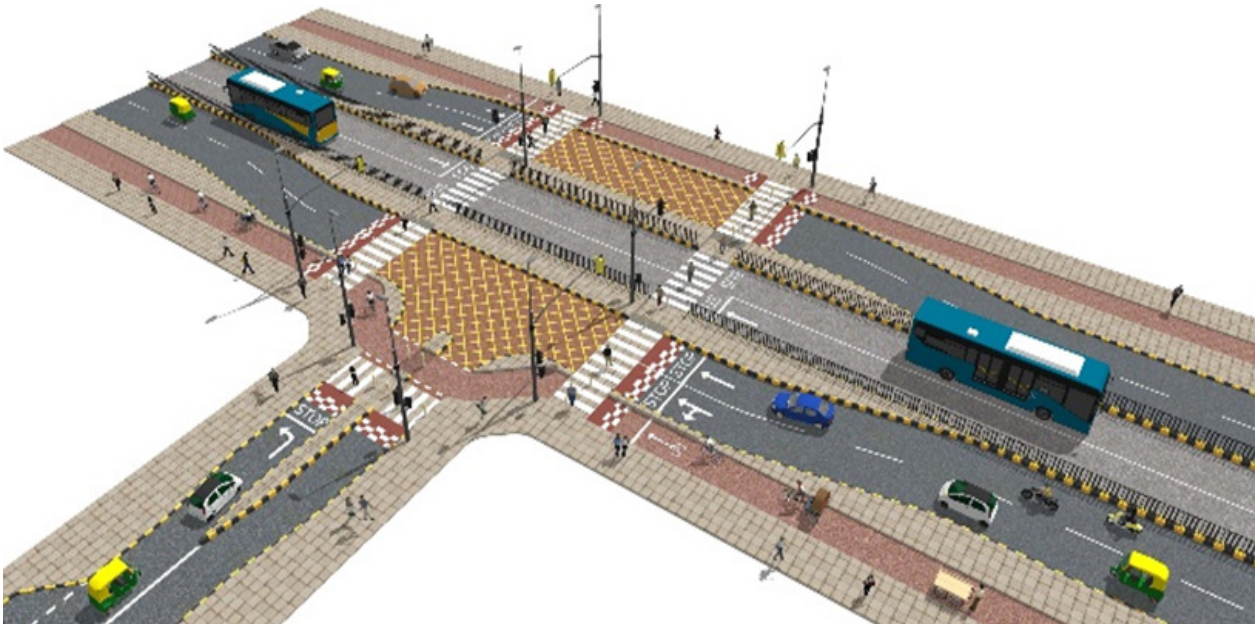
3.4.a. Street networks and linkages

The first step is to understand and establish the linkage of important streets and spines in relation to surrounding areas and other parts of the city. This helps avoid a piecemeal approach and ensures design for smooth vehicular and mass transit flow, along with enhanced pedestrian provision in the area.

Figure 20 | **The concept of interconnected streets**

source: Safe Access Manual, WRI India

Figure 19 | **A design of a universally accessible and safe street**



source: Safe Access Manual, WRI India

3.4.b. Street typologies

Street typologies are determined based on the width, intensity of use and the nature of activities in adjacent parcels and in the area.

Figure 21 | **Road hierarchy map**

Source: Shaping Hubli-Dharwad as a connected city, WRI India

3.4.c. Design speeds

These are the highest vehicular speeds for which the given street needs to be designed. It in turn helps the designers and traffic engineers to better design the street and its elements. From the road safety aspect, lower speeds are of higher priority in pedestrian intensive areas. The arterial streets of the area can be designed for higher speeds provided that the carriage way is separated from footpaths using a boulevard and/or plantation.

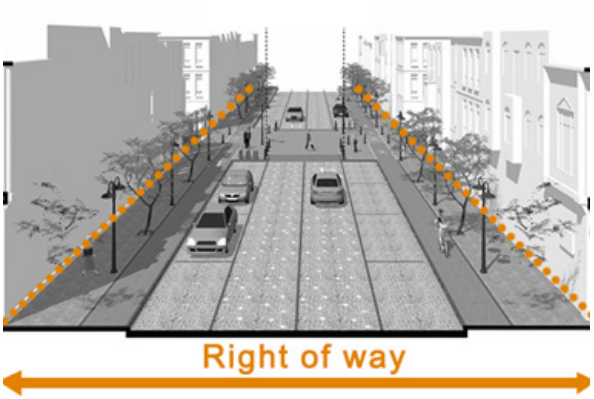
Figure 22 | **Measures for regulating speeds**

source: Safe Access Manual, WRI India

3.4.d. Right of Way (ROW)

The end to end measurement of width of a street is called the right of way. The ROW includes metaled road/carriage way, medians, pavement areas, planting strips, sidewalks and shoulders all together, up to the setback line. All of these should be considered together and regulated accordingly to develop a given space.

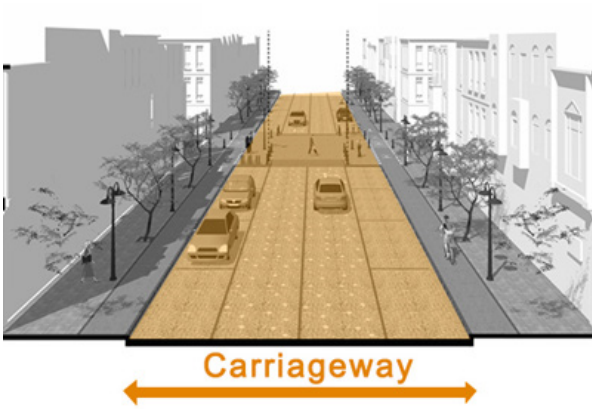
Figure 23 | **A street section indicating right of way**



3.4.e. Carriage way

The distance across the street between the curb edges defined for vehicular movement, including on street parking. This plays a major role in facilitating the speed of vehicles and hence, should be designed taking into consideration pedestrians and other slower modes of transport.

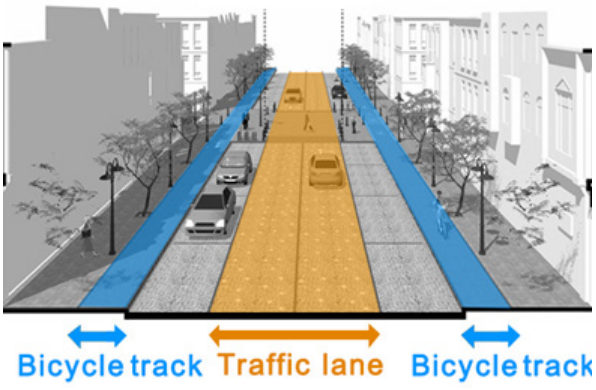
Figure 24 | **A street section indicating carriage way**



3.4.f. Traffic and bicycle lanes

The number and width of the area defined for different modes of travel. These are designated lanes designed for vehicles, as well as bicycles. The narrower the width of vehicular lanes, the slower is the speed of the vehicles, creating a safer and more comfortable environment for pedestrians. The bicycle lanes on the other hand which consist of min 1.5 m width for each direction, should ideally be located away from the vehicular lanes using plant buffers or curb edge, to ensure safety of cyclists.

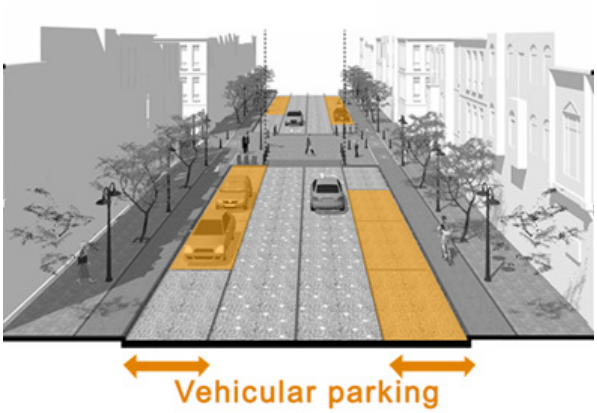
Figure 25 | **A street section indicating traffic and bicycle lanes.**



3.4.g. On street parking spaces

This is the number and area designated for on-street parking. The design and inclusion of on-street parking slows down the traffic by narrowing down the perceived width and creates a buffer between the vehicular and pedestrian movement, ensuring the safety of pedestrians. It also provides a defined space for parking for businesses and other commercial areas, and hence, cutting down on unsightly parking towers. Provide enough parking to ensure all of them are occupied on a rotational basis and close to every building. As much as on-street parking is important for the ease of car users, the users should be encouraged to opt for public transport, walking and cycling. This helps create the right balance between pedestrians and vehicular users.

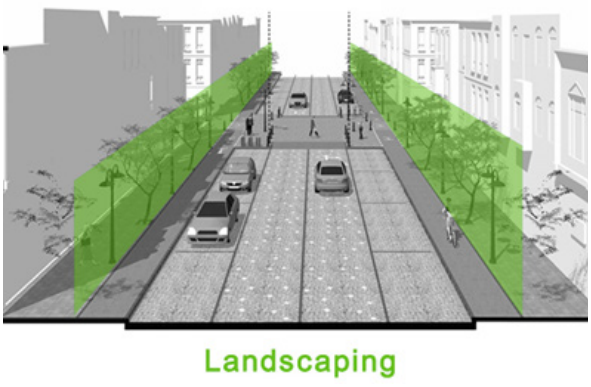
Figure 26 | **A street section indicating on street parking**



3.4 h Landscaping

The design and landscape elements used, determine the nature of streetscapes, as well as perceived proportion of public space based on the desired character. Every landscape element offers multiple functions to enhance the walking experience. Trees help create a barrier between vehicles and pedestrians and provide shade to the walkways. The smaller elements like swales, hardscapes and planters help create a buffer, improve the aesthetic quality of the space and help create an ecological balance. As far as possible require regular tree-spacing in all zones.

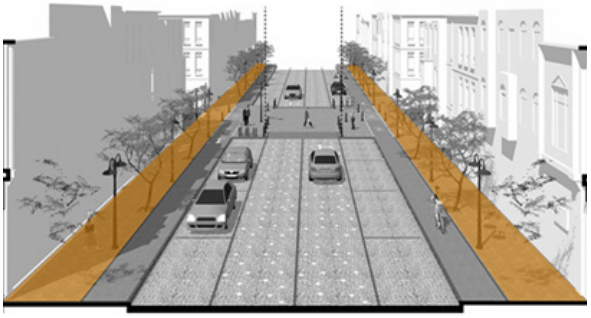
Figure 27 | **A street section indicating landscaping**



3.4.i. Walk ways (sidewalks, footpaths)

This is defined as the horizontal width of the street space which is dedicated to movement of pedestrians and are generally located on either side of the carriage away. With a minimum width of 1.8 m, the size and type of walkway can be determined based on the nature of designated zone and the street typology. Walkways are to be designed in a continuous unobstructed manner maintaining even surfaces, particularly in front of property entrances. They also must be designed to have a smooth transition to crossings and junctions across the street. In mixed-use areas, consideration should be made about how adjacent uses will spill out onto the sidewalk.

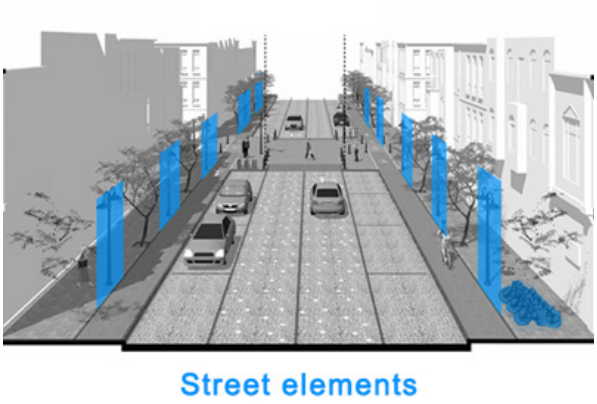
Figure 28 | **A street section indicating walkways**



3.4.j. Street furniture & lighting

These constitute all the amenities and facilities provided to enhance the safety and walking experience of the pedestrians as well as for vehicles. Lighting forms one of the main components which ensures safety and hence encourages social life on streets. Adequate intensity and spacing of street lighting should be considered based on the road width and intensity of use. Other street elements like benches, waste bins, water fountains and toilets, add to the overall comfort and experience of the user.

Figure 29 | **A street section indicating street elements**



3.4.j. Creating universal access

The design of streets is not all about providing space for vehicular movement and pedestrians but also to ensure smooth transition within and between these spaces as well as access to the properties from the street. Universal access (access to users of all age groups and abilities) is achieved by the provision of the right set of elements which help transition from one space to another. These constitute of ramps at property entrances, table top crossings to regulate speeds, tactile flooring and other safety precautions.

3.4.k. Safe access

This includes the surface and sub surface civil work required to create a universally accessible and safe street. This includes creation of footpaths, ramps, crossings, etc.

Figure 30 | **Street infrastructure comprising of bollards, table top crossings and walkways**

Source: TOD manual, WRI India

3.5 Accessible Public Spaces

This essentially includes open spaces or public areas which exist at different scales (city, neighborhood and street) and are accessible to all. This may include parks, playgrounds, squares, plazas, neighborhood parks etc. The streets on the other hand are also considered as linear public spaces of the city.

Figure 31 | **An illustration of interconnected hierarchy of public spaces.**

Source: TOD manual, WRI India

Well-designed public spaces, like parks and plazas, play a very critical role in creating a healthy and vibrant neighborhood. The civic spaces comprise of multiple functions - they provide access to the outdoors, become instrumental in shaping the structure of the neighborhood in relation to streets and built form, and function as congregation spaces for people of the community.

Often, public spaces are designated based on the mere calculation of spatial areas rather than through a more contextual and experiential approach. This leaves developers and cities to develop these spaces as mere patches derived from residual spaces (e.g. spaces between two arterial roads, transit lines, large roundabouts, etc.). Also, the regulation typically focuses on creating a hierarchy of city and neighborhood level parks with active functions, which are often prohibitive for redevelopment and urban conditions. These do not allow for smaller, more localized and organically evolved spaces. So, as a means of creating walkable communities, public spaces should be specifically regulated and calibrated based on the typology of the area.

Public spaces should ideally be located at walking distance from the residence or office spaces to make them more accessible. The spaces need to be designated based on their scale, and generally include plazas, parks, open grounds, public squares, playing fields etc.

The regulations to be established for public spaces should typically include:

- Restoration of existing public spaces.
- Identifying locations and function of new public spaces based on the FBC zones.
- Parameters for placement of public spaces.
- The amount of land area required for respective public spaces.
- Elements of the space (furniture, landscaping, planning).
- The nature and intended use of the space and
- The appearance and design of the space.

The components of public spaces are as follows:

Image 13 | **Development of streets as a public space in Navanagar TOD project, India**

Source: Shaping Hubli-Dharwad as a connected city, WRI India

3.5.a. Area covered

This is typically the area of each type of public space based on its scale (city level, area level, street level and project level). This is often determined as the number of public spaces with designated use and area. It can be designed as a single large space or a series of smaller spaces.

As per the URDPFI guidelines, the hierarchy of open spaces are categorized under scales of housing cluster, neighborhood, community, district/zone, and city level. These open spaces can include the following categories.

Recreational open spaces – City chowks, congregation spaces, city plazas etc.

Image 14 | **Bhadra square in the old core of Ahmedabad, India**

Organized green – Parks and play fields

Image 15 | **A community park in Delhi, India**

Other common open spaces - specified park, amusement park, Maidan, a multipurpose open space, botanical garden and zoological parks, traffic parks.

Image 16 | **The Clock tower square functioning as a public space in Lucknow, India**

3.5.b. Location

Determining the location and hierarchy of public spaces is key - from the city level to the street level. This helps ensure that public spaces are utilized efficiently. Some of the considerations for locating public spaces are as follows -

- Place playgrounds within walking distance of all residential uses.
- Place squares and plazas at prominent locations at the heart of city cores and neighborhoods.
- Ensure that the public spaces are not created out of residual spaces left after buildings are placed.
- Frame at least 2 sides of the public spaces with streets.

3.5.c. Size

The regulation of public spaces designed, should ensure minimum dimensions to ensure that they are large enough to be usable and achieve the designed function. The maximum regulations ensure the appropriate scaling and use of the type of space.

3.5.d. Allowable uses

This helps ensure that public spaces are designed based on the right context. This is usually determined based on the proportions of users in the area and the prominent activities which define the character of the area.

3.5.e. Local context

As much as the spaces need to be designed based on the designated use, it is equally important to include the existing context and natural features as a part of public space design. This helps maintain a balance with the ecosystem of the place. E.g.: Including an existing pond as part of a public space.

3.5.f. Accessibility to public spaces

Public spaces should be designed to be universally accessible, both through provision of adequate infrastructure (ramps and other facilities) as well as designing for users of all age groups and genders.

3.5.h. Public space furniture

Public spaces comprise of both generic elements as well as specific elements of design. This helps create a unique character to these spaces and imparts an identity to these spaces.

The generic elements include basic furniture like benches, dustbins, lighting etc. while the specific elements are determined based on the nature of public space.

E.g.: Kids park – kids furniture, swings etc.

Commercial square – Seating areas, spaces for shops and displays etc.

Image 17 | **Public space seating in market area in Lucknow, India**

3.5.g. Streets as public spaces

Streets are the linear public spaces of a city and generally cater to a transit population. The transit spaces (footpaths, cycle tracks) and the static spaces (vending spots, parking areas, landscapes) should be consciously segregated to avoid conflicts. The activities on the street edges should be placed to provide no obstruction to the movement of pedestrians.

Image 18 | **Streets developed as a public interaction space in Pune, India**

3.5.i. Vending

As chaotic as it seems in the Indian context, strategically, vending is one of the key activities which adds pulse and provides safety and dynamism to public spaces. These can be incorporated based on clear designation and placement.

3.6 Effective Mobility Management

Parking standards are derived from conventional zoning regulations and are established according to the building use and activities designated for the FBC area. Surface parking damages the physical quality of the public realm on streets, and unplanned parking obstructs the movement of pedestrians. In response, FBCs aim to reduce this negative impact by locating the parking at the rear side of built form or in the center by pushing the built form to the edge (which also creates an active edge).

The parking standards are defined at two levels i.e. on street and off-street parking and the amount and type of parking is determined based on the density and use of the built form.

The amount of on street and off-street parking should be calculated based on the city's zonal regulations. This can be adapted to the FBCs based on the extent of parking required. The off street or the building level parking is defined within the private property while the on-street parking is designated as a part of street design guidelines. In addition to the number of parking spaces to be allotted, typical off-street parking standards include, area for parking, desired setbacks, size of parking spaces and adjoining landscape.

Image 19 | **Integration of multiple modes in Bengaluru, India**

The section includes standards on:

3.6.a. Parking

Free parking provision incentivizes excessive car use by making driving the most convenient and affordable travel option. While parking is an essential component of the transportation system, a typical automobile is parked for most part of each day and uses several parking spaces each week. Parking convenience affects the ease of reaching destinations and therefore affects overall accessibility. The public provision of parking facilities is a cost to the society, and designers, operators, planners and officials are faced with the conundrum of managing parking demand.

Image 20 | **Parking at Flora-fountain circle Mumbai**

Despite Indian cities having lower levels of car ownership and higher dependencies on public transport, off-street (plot parking) parking requirements within plots in general, are much higher than corresponding parking requirements of cities such as Hong Kong, Singapore. The current approach to parking in Indian cities is almost no management of on-street parking and increasing parking supply through building regulations and incentives.

The concept of managing parking for sustainable growth has now started to gain traction. Parking management is focused on travel demand management by regulating the availability of parking to induce a mode split.

3.6.b. Promoting alternate modes

Promote cycling as a feasible alternate mode of transport and include minimum bicycle parking requirements in the regulating plan for different land uses. Retail uses require a greater proportion of short-term bicycle parking near building entrances. Residential areas require long-term, secure parking that can be accommodated in bicycle sheds on ground floor. Offices require a mix of both short-term and long-term bicycle parking for both visitors and employees.

Image 21 | **Seater autos serving as Intermediate Para Transit in Kochi, India**

Codes should provide for PBS facilities at station areas and at major generators. Also consider, requiring major new developments to contribute to the bicycle sharing program.

Encourage use of IPT and provide for IPT infrastructure to enhance last mile connectivity from the FBC areas and provide IPT stands at important transit stations.

3.7 Contextual landscapes

The landscape plays a very important role in creating sustainable and environmentally friendly FBCs for the chosen area. The key to achieve an effective landscape for the project is by using native species of vegetation as a part of the project.

Image 22 | **Trees used as a pubic and a religious identity in a parking Bengaluru, India**

The landscaping for a project can vary all the way from a single tree to a huge green space for a city. The strategies and solutions must be developed based on careful understanding of these scales. The landscaping can be categorized into two components based on the nature of intervention.

3.7.a. Vegetation

It is recommended to identify the native species in a given region for planting both along the streets to shade the foot paths and in private properties to control the porosity of built form. The vegetation could be categorized as:

- Native Trees (large maturing, small maturing, canopied, lesser leaf fall) and Shrubs.
- Other forms of landscapes.

Image 23 | **Local tree species preserved in cubbon park, Bengaluru, India**

3.7.b. Landscape elements

This consists of all elements which complement and help shape the landscaping in a functional and aesthetic manner. Some of the landscape elements include:

- Tree guards
- Benches
- Bollards
- Lighting etc.

Image 24 | **A tree guard as a landscape element.**

Source – Safe Access Manual, WRI India

3.7.c. Sustainable measures

Considering the rapidly diminishing recourse due to intensive use and human negligence, there is a critical need to make the best of the resources available. Hence, the idea of Reduce, Reuse and Recycle, becomes prevalent in the context of developing landscapes in the city. A few measures include:

- Creating pervious surfaces to allow excess water to seep in
- Treating the earth to make the best use of natural slopes and drain patterns available
- Creating low cost sustainable measures to develop and maintain landscapes.

Image 25 | **Swales created on the edge of the road with local vegetation**

Source – ministryofthefence.me

3.8 Environmental and cultural inclusivity

Every city is made up of unique character and features and the historical and natural elements contribute very strongly to this character. The association of the community also plays a vital role in strengthening the identity of a place. The inclusion of these components should be the first step towards shaping the new development of the area.

Image 26 | **The Pushkar lake functioning as the key anchor in shaping the built form around.**

This calls for orienting attention toward historic monuments and heritage structures, leaving space at the ends of the visual axis to "frame" existing views and vistas. Natural views and vistas demand respect, assuring that buildings do not block major sight lines toward visual assets. The incorporation of these historic components into the spatial order of urban settings is promoted. Adherents promote the orientation and structuring of urban plans using local knowledge and meaning systems, expressed through art, urban space and architecture.

Steps towards the development of FBCs should include

- Preserving local history and traditions by Identifying historical settlements and the significant cultural values present in them.
- Recognizing these as Special Heritage Areas and collaborating with the competent authority to frame a special set of guidelines for them.
- Creating a dedicated institutional body that is responsible for the creation and implementation of the guidelines.
- Technical assistance through an established FBC team for the restoration/repair/ maintenance of traditional structures.
- Improving the existing traditional infrastructure systems to bring it on a par with the surrounding areas, with the objective of making the area a self-sufficient entity, while conserving the quality of life.
- To create a Heritage Cell embedded within the FBC cell, mandated to make an inventory of cultural, natural and built heritage

Institutional setup

The functions of the FBCs will include and not be limited to:

- Identifying and delineating the extents of cultural, natural, built heritage.
- Developing conservation plans.
- Facilitating framing of guidelines for the delineated areas.
- Advising the responsible authority on projects that come up for approval in the delineated areas.

Image 27 | **The local cultural and traditions adding a character to the city and the street.**

CHAPTER 4
METHODOLOGY

FBCs provide standards in the form of principles and codes as well as establish a methodology to help understand the overall design and implementation of the codes. Each of the stages mentioned below, act as a critical step towards achieving the desired output for any given project.

4.1 Scoping

The process of FBCs begins by identifying the typology of area to be chosen, the extent of coding required, type of stakeholders involved, communities to be included and how the process fits in with the regulatory frameworks.

Starting with the first step of assembling the team, the scoping sets the context for the entire process based on the review of existing trends of development in the potential areas. This stage consists of reviewing the current regulations and plans, determining the extent of the project to be taken up and delineating a conceptual FBC boundary based on preliminary understanding.

4.2 Documentation

Unlike conventional codes, FBCs are contextual in nature and demand a tailored approach in designing the project. Hence, collection of appropriate and validated data becomes a critical component of shaping the proposal. The process involves creation of base drawings and compilation of data for layers like topography, built form, infrastructure, socio-cultural factors and other relevant parameters. This is developed through available data and validation through site visits. The collected data hence helps in providing a direction for regulating the FBC.

4.3 Develop a vision

The FBC are developed through a people centric approach and are hence driven by the unique vision created by the community. This is the first step towards shaping the regulations. The potential stakeholders are identified and a kick off workshop/ discussion is organized with a planned agenda. The process helps derive the vision and identify the macro and micro elements of regulating FBCs. This is followed by a listing of potential guiding principles and code development for the chosen area. The visioning process hence leads to identification of potential projects and scope of work for the area under consideration. 4.4. Plan and design

Figure 32 | **Different stages of FBC process**

4.4 Plan and design

This is the core component of deriving the regulations where the documentation, scoping and visioning process is consolidated into Form – Based Codes which become applicable for the project area. The process involves finalization of the project scope, geographical extent, formulation of detailed codes and a regulating plan.

Image 28 | **Neighborhood visioning and design in process.**

4.5 Implement

This is a process of implementing the projects on the ground. The process involves community notification, development of technical drawings (tender and Good for Construction) as per the regulating plan specifications, financial and administrative approval process and finally, building on the ground. This process is largely dependent on the city's administrative and financial set up, as it involves coordination between multiple agencies at various levels.

Image 29 | **Evaluation of site during the implementation process**

4.6 Monitor and evaluate

While planning and implementation form the core activities in FBCs, it is equally important to track and evaluate projects post-implementation, given that it is a relatively new approach. It is also important to evaluate the impact of the project in the larger region/geography and formulate amendments, if needed, to retain its objective. The monitoring process hence, acts as an important part of the project where the design and performance parameters are benchmarked prior to the project design and the project performance is measured based on the same, post its implementation. This also helps in addressing any transformations that may occur in the project over time.

4.7 Scale up

Form-Based Codes are a new approach which are being tested in India. To successfully apply and scale this concept, documenting and adopting the learnings from the cities and projects that are early adopters, will be crucial to its evolution and further adoption. The documentation will help in the project methodology and learnings to be adapted in other projects in the city and the country. This will also provide room for revising FBCs to make them more appropriate to the context and thereby, scale.

CHAPTER 5
SCOPING

The FBC process begins with identifying a route map for designing and formulation of the codes. This is primarily determined by assessing if the city has the required resources to develop FBCs and the extent to which it is willing to adopt these regulations. The city needs to make a set of preliminary choices that will determine the process of drafting the codes and implementation mechanisms, including selection of the appropriate team, nature and extent of the project and the overall approach.

Scoping follows 5 important steps:

5.1 Assembling the team

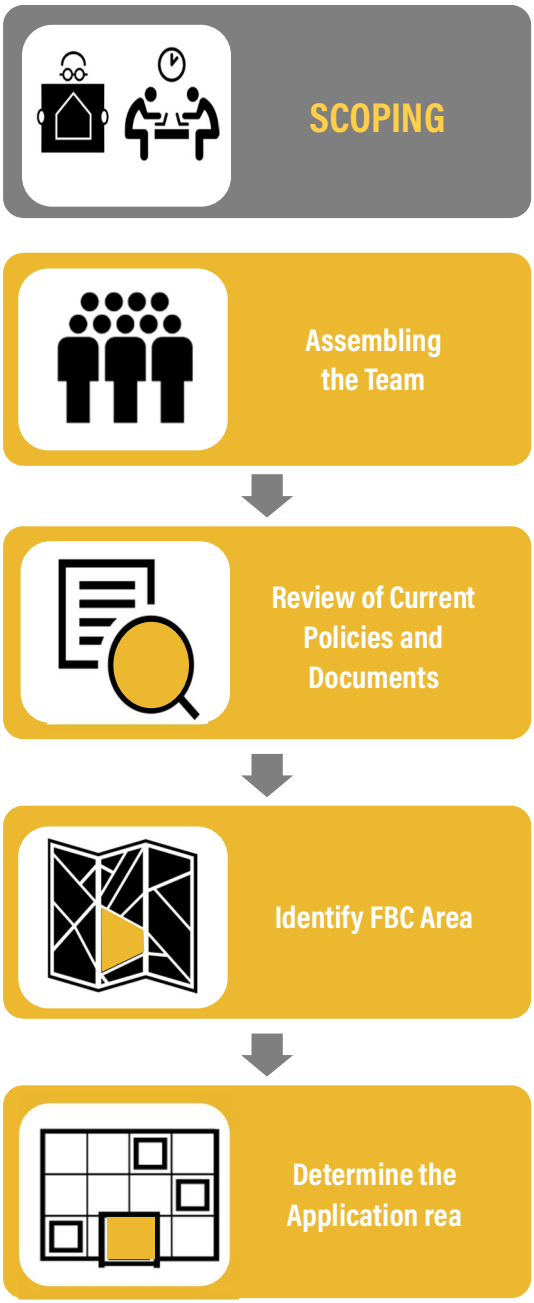
The first step involves formation of a specialized multi-disciplinary team that needs to work together to create and maintain the framework for development of the city.

This is done by involving key municipal departmental representatives (like urban development, public works, water supply, electricity, transit and other infrastructure) for stakeholder consultations during the visioning workshop and other stages of the code drafting process. Along with this, consultants with desired expertise are appointed for the development of the concept.

Depending on the nature of the project (e.g. redevelopment, heritage revitalization, greenfield, development around transit, etc.) the specialized professional disciplines could include (but not be limited to) the following – planning, architecture, urban design, landscape design, traffic and transportation, economics, housing, retail markets, finance, environmental resource analysis, civil engineering, graphic design etc.

All experts might not be required at every stage of the project. The anchoring FBC team along with the community, would lead the planning process; with experts to be hired based on the scope of work and funding available.

Figure 33 | **Different stages of scoping process**



5.2 Review of current policies and documents

Next, the team needs to review the existing planning mechanisms and regulations, such as the city's master plan, zoning/ development control regulations and other guidelines. This will help determine the extent to which FBC codes need to be detailed and could be adopted in the city in alignment with existing regulations.

Table 2 | **A list of documents to be collected by city and local institutions.**

SUGGESTED LIST (NOT LIMITED TO) OF BACKGROUND MAPS	
Exiting condition maps	Aerial pictures Topography map Street map Surveys GIS layers of information
Existing condition maps including plans and accompanying regulations	Regional plan City Master plan Zoning map and regulations Ward level plans and details Street hierarchy plan Parks and open space details Historic plans Infrastructure plans (water supply, sewage)

5.3 Identify FBC area

Once the city takes the decision to go ahead with the FBC process and creates the FBC team, the next stage is to identify the FBC area/zones for the project. This can be identified based on two main aspects - development typology and area characteristics.

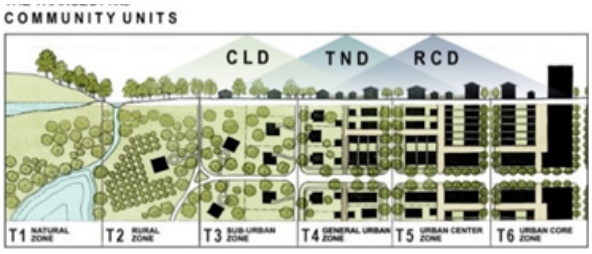
5.3.a. Development typology

The primary method of differentiating the different zones in an FBC area are transect codes.

Figure 34 | **City zoning using Transect codes**

An example of segregation of different areas in the city using the concept of transect zones has been shown below.

Transect zones are basically classified by the physical intensity of the built form, the relationship between nature and built environment and the complexity of the uses within the zone. This not only helps develop an identity and harmony but also brings continuity to the current growth pattern (Refer Image and Table 3)



Defining Zones (Transects) in FBC

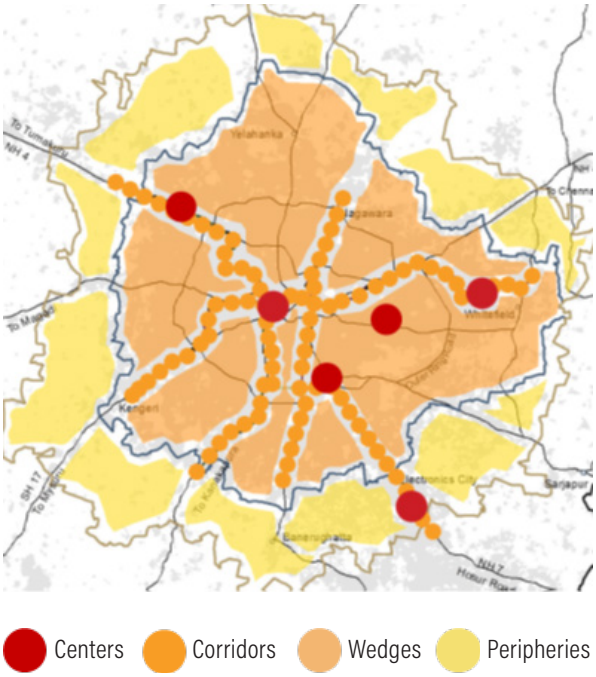
Zones in FBCs are determined by organizing human habitat in relation to development intensity which can range from low to high. It also considers the relation with natural environment and the nature of activities.

India due its rich history, diverse culture and geographies possesses a rich and functionally evolved built form and activities. The influences of western planning methods brought the idea of segregation of uses, however cities at present consist of a heterogenous built form, creating interesting typologies and morphologies based on varied development forces (institutions, religious, historic, economical etc.). Hence it is important to understand and determine the zones based on the current development trends.

Zones in the Indian context can be determined based on the state of growth, morphology and development influence in the city. These geographies can be categorized under four distinct zones-

Centers: areas in the city that are dense and owe their existence to historical significance or robust trade centers/ economic activity agglomeration hubs. Every city can potentially have one or more centers depending upon its geography and nature of activities.

Figure 35 | **Map indicating 4 types of Transect zones in the Indian context.**



Source: Cityscapes, WRI India

Corridors: Well-connected and diverse in character, these are areas along mass transit lines that typically extend from the center of the city to the periphery.

Wedges: Interstitial low-density/intensity areas between corridors where the neighborhoods are growing, evolving and stabilizing in terms of use and character

Peripheries: Under-served areas, typically outside municipal boundaries where unplanned growth is occurring

5.3.b. Area characteristics / features

This is determined based on significant characteristics of the area like economy, culture, history, functional activities, nature of built form, etc. If the area does not have a significant feature (such as in a greenfield project), the typology can be determined based on the significant land use. A set of constants could be identified and benchmarked, which could then be adopted into the FBC guidelines.

A suggestive list of area typologies includes (but are not limited to) the following:

Type 1 - Heritage precinct

These are areas of significant heritage character and generally, are seen in old cores of cities. Two such areas are-

Case 1- An area which consists of an important monument or monuments and surrounding development complementing the same. e.g.- axial street, market, built form etc.

Case 2- An entire precinct of historical significance, both in terms of heritage value as well as architectural character.

Image 30 | **Monument and city landmark at Indore old city core.**

Constants – heritage elements, building uses, street types, public chowks etc.

Type 2 – Transit area

These are areas which have mass transit systems as a main feature and anchor for the area. This in turn influences the nature and intensity of activities in the area as the surrounding streets and built form respond to the transit mode.

Image 31 | **Area around MG road metro station, Bengaluru**

Constants - streets which support both mass transit and pedestrian movement, facilities for feeder systems, supporting development

Type 3 – Ecological zone

These are areas of ecological value for the city like city parks, urban forests, water-bodies etc. The development around these zones should be appropriate, carefully integrated and low-impact in nature.

Image 32 | **Sanjay Van Mehrauli**

Source: Wikipedia

Constants – low height-built form, cycle and pedestrian friendly transport, no truck or heavy vehicular movement.

Type 4 - Function specific zone

These areas are determined by the primary function/activities in the area. Here, the development and streets are configured based on the dominant use or activity. e.g. – industrial towns, housing, commercial area, market streets, etc. For example, Jamshedpur is primarily an industrial town, where the area is designed keeping in mind the cycling needs of the working class.

Image 33 | **Jamshedpur city**

Source: Wikimedia commons

The development typologies and area characteristics determined, aid identification of potential FBC areas in a chosen city. This can also be strengthened further through analysis of city data and the city's development vision.

5.4 Determine the application area

To apply the guidelines and regulations to the chosen FBC area, the scale of intervention and degree of change needs to be determined. This will guide the design process for the FBC area. The extent of area to be taken up by the city for application of FBC will not only depend on the city's or public's vision, but also on the need to revitalize particular areas, or to take advantage of opportunities due to changes in land ownership, improvement in city infrastructure or availability of funding.

Table 3 | **Showing identification matrix format**

DEVELOPMENT TYPOLOGY ↓ / AREA TYPOLOGY →	HERITAGE AREA	TRANSIT ZONE	ECOLOGICAL ZONE	FUNCTION SPECIFIC AREAS	OTHER CONTEXT SPECIFIC AREA
Centers					
Corridors					
Wedges					
Peripheries					

Figure 36 | **An FBC boundary demarcated around a transit station**

Source - Towards safer and walkable Bengaluru, Indiranagar Accessibility project, WRI, India

Cities can also opt to implement FBC in smaller demonstration areas in the form of pilot projects. This will provide an opportunity for elected representatives and government officials to gain experience in the administration and implementation of FBC, before applying the techniques to larger areas or the entire city.

Degrees of change

An important aspect of FBCs is determining the extent of physical change that is desired over time in different areas of the city. FBCs are fundamentally about managing change in the city in a manner that does not take away, but rather enhances, the essence of the place.

The following list identifies the continuum of change that may be desired, and the community may wish to effect through FBCs.

Preservation - Generally applicable to historic areas and city cores where the community wants to retain the existing character of the place with a distinct identity. This may need adaptive reuse and sensitive integration of new development to retain the character of the place.

Preservation and Enhancement – The community wants to retain the established character in one or more areas, but is interested in carefully conceiving targeted enhancements, in private property developments or in the public realm.

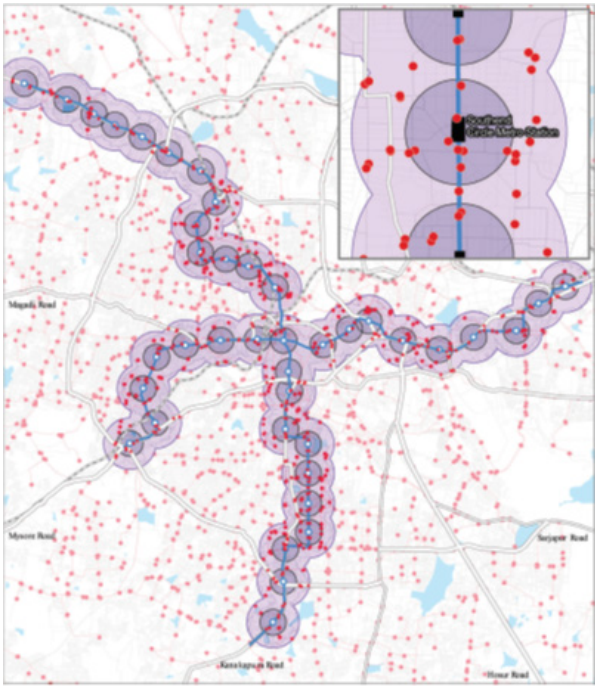
Evolution – The community would like to see a physical change in the area but controlled through regulation to achieve the desired outcome. Generally applicable to urban areas outside city centers.

Transformation – The community wants change that is occurring rapidly to be streamlined and is willing to adapt to this transformation. This is generally applicable in new growth areas where along with guiding growth, there is a need to impart character to the place.

The different scales of interventions can be determined by the extent of change desired, the geographical setting and the city's vision.

- **City level** – These can be larger city level interventions of developing codes for streets and streetscape design, development along mass transit systems, public spaces, historic or iconic landmarks and their surroundings etc. The interventions can also be broken down to smaller scales by creating zones in the city and creating regulating plans for the same.
- **Area level** – These are determined for areas of specific significance, single or multiple typologies of urban form. They can extend to a neighborhood or ward level depending on the urban character of the area and codes can be developed based on the desired vision for the area.

Figure 37 | **FBC project areas at city level and area level. Case of Bengaluru, India.**



Source: Cityscapes, WRI India

- **Project or site level** – These contribute to demonstrating the smaller, yet effective application of FBC. Due to limited scale, the regulating details for the building form, public spaces and activities, can be very precise. These small-scale interventions also serve as pilots to test the feasibility and impact of the FBC process.

CHAPTER 6
DOCUMENTATION

Documentation is an important step after scoping, as it forms the basis for detailing FBCs for the area. Documentation helps reintroduce the urban design process at two scales. First, at the macro scale to understand the existing condition and plan to inform the Vision and Regulating Plan framework. Secondly, at the micro scale, to benchmark the basic elements of the FBCs. The process needs to be validated through relevant documents, site visits and stakeholder consultation.

By the end of the documentation process, the team will have the following products:

- Existing conditions base map
- Existing framework diagram, showing neighborhoods, wards and corridors
- Existing zones matrix showing various zones
- Presentation boards for micro-elements (thoroughfares, building types, frontage types etc.) including photos, maps, and measurement matrices.

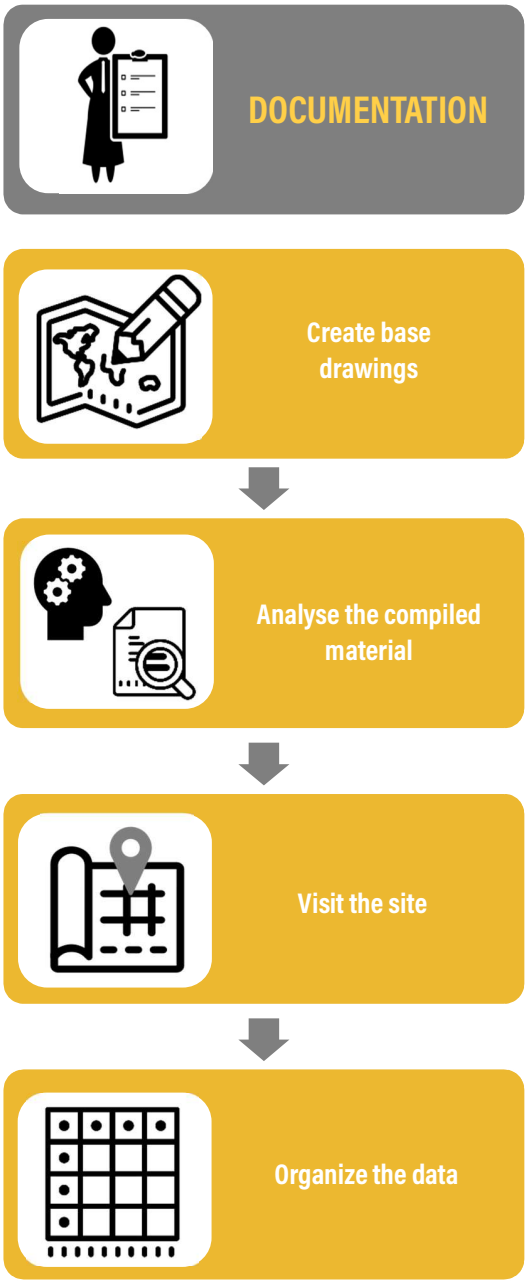
6.1 Create base maps

Once all the data is gathered, it should be organized in the form of base maps, drawings and imagery. As a first step, the team analyses the existing city level maps to understand the larger urban structure and geographical conditions to help determine the areas to focus on during site visits. Post finalization of the areas, the team documents detailed components of the FBC area. It is important for the data to be validated and updated based on ground conditions, to achieve appropriate results.

The team should begin by compiling the existing conditions base maps with the following critical information:

- Topography
- Existing road widths
- Plot lines
- Building footprints

Figure 38 | **Stages of documentation process**



- Infrastructure facilities like water supply and sewage lines, power lines, storm water drains leadings to waterbodies etc.
- Water-bodies, open spaces, parks and other natural features that will impact development.

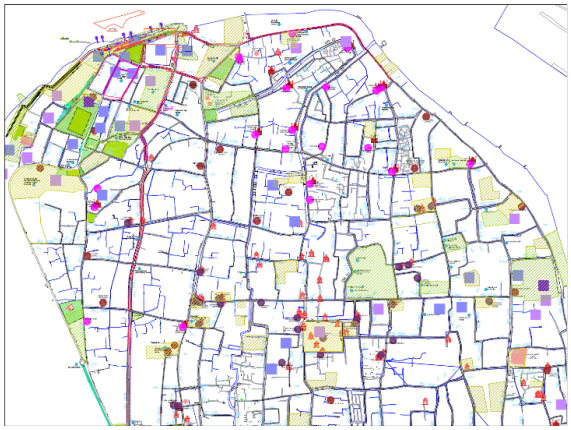
Based on the existing conditions data, a set of analysis drawings can be developed, which can help provide direction for determining the potential FBC areas.

Image 34 | **Documentation of site through mapping and photography**

Source: Shaping Hubli-Dharwad as a connect city, WRI India

- Ground plan (with only building footprint layer) – to help analyze the development patterns, urban typologies and morphologies.
- Historic evolution/growth maps – to understand the degree and type of urban growth over time
- Slope analysis maps – to understand the impact of natural features on the development

Figure 39 | **Total Station Survey (TSS) drawing of Fort Kochi area**



Source: WRI, India

Once the FBC area is determined, the team should focus on developing a set of detailed maps which serve as benchmarks and references for the coding process. The team should build upon the existing maps to develop proposals for FBCs. These base drawings and data must be developed accurately based on effective methods like GIS mapping, surveys, collecting and validating data on ground. A set of layers for documentation of FBC area include (but are not limited to):

- Road networks and hierarchy
- Land uses and plot lines
- Building footprint, heights, use and type
- Vegetation – trees and other greens
- Open spaces
- Footpaths and other street infrastructure
- Transport infrastructure – bus stands, railway/metros stations, parking etc.
- Water systems – existing water bodies, connecting channels
- Sewage and storm water drain systems

Figure 40 | **Documentation of local built form typology**

Image 35 | **Documentation of built form through mapping and photography process.**

Source: Shaping Hubli-Dharwad as a connect city, WRI India

6.2 Analyze the compiled materials

Once all the data is compiled, it is important for the team to analyze the data to take next steps in the FBC process. The analysis should begin by asking the following questions:

- What are the existing development patterns and zoning classification that suggest centers or focal points and define edges?
- Which are the regional and local connectors (roads)?
- Which are the pedestrian or non-motorized movement corridors in the area?
- Which areas are currently regulated to undergo major changes in development and use?
- Which places lend identity and unique character to the area? Are there any historic or environmentally-sensitive elements?
- Where do building or street patterns change and what might be the reason?
- What is the reason for change in development patterns over time?
- Are there any specific evolving development patterns?
- Which neighborhoods would benefit from the preservation of existing character?
- Which corridors function well and do not need to change?
- Are there clear distinctions in the nature of the urban fabric between neighborhoods?
- Which transect levels exist in the area?
- Which areas need a visit to answer or confirm the answers to any of the questions above?

The given list of questions is indicative, and stakeholders may choose to add to the same. By the end of this process the team analyses and creates a draft list of places which have the need or potential for application of FBC.

6.3 Visit the site

Once adequate data and maps are compiled, the team should undertake site visits. There are three major reasons of doing so:

- To document the existing macro elements: characteristics of the area which make it unique. These vary from place to place due to varying geographical setting. local economic and socio-cultural conditions or other influencing factors. The documentation and analysis should inform the team on how to respond to and reinforce these characteristics.
- To establish the important micro elements: determining local characteristics at a smaller scale. These include building types, frontage types, street typology, architectural styles, public space types, etc.
- To refine the list of applicable zones

Image 36 | **Site visit during documentation process**

Considering different scales, the following aspects also need to be documented -

i. Neighborhoods

This includes location and structure of existing neighborhoods and new evolving ones. The boundaries could be defined based on existing street networks, property lines of changing urban forms, natural boundaries like rivers, drains, etc. and/or major transit lines.

Once the existing neighborhood structure is documented, determine the transect levels of each neighborhood. From there on, neighborhoods can be broadly classified under these three categories.

- **Preserve:** A neighborhood whose size and character must be preserved
- **Preserve and enhance:** A neighborhood that needs to be strengthened
- **Evolve and transform:** A neighborhood that needs to be changed to accommodate the desired change in the community.

ii. Wards

Wards constitute the administrative boundaries comprising of a cluster of Neighborhoods. Document the following components to determine the character of the wards:

- Important elements or activity centers, like educational campuses, religious institutions etc.
- Identify key functional anchors like market complexes/streets, transit hubs etc.
- Identify different functional typology clusters.

iii. Corridors

The typology of each corridor on the existing base map should be identified, along with its relationship and impact on adjoining neighborhoods. The approach and movement patterns (vehicular, pedestrian share) along the corridors should be mapped out and documented.

The final set of documents should include existing conditions with base maps, images, list of macro and micro elements.

6.4. Organize the data

Post compilation and analysis, the final documents will include framework diagrams and photo sheets of each transect level.

The framework diagrams would include (but not be limited to) separate mapping of:

- Existing neighborhoods and wards
- Existing corridors
- Other special features / conditions

Once the framework diagrams are complete, the must be compiled along with photos taken and macro elements listed.

The existing framework diagram should be reviewed for various zones noted for each neighborhood. This is used to help create photo sheets for each zone type, including photos of various neighborhoods.
The list of micro elements are to be identified and pictures compiled and each of the elements indicated on a sheet.

CHAPTER 7
DEVELOP A VISION

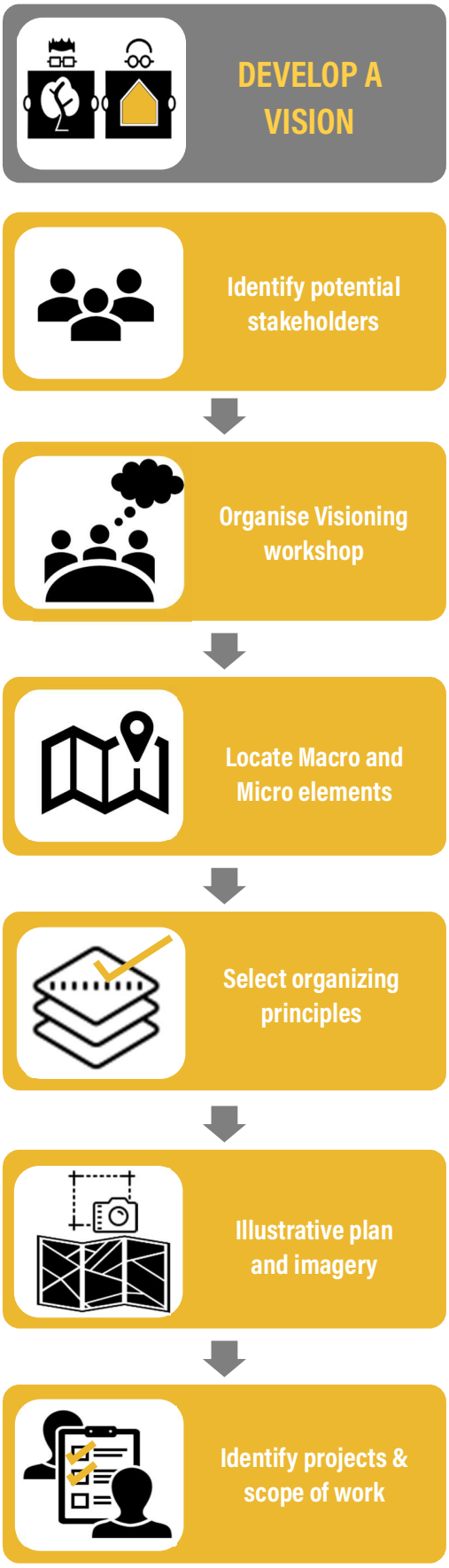
Developing a vision is a critical stage in the whole FBC process and it includes intensive community participation as part of the planning, so the project vision is contextual and feasible. This exercise aims to provide the following support to communities:

- Help formulate a vision based on ground realities and community needs through public participation.
- Help present and process prioritized proposals to government and key decision makers to facilitate design and implementation.
- Facilitate the overall process by collaborating with different neighborhoods.

Validate the documentation process:
By initiating a focused discussion about the neighborhood, the visioning process seeks to increase awareness about local conditions, opportunities, and influential actors/community champions. This also helps the team to validate the areas chosen for the project, by discussing the same with the community.

The visioning workshop encourages people to develop strategies by identifying constraints and assets within their community and making decisions together. This engenders collaborative creation of priorities for the neighborhood through community participation.

Figure 41 | **Different stages of vision development process**



7.1 Identify potential stakeholders

Identification of stakeholders in the early stages of the project helps validate the ideas for development of FBC codes and helps reduce challenges and resistance during implementation process. The workshop is organized for interested and concerned citizens who are committed to improving their neighborhoods. In turn, it also acquaints them with the FBC process and how it could impact their neighborhood or a group of adjoining, interdependent neighborhoods, sharing common concerns. This could include proactive members of varied perspectives and age groups like –

- Civil society organizations
- Citizen groups and resident welfare associations
- Traders' associations & developer groups
- Panchayats from urban villages or Lal Dora areas
- Schools, student groups
- NGOs working in the area
- Religious groups like madrasas, temple committees
- Media representatives

7.2. Visioning workshop

The visioning workshop is a significant milestone in the FBC process and marks the starting of the stakeholder consultative process. The organizing team, should first, provide a brief insight about form-based codes and the benefits to stakeholders through the process.

Tools like maps, presentations, interactive activities, discussions, etc. can be used to communicate with the stakeholders. This helps gain inputs which aid the translation to strategies for the chosen area.

The findings of the existing conditions assessment should be presented to participants. After the presentation, the organizing team should elicit views from the community on what should be retained, enhanced or changed and what is desired. These inputs can inform the desired vision. Based on community inputs the development vision of the FBC area can be derived.

Image 37 | **A Neighborhood visioning workshop through interactive activities.**

Source: WRI India

7.3. Locate Macro and Micro elements

The existing Framework Diagrams, photo sheets, macro and micro findings of the site should be presented to the audience.

This helps determine if significant elements are missed out during documentation. The team should also gather suggestions on which areas are successful and which ones must be improved.

At the macro level, maps of larger areas must be presented to the community, inviting suggestions on the important street networks they want to improve and elements they want to retain as constants (for e.g. public buildings, landmarks, transit nodes, open spaces etc.). This is followed by the marking of areas they want to preserve/improve or that might be assets to the community.

Once this is determined, the next stage is to identify the micro elements which define the character and function of the place. These could be area functionality, building types, architectural character, etc.

All the inputs should be captured to develop a concept plan and proceed to the next stage of identifying the key principles and potential FBC codes.

Image 38 | **A visioning workshop in a neighborhood in Bengaluru.**

Workshop 2: Visual Preference Survey:

A Visual Preference Survey was administered where community members were asked as to what kind of built form/development they would like to see in their neighbourhood. Below are responses to the same.

Image 2.36 Workshop Session 2 in progress

Typology	Most Preferred	Least Preferred
RESIDENTIAL TYPOLOGY	Duplex 	Apartment 
APARTMENT TYPOLOGY	Multi-family (3-4 storeys with retail on GF) 	Multi-family (high-rise) 

Source: Exploring Form-Based codes, CiSTUP, Bengaluru

7.4. Select organizing principles

Based on the concept plan, stakeholders need to select the organizing principles for the FBC, which will help them derive the regulating plan which will be binding for the development of the FBC area.

The principles (mentioned in section 3) are then presented to the stakeholders, who are asked to choose those that will best cater to the improvement or enhancement of chosen areas, based on their macro and micro elements identified.

For example, adopting 'cultural and environmental inclusivity' and 'complete streets' as the principles for heritage cores, with an aim to preserve the existing character and enhance walking conditions.

The principles mentioned in Chapter 3 are re-listed below for reference:

- Coordinated built-form
- Complete streets

Figure 42 | **An illustration of different guiding principles adopted in the neighborhood development.**

Source: Shaping Hubli-Dharwad as a connect city, WRI India

- Accessible public spaces
- Effective mobility management
- Contextual landscape
- Environmental and cultural inclusivity

7.5. Illustrative plan and imagery

Once the principles are shortlisted, the next stage is to earmark potential FBC zones and develop the plan into an illustrative plan. This could be at the street scale, neighborhood scale or city scale. This can be done by presenting images and drawings which are indicative of FBC codes (refer section 3)

The stakeholders can then choose from the list of codes mentioned. These could be further discussed and prioritized based on their feasibility and applicability to the given context.

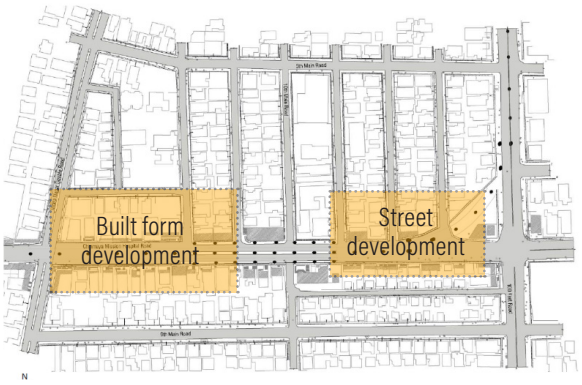
7.6. Identify projects and scope of work

Based on the illustrative Plan created along with stakeholder inputs (i.e. starting from visioning workshop and the subsequent stakeholder interactions till the formulation of illustrative plan), priority projects are identified (if possible) and the scope of work is defined.

Building on local knowledge of the area, neighborhood needs must be identified, and priorities established. This leads to viable local development options through community participation, thus making it an initiative "for the people and by the people".

Through each of these steps, the consultation process provides a platform for engaging communities in the planning process that culminates in a shared vision and multiple achievable and measurable goals. The process promotes collaboration between the community, government officials and developers/ implementers that is driven by the knowledge, priorities and strategies co-created by the participants.

Figure 43 | **Identification of extent and scope of projects.**



Source: WRI India

CHAPTER 8
PLAN AND DESIGN

Planning and designing in FBCs form a core activity that is key to determining outcomes. The following sections outline the steps involved-

8.1 Assemble the Vision Plan

All the products from the visioning workshop must be gathered and assembled into a single document. The vision plan takes many forms and includes a variety of information, depending on the intention and scope of the overall project, of which FBCs may be only a piece. To be a robust base for FBCs, the vision plan should include the products listed below.

- Indication of FBC area
- Details of existing macro and micro elements.
- Organizing principles for FBC intervention
- Overall vision w.r.t. FBC application
- Illustrative plan

8.2 Delineate the FBC boundary

The first step is to demarcate the firm boundary for the regulating plan using the illustrative plan and validate the same using macro elements (neighborhoods, districts and corridors) established during visioning process. Based on community surveys, the focal point in the chosen neighborhood is identified. An applicable zone and typology of the area (refer table 3) must be selected, using the existing background maps like, land use, and the illustrative plan. The FBC zone boundary can be demarcated based on the following:

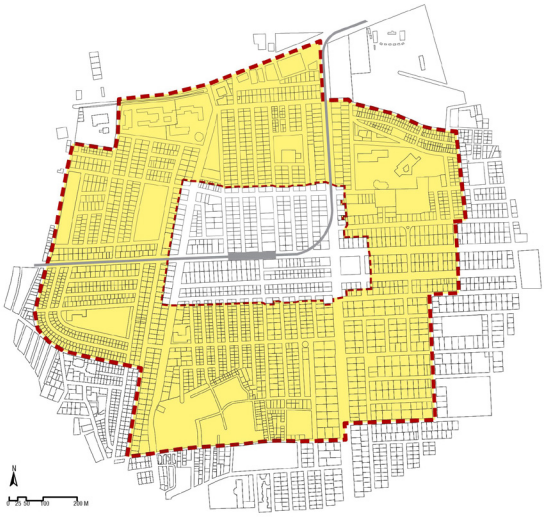
- Existing property lines,
- streets and public spaces boundaries,
- Nodes,
- landmarks etc.

It is often easier to begin with smaller areas and then scale up.

Figure 44 | **Stages of plan and design process**

Once the zone and typology of the FBC area is determined, the extent of FBC intervention must be determined.

Figure 45 | **Final delineation of FBC Zone boundary**



Source: Accessibility project for Indiranagar, Bengaluru, WRI India

This is done based on the following parameters:

- The extent of intervention required,determined by community vision.
- Funding and time available.
- Administrative and technical support available.

8.3 Apply the Organizing Principles

Using the finalized area boundary and inputs on organizing principles provided during the visioning process by stakeholders, the final set of organizing principles along with its elements are listed. These principles are contextual to development typology/ zone and area typology that is applicable to the earmeaked FBC area (refer table 3). The final set of principles along with its elements as determined, aid in the formulation of codes.

8.4 Develop the Zone Regulation Matrix

A zone vision sheet must be created, with all the zones and typologies in the format as given under table 3. and the code details filled for each regulation. Once all the regulations are filled, based on the data collected and analyzed, the regulations and codes must be reviewed to determine if any of them have to be revised. The codes are calibrated based on the nature of change envisioned in the vision plan and on as received the inputs from the stakeholders. Refer Table 2 for an example of Zone regulation matrix.

8.5 Formulation of Codes

Based on the selected list of organizing principles and their elements, detailed regulations and codes are developed for all the elements under each principle for enabling its onground application. These developed codes are also spatialized on the earmarked FBC zone plan. At this point the regulating plan starts to take its final form.

8.6 Finalizing Outer Area Boundaries

At this point, the earmarked boundary of the FBC area is reviewed and the final alignment of the boundary is determined, formulating the final FBC regulating plan zone. At this point, if needed, some existing zones may be considered for expansion to encompass additional areas, or excluded, or new zones created. Once all the outer edges have been resolved, the first drafts of Zone Regulation Matrix and the Regulation Plan are complete.

8.7 Finalize and Compile the Regulating Plan and Codes

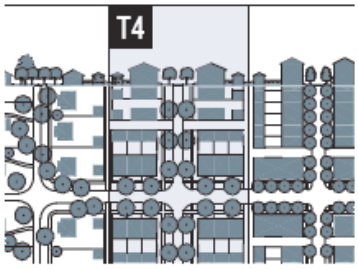
Once all the Regulating plan with respective zones regulation matrix including codes are prepared for the given FBC regulating area, this data is compiled in a formal document. An adequate amount of time is required to complile the data with all the supporting drawings, images and appendices

Table 4 | **An example of creation of Transect Regulation Matrix.**

	ZONE 1	ZONE 2	ZONE 3
a. RESIDENTIAL	**Restricted Residential:** The number of dwellings on each Lot is restricted to one within a Principal Building and one within an Accessory Building. With 2.0 parking places for each. Both dwellings shall be under single ownership. The habitable area of the Accessory Unit shall not exceed 440sf, excluding the parking area.	**Limited Residential:** The number of dwellings on each Lot is limited by the requirement of 1.5 parking places for each dwelling, a ration which may be reduced according to the shared parking standards (See Table11).	**Open Residential:** The number of dwellings on each Lot is limited by the requirement of 1.0 parking places for each dwelling, a ration which may be reduced according to the shared parking standards (See Table11).
b. LODGING	**Restricted Lodging:** The number of bed-rooms available on each Lot for lodging is limited by the requirement of 1.0 assigned parking place for each bedroom, up to five, in addition to the parking requirement for the dwelling. The Lodging must be owner occupied. Food service may be provided in the a.m. The maximum length of stay shall not exceed ten days.	**Limited Lodging:** The number of bedrooms available on each Lot for lodging is limited by the requirement of 1.0 assigned parking places for each bedroom, up to twelve, in addition to the parking requirement for the dwelling. The Lodging must be owner occupied. Food service may be provided in the a.m. The maximum length of stay shall not exceed ten days.	**Open Lodging:** The number of bedrooms available on each Lot for lodging is limited by the requirement of 1.0 assigned parking place for each bedroom. Food service may be provided at all times. The area allocated for food service shall be calculated and provided with parking according to Retail Function.
c. OFFICE	**Restricted Office:** The building area availale for office use on each Lot is restricted to the first Story of the Principal or the Accessory Building and by the requirement of 3.0 assigned parking places per 1000 square feet of net office space in addition to be parking requirement for each dwelling.	**Limited Office:** The building area available for offie use on each Lot is limited to the first Story of the principal building and/or to the Accessory building, and by the requirement of 3.0 assigned parking places per 1000 square feet of net office space in addition to the parking requirement for each dwelling.	**Open Office:** The building area available for office use on each Lot is limited by the requirement of 2.0 assigned parking places per 1000 square feet of net office space.
d. RETAIL	**Restricted Retail:** The building area available for Retail use is restricted to one Block corner location at the first Story for each 300 dwelling units and by the requirement of 4.0 assigned parking places per 1000 square feet of net Retail space in addition to the parking requirement of each dwelling. The specific use shall be further limited to neighborhood store or food service seating no more than 20.	**Limited Retail:** The building area available for Retail use is limited to the first Story of building at corner locations, not more than one per Block, and by the requirement of 4.0 assigned parking places per 1000 square feet of net Retail space in addition to the parking requirement of each dwelling. The specific use shall be further limited to neighborhood store, or food service seating no more than 40.	**Open Retail:** The building area available for Retail use is limited by the requirement of 3.0 assigned parking places per 1000 square feet of net Retail space. Retail spaces under 1500 square feet are exempt from parking requirements.

Source: Smartcodes 9.2

Figure 46 | **An example of formulation of codes for built form of a Transect zone.**



(see Table 1)

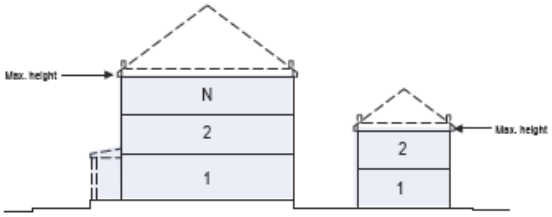
I. BUILDING FUNCTION (see Table 10 & Table 12)	
Residential	limited use
Lodging	limited use
Office	limited use
Retail	limited use
k. BUILDING CONFIGURATION (see Table 8)	
Principal Building	3 stories max, 2 min
Outbuilding	2 stories max.
f. LOT OCCUPATION (see Table 14f)	
Lot Width	18 ft min 96 ft max
Lot Coverage	70% max
i. BUILDING DISPOSITION (see Table 9)	
Edgeyard	permitted
Sideyard	permitted
Rearyard	permitted
Courtyard	not permitted
g. SETBACKS - PRINCIPAL BUILDING (see Table 14g)	
(g.1) Front Setback Principal	6 ft. min. 18 ft. max.
(g.2) Front Setback Secondary	6 ft. min. 18 ft. max
(g.3) Side Setback	0 ft. min.
(g.4) Rear Setback	3 ft. min.*
Frontage Buildout	60% min at setback
h. SETBACKS - OUTBUILDING (see Table 14h)	
(h.1) Front Setback	20 ft. min. + bldg. setback
(h.2) Side Setback	0 ft. min. or 3 ft at corner
(h.3) Rear Setback	3 ft. min
j. PRIVATE FRONTAGES (see Table 7)	
Common Lawn	not permitted
Porch & Fence	permitted
Terrace or L.C.	permitted
Forecourt	permitted
Stoop	permitted
Shopfront & Awning	permitted
Gallery	permitted
Arcade	not permitted
Refer to Summary Table 14	
PARKING PROVISIONS	
See Table 10 & Table 11	

*or 15 ft. from center line of alley

"N" stands for any Stories above those shown, up to the maximum. Refer to metrics for exact minimums and maximums

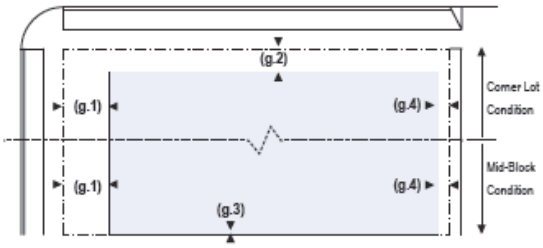
BUILDING CONFIGURATION

1. Building height shall be measured in number of Stories, excluding Attics and raised basements.
2. Stories may not exceed 14 feet in height from finished floor to finished ceiling, except for a first floor Commercial function which must be a minumum of 11 ft with a maximum of 25 ft.
3. Height shall be measured to the eave or roof deck as specified on Table 8.



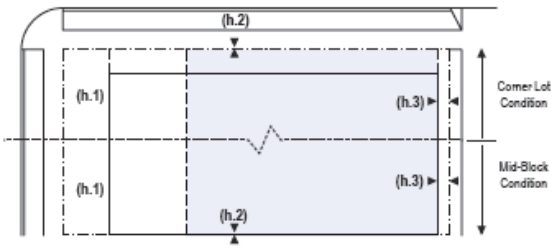
SETBACKS - PRINCIPAL BLDG

1. The Facades and Elevations of Principal Buildings shall be distanced from the Lot lines as shown.
2. Facades shall be built along the Principal Frontage to the minimum specified width in the table.



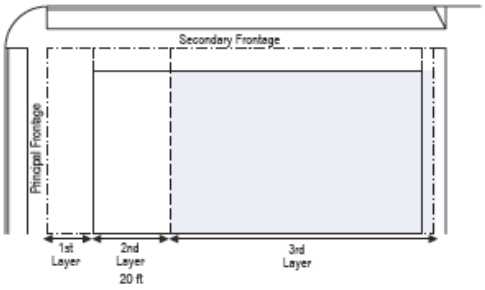
SETBACKS - OUTBUILDING

1. The Elevations of the Outbuilding shall be distanced from the Lot lines as shown.



PARKING PLACEMENT

1. Uncovered parking spaces may be provided within the third Layer as shown in the diagram (see Table 17d).
2. Covered parking shall be provided within the third Layer as shown in the diagram (see Table 17d).
3. Trash containers shall be stored within the third Layer.



zone. Source: Smartcodes 9.2

CHAPTER 9
IMPLEMENT

9.1 Administration

For the successful implementation of FBCs, an effective and dynamic institutional setup is required. This section details out the proposed institutional setup along with roles, responsibilities and approval timelines. In addition to the standard administration process illustrated in the following sections, listed below are two modalities by which FBCs can be administered:

i. By-Right Option (administrative review):

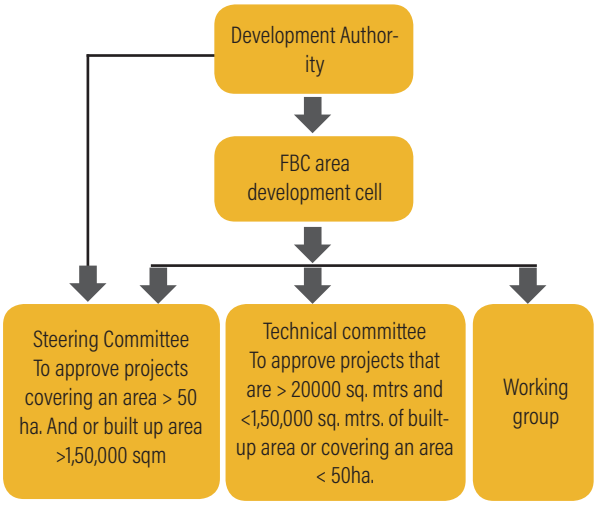
Projects on sites less than 400 sq. mts. have the right to build when they meet all standards of the Code. Proposals deviating from the provisions of FBC may submit a revised proposal for review or seek approval through Special Exception/Use Permit.

ii. Special Exception/Use Permit Option:

This shall be required for sites over 4000 sq. m. This process provides an opportunity for community inputs and finetuning of the development proposal to address issues that may not have been contemplated by the Code. It also ensures that there is an opportunity for appropriate deviations from the Code consistent with the Municipality's goals and plans. Further, it sets forth limitations on what regulations may be modified by the approval of a use permit.

9.1.a. Institutional setup

Figure 47 | **Institutional setup for approving FBC projects.**



9.1.b. Roles, responsibilities and approval timelines

The development authority shall oversee the development and implementation of the FBC Zone Plans. The role and responsibilities of each agency is listed below-

i. The Development Authority shall:

- Establish an FBC Area Development Cell for all FBC projects.
- Appoint the Head of Department for the constituted cell, who shall be an Additional Commissioner Level personnel and shall appoint a Director for the Department.
- Constitute a Steering Committee and a Technical Committee as part of the Special Area Development Cell.

ii. FBC Area Development Cell shall:

- Create a ring–fenced fund for FBC zones, earmarked special areas and manage the disbursement.
- Formulate the working groups.
- Be responsible for conducting stakeholder and citizen consultations.
- Adopt a single window clearance including all types of clearances (i.e. no separate environmental clearance or pollution control board clearance will be required and shall be facilitated through an MoU between the Development Authority and Concerned Environment Clearance Authority).
- Create an online portal for uploading all necessary formats, regulations circulars, etc. that can be refereed by the stakeholders at any given time.
- Accept the submission online based on given formats and update the project details along with status regularly, so that it can be refereed by the stakeholders at any given time.

iii. The Steering Committee shall:

- Meet once every month for assessing and approving scheduled projects.
- Be responsible for clarifying or cross checking any query that arises during the assessment of projects from the working group.

- Call the proposal submitting entity within 15 working days for any required clarifications. Post this timeline, the submission shall be considered complete in all respects.
- Ensure the approval is issued within 60 working days from the date of submission of the proposal to the Special Area Development Cell.

iv. The Technical Committee shall:

- Be chaired by the FBC Area Development Cell head.
- Have representation from the development authority, public works departments, municipal authority, fire department, State or center environment department, pollution control board, transport department, NHAI (if applicable), flood and irrigation department, and traffic police.
- Meet every week for assessing and approving the scheduled projects.
- Be responsible for clarifying or cross checking any query that arises during the assessment of projects from the working group.
- Call the proposal submitting entity within 15 working days for any required clarifications. Post this timeline, the submission shall be considered complete in all respects.
- Ensure that the approval is issued within 60 working days from the date of submission of the proposal to the FBC Area Development Cell.

v. The Working Group shall:

- Be chaired by the Director of the FBC Area Development Cell.
- Be responsible for assisting FBC Area Development Cell in conducting stakeholder consultations.
- Have representation from Ward Councilors and citizen representatives on invitation basis, depending on the nature of the project.
    - If any FBC Zone has two or more than two ward areas, then the constituted working groups shall have representation from Ward Councilors and citizen representatives of all the wards that are part of the FBC Zone.
    - The Ward Councilors and citizen representatives shall be invited only for the working group meetings and not for Technical Committee meetings or Steering Committee meetings.
- Representation from public works departments, municipal authority, fire department, state or center environment department, pollution control board, transport department, flood and irrigation department, and traffic police shall be on invitation basis.
- Working group can outsource the preparation of plans through consultant appointment by following process as established by the Development Authority.

9.2 Action Plan

9.2.a. Plan of Action - Strategize phases of implementation

The implementation of urban design and planning projects entail large funding and long timelines. The implementation process hence needs to be phased to achieve outcomes at desired intervals. This also helps manage the funds and the staff time better, in turn, helping achieve impacts on ground. Each phase can be given part approval by the concerned authorities, and can also be given a part completion certificate, depending on the nature of the project.

9.2.b. Institutional Coordination

For the successful implementation of FBCs, institutional coordination is critical. The table below broadly illustrates this. (Reference to the table in the next page)

9.2.c. Timeline and Approval Process

This is covered in above sections. However, details for approval processes based on the public agency project, private agency project and PPP project may be detailed, in addition to what is mentioned above.

9.2.d. Prerequisites for FBC proposal submission

The consultant and the concerned implementation team need to abide by a set of requirements to fulfill the approval process of FBC project.

Submission Requirements include (but are not limited to):

- Topography, site plan, building, tree, subdivision and infrastructure details
- Physical relationship between proposed development with other lots/buildings, adjacent to and across the street
- Any other necessary plans -- landscape, lighting, parking, architectural, area calculations, etc.
- Mandatory TIA for any project more than 20,000 sq. m.
- GRIHA/LEED or any other sustainability scorecard
- Parking requirement statement
- Proposed signage
- Street cross-sections and plans

9.3 Implementation Strategy

Achieving the vision articulated in a plan will occur incrementally over time through the combined efforts of the local government, private property owners, residents, developers, and many others. This implementation chart below (reference table) specifies steps that can be taken by various public and private bodies so that the desired future envisioned in this plan may be realized. The lead responsible agency and tentative time frame is also included. The strategies are sequential and correspond to the steps involved in developing FBCs. This allows one to track the progress of the plan over time.

Some strategies may be physical such as the addition of pedestrian connections or park enhancements. Other recommended strategies could be organizational, such as maintaining public recreation facilities for public use or encouraging low impact design. Some may even involve changes to existing policies, regulations and/or practices.

The implementation strategies do not imply a public or private sector commitment. The Urban Local Body (ULB) is not asked to adopt this implementation chart. However, many of the strategies in this section will require future action by municipal officials and will be presented to them for approval as needed, on a case-by-case basis.

9.4. Financing FBCs

9.4.a. FBC financing framework

The successful implementation of FBCs requires significant public and private sector investments. With growing interest in India for adopting FBCs to solve issues in existing and newly emerging urban areas, it is important to understand that its implementation requires a bottom-up approach for achieving the desired development outcome. It will also require cross-disciplinary integration and partnering at various tiers of the Government, its departments, along with the involved community.

The project proponents must identify all the components that require financing, the best model that could benefit them, the role of all stakeholders in the financing process and most importantly, the possible changes to the finance model if the project deviates from what was originally planned. The financials of the project must be scrutinized for being realistic and whether the project is feasible. A “business model framework” to support building capacity around the key elements of FBC investments and facilitating dialogue between key strategic actors on the options available, current gaps, and potential strategies for developing bankable models for FBC investments also need to be explored.

9.4.b. Potential funding and financing tools (Private and public)

Between the local, state and central governments, transit agencies, business community, philanthropy leaders, community and community-based organizations, developers and the financial institutions that provide resources and support to the FBC process, the amount of capital available for development is huge but it needs to be properly channelized. Hence, finance mechanisms such as land value capture should be explored and incorporated during the planning process so that it can be successfully used to facilitate FBC implementation. Further, the roles and responsibilities of the stakeholders should be structured so that fund channeling and governance structures are in sync.

Table 5 | **Institutional Coordination And Tasks At Different Stages**

PROJECT STAGES	TASKS	NODAL/ ANCHOR AUTHORITY	SUPPORT AUTHORITY	EXECUTION AUTHORITY
Administration	Developing a special team for FBC management and approval process which involves representatives from all the departments (water supply, urban development, fire, electricity etc.)	Urban development authority	All the concerned departments	Urban development authority
Review and Assess	**Mapping** • Map land uses and key developments • Identify priority transit demand corridors. • Identify activity generators • Map transit alignment and station locations	Development Authority and FBC committee	Municipal Corporation	Development Authority + FBC team
	Delineation and notification of FBC Zones • Delineate and notify FBC zone for implementation • Creation of centralized data base of FBC Zones	Special area development cell	Development Authority, FBC committee	FBC working group
Plan and Design	**Evaluate existing conditions** • Review of planning documents followed by existing conditions baseline assessment. • Identify activity generators. • Develop FBC area typologies considering existing carrying capacities and existing development scenario.	Development Authority, FBC committee	• Municipal Corporations • Ward Counsellors • Fire Department • Traffic Department • Public works Department (Road, Water Supply, Public Buildings, Sewage and stormwater drainage and Horticulture) • Irrigation Department • Disaster Management Department • Environmental Department	FBC working group
	Undertake analysis of FBC zones • Carrying out Capacity Analysis and potential for upgradation. • Undertake audit for way findings, usable public spaces. • Urban form analysis (permissible, existing and proposed). • Conduct SWOT (i.e. Strength, Weakness, Opportunity and Threat) Analysis matrix to determine development context. • Identify goals, targets and development opportunities.			

PROJECT STAGES	TASKS	NODAL/ ANCHOR AUTHORITY	SUPPORT AUTHORITY	EXECUTION AUTHORITY
Plan and Design	**Develop Regulating Plans for FBC zones** • Develop a vision for the FBC zone through public consultation. • Adopt guiding principles • Develop regulating plans • Undertake public consultation and incorporate the inputs in the regulating plan • Finalize the regulation plan • Identify a pilot/demonstration project • Identify a phasing and implementation strategy including catalyst projects	Development Authority and FBC committee	• Municipal Corporations • Ward Counsellors • Fire Department • Traffic Department • Public works Department (Road, Water Supply, Public Buildings, Sewage and storm water drainage and Horticulture) • Irrigation Department • Disaster Management Department • Environmental Department	Special area development cell
Implement	• Formulate a phasing strategy for implementing the regulating plan • Define clear roles and responsibilities of each involved stakeholder • Establish statutory relevance • Develop a community engagement strategy and outreach.	Special area development cell	Development Authority, FBC committee FBC working group	Developer entity
Funding/ Financing	• Revenue generation / value capture/ collection based on spatial property map of all properties in FBC zones, through applicable value capture mechanisms. • The generated revenue shall be used for development/ expansion/ upgradation of horizontal infrastructure in FBC Zones that includes, roads, water supply networks, sewerage networks, storm water drainage network, Solid waste management, Public spaces, water bodies etc. within the FBC Zones. • There shall be sharing of revenue between authorities based on development and the service augmentation needed for the horizontal infrastructure.	Special area development cell	Finance Dept. of Development Authority	Municipal Corporation
	• Identifying other potential funding mechanisms through PPP models, land value capture mechanism, etc.	Special area development cell	Finance Dept. of Development Authority	Municipal Corporation

CHAPTER 10

MONITOR & EVALUATE

As per the standard practice, post-implementation monitoring is usually neglected. However, since FBCs are a new approach for Indian cities, it will be imperative to monitor and evaluate their implementation, so that, in case course correction is needed, it can be addressed immediately. This would also help to keep violations at bay and ensure better management.

10.1 Establish a review committee

The FBC committee established during project inception can continue to function as a review committee. This is useful since the team is equipped with the technical knowledge of the project and has been through the entire process, from planning till implementation. This can also help to benchmark the project indicators and constants to track changes.

10.2 Feedback and evaluation

This is done through the evaluation process, by reviewing pre- and post-implementation scenarios of the project. Bench marking of the indicators and measuring them at every stage is part of this step. It also helps to measure the KPIs (Key Performance Indicators), which can lead to sustainable development of the area. This provides an opportunity to determine next steps for the project growth and development.

10.3 Evolve implementation strategies

Once the city evaluates the feedback for the project through collected data, the development authority and the corporation can take a decision on revisions to be carried out for future projects.

CHAPTER 11
SCALE UP OF FBCs

The implementation of any FBC project (or any urban project) is not the end, but a precedent for future projects. Each FBC project designed and implemented in the city is much more than simply a physical entity. It triggers potential and sets the tone for growth of the city.

Each city during and post implementation of the FBC projects, should establish a methodology for documenting the entire process as well as the learnings. This will act as a point of reference for other projects and help evolve strategies for development, especially for future projects.

As much as it is important to document the methodology of the implemented projects for future reference, it is also vital to understand that varying contexts and geographies of the place shape the true potential of successful FBC implementation. Hence, the methodology can address two components:

- Generic principles – These are principles that can be adopted in most scenarios.
- Specific principles – These are shaped based on the context and can vary due to the shift.

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Figures and Image sources

All the figures and images are sourced from various sources as specified along with the figures or images. The images or figures with no source mentioned are the property of WRI India.

Other Suggested readings

References and links to other Form-based codes, course and webinars can be found on Form-Based codes Institute web site: www.formbasedcodes.org

Implementation of Form-based codes and Value capture: https://www.gatewayplanning.com/implementation.php?page=20

Smart Growth network: www.smartgrowth.org

LIST OF IMAGES

LIST OF FIGURES

LIST OF TABLES

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