PLANNING FOR SUSTAINABLE URBAN FORM FOR INDIAN CITIES

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ABSTRACT

As India marches on towards becoming a more urbanised society, there are growing concerns on how sustainable our cities will be. The Paper looks to establish the correlation between urban form and sustainable city growth in India. It learns from extensive review of international literature on this subject, as well as detailed primary exercises undertaken in two cities of India – Rajkot and Faridabad. The analysis is done at two levels namely at the city-level and the neighbourhood level. The case studies look at establishing how elements of urban form impact the sustainability of a neighbourhood. Indicators being studied at this scale include density, social characteristics, land use, built form, open spaces, access to services, access to transport facilities, and layout plans.

The Paper puts forward a range of recommendations categorised into three elements: regulatory and institutional structures, city and regional planning aspects and neighbourhood-level interventions.

BACKGROUND

India's urban population is now the second largest in the world (McKinsey 2010). With this rapid urbanization, India has started facing a number of first-time complex issues including urbanisation of poverty (Government of India, 2009), degradation of natural resource resulting from extensive land use changes (Government of India, 2008), increased green house gas (GHG) emissions, to name a few, that threaten sustainability of our cities. These add to the traditional problems of overstretching of available infrastructure, slum creation, and congestion. Various sources indicate that urban India presently contributes to around 60% of India's gross domestic product (GDP); this is likely to rise to around 70% over the next two decades (FICCI 2009; McKinsey 2010). It is clear that progress of cities over the next two decades will dominate the way India progresses as a nation.

India needs to start thinking more pro-actively on sustainable solutions to its cities' problems. Sustainable cities present a challenge that needs to address social, environmental and economic sustainability concerns, as well as the inter-linkages between these. While understanding on these challenges is slowly building up, what is woefully lacking is the linkage of these to sustainable urban form, which in turn derives from lack of sustainable urban planning.

It is widely recognized that combinations of elements of urban form – such as infrastructure, density, land uses, urban layout, building types and transportation – have an influence on the economic performance, environmental biodiversity, energy use, social life and cultural climate of a city. However, how urban form influences a city and how exactly this is manifested remains unclear. To date, even the little empirical research done in this context in India does not taken into account features of urban form, such as layout and density, in examinations of sustainability. This has led to significant gaps in knowledge: there is no existing evidence in India that can explain if tenets of sustainable cities are affected by, for example, residential density, transport accessibility and layout. Similarly, there has been no examination of existing urban forms (e.g. sprawling settlements spreading from city centres) to show how they may negatively influence residents' access to facilities and services, which in turn influence energy consumption patterns. There is, therefore, an urgent need to study these phenomena in India and test findings from cities of developed nations for congruency in the Indian context. This paper looks towards fulfilling this gap.

AIM AND SCOPE

This paper looks to determine factors that affect sustainable urban form, and the extent of its affect, for rapidly growing cities in India. It looks at how urban form - the size, shape, density, land uses and layouts of a city - influences social, economic and environmental sustainability, and transport use.

This Study was limited to understanding and evaluating the built environment of selected sites in two cities and establishing the parameters influencing the same. Other factors influencing the overall sustainability of the city, such as environmental and economic factors, were not addressed unless clear physical influences of these were observed on the structure of the city.

CASE STUDIES

For purpose of this study, two cities were selected – Rajkot and Faridabad. Rajkot is a historic city which has grown organically. An important regional trade centre, the city is recorded as the 22nd fastest growing city globally and identified as one of the eight business opportunities cities of India. Another unique aspect of Rajkot is the land development model used here called Town Planning Scheme that looks at land pooling. A set of six Schemes are being studied in details for purpose of this study.
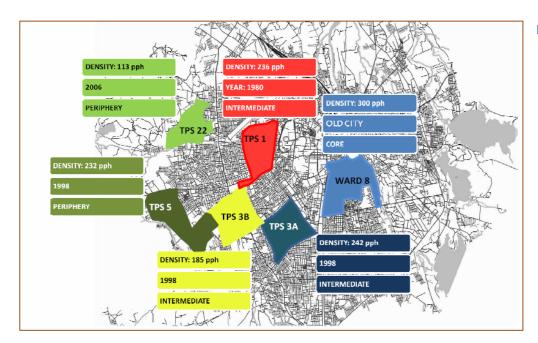

Figure1: Location of Selected Areas in Rajkot

Faridabad in located in the Delhi national capital region and contributes to nearly 60% of revenues generated by the state (Haryana). It is an industrial hub whose growth has primarily been in the post-independence era as a resettlement city. It followed the full land acquisition model of land development. Four case study areas are being studied in this city.
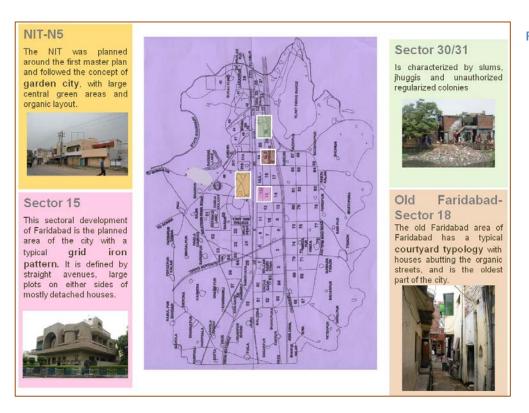
NIT-N5

The NIT was planned around the first master plan and followed the concept of **garden city**, with large central green areas and organic layout.

Sector 15

This sectoral development of Faridabad is the planned area of the city with a typical **grid iron pattern**. It is defined by straight avenues, large plots on either sides of mostly detached houses.

Sector 30/31

Is characterized by slums, jhuggis and unauthorized regularized colonies

Old Faridabad-Sector 18

The old Faridabad area of Faridabad has a typical **courtyard typology** with houses abutting the organic streets, and is the oldest part of the city.

Figure 2: Location of Selected Areas in Faridabad

METHOD

A two tier approach was adopted. One, at city level and two, at the case study (or neighbourhood level). The (generic) city level study looks at overall characteristics of the city including its social structure, economic structure, overall services and infrastructure availability, overall land use configuration, overall communication and transportation facilities, demographic trends, city morphology, and likely areas for city expansion.
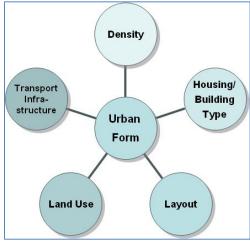
The (detailed) case studies look at establishing how elements of urban form impact the sustainability of a neighbourhood. Indicators being studied at this scale include density, social characteristics, land use, built form, open spaces, access to services, access to transport facilities, and layout plans. The neighbourhood studies included a set of intensive primary surveys ranging from household surveys to traffic studies and built form mapping. For the purpose of household survey, a stratified random sampling approach was taken using income group, housing typologies and morphology as the criteria for selecting samples. Efforts have been made to ensure that the selected samples are uniformly distributed throughout the neighbourhoods.

Figure 3: Elements of Urban Form

LITERATURE REVIEW

Urban Form

Urban form can be defined as the spatial pattern of human activities at a certain point in time (Anderson et al., 1996). Urban form does not simply relate to physical features, but also encompasses non-physical aspects (Dempsey, et.al., 2005). It can be viewed from various geographical scales and classified into such levels as metropolitan area, city, city district/zone, neighbourhood, street, and individual home. To understand sustainable urban

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form better, it is necessary first to understand the basic urban form elements that play a significant role in determining solutions. Brenda and David (2002) list eight widely accepted principles of sustainable urban form, including density and compactness of form; land use and mix of land uses; balancing land uses by protection of sensitive uses; preservation of existing built form; open space availability; land parcel size; size of building; mix of building type, size and age. For purpose of this study – recognizing the need to be relevant to Indian urban form – four principles were identified including density, land use, accessibility and transport infrastructure, and layout.

Density

Density is a multi-faceted concept embroiling a number of inter-related dimensions. Very simply put, density refers to the number of people (living) in a defined area. Density has been an integral component of official urban planning policy in most developed countries. Unfortunately, post-independence urban planning in India has either ignored density or deliberately discouraged it. This has led to sprawls or even worse, densification without the supporting infrastructure (WWF India, 2009). Delhi and Mumbai provide good examples of both. Density has an important role to play in terms of land use planning, deciding for type(s) of public transportation and utilities provision, which leads to deciding on the ecological footprint of a city. There is no 'one size fits all' for density – different Indian cities will need to look at their unique opportunities and problems to decide on this. Socio-economic characteristics of density also have an important role to play in decision making. Lastly, while most Indian state/city planning norms do not incorporate density as an integral tool to promote sustainability, various national efforts such as JNNURM and satellite development for metros are promoting densification of both inner and outer-city limits resulting in policy gaps that need to be effectively bridged.

Land Use

Land use is an equally important tool that determines the nature of urban form. It has been defined as 'the total of arrangements, activities and inputs that people undertake in a certain land cover type' (IPCC, 2000). Land use is an important determinant of public transportation and sustainable urban form and plays at city, zonal and neighbourhood scales. Effective land use planning in India suffers from incongruous regulatory structures at the three levels of government, as well as from other critiques of Master Plan preparation. There is lack of clarity on which services and facilities are to be provided at what scale, and this requires further elaborate exercises. Many cities in India are now formally moving towards mixed land use and implications of this on sustainable urban form are still unknown. Most cities (mainly metros) fail to take into account the possibility of providing services/facilities to residents vertically thereby leading to more horizontal sprawl. Decision makers need to understand that solutions for promoting sustainable form through land use mechanisms are likely to be unique to each city and cannot be replicated; however, common basic principals can be laid down for all cities as successfully demonstrated in the UK.

Accessibility and Transport Infrastructure

Access and transportation infrastructure are closely associated with density and land use and layout characteristics; this determines the ease with which spaces and places can be reached. Accessibility levels are defined on ability of users to reach their destinations (work areas, market places, recreational places, etc.), as well as extent to which they have the means to access places, services and facilities outside their local area (OBU 2007). While guidelines exist in India on what should be accessible to residents (for example, access to primary school, local shopping centre, primary health facility, etc.), there exist no norms on how accessible these should be. More critically, where such norms are available, lack of oversight mechanisms and external market factors ensure that the purpose of such norms is defeated (for example, children travelling long distances to access 'good schools'). There is an increasing realization that transport links are becoming almost a precursor to land

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development in cities today. It is important for cities to ensure that transportation planning and land use planning derive from the same long-term plan.

Layout

Layout describes the spatial arrangement and configuration of elements at the street scale, such as grid or cul-de-sac street patterns. The layout of a neighbourhood determines its accessibility and influences pedestrian movement accordingly. More importantly, layout directly affects the social and cultural vibrancy of a neighbourhood. Streets which are well-connected to services and facilities and support pedestrian access (taking lighting, paving, safety, etc. into account) are generally more frequently accessed, leading to greater concentration of multiple uses on these. This holds true at all three scales – neighbourhood, zonal and city-level. Layouts in Indian cities are largely a legacy of past development, and planning and building regulations. As indicated earlier, the configuration of the street network, in terms of its urban block sizes, their overall location within the city, pedestrian and vehicular connectivity, can affect the functioning of a city by, for example, influencing the location intensity of activities (Penn et al., 1998; Porta et al., 2008).

Inter-Relation of the Four Principles

Each of the above four elements are inter-related. For example, accessibility to any space within the city is dependent on its density and transport linkages, which in turn are dependent on the land use. Layouts in Greenfield sites are dependent on the land use and the proposed density that would determine the extent of open land, recreational, commercial or other alternate uses, and residential use. Land use, in turn, is dependent on transport linkages and the density to be achieved. While it is understood that these elements of urban form are dependent on each other, the extent to which they are dependent, and the compatibility each of these have with others are not known. This raises two issues; firstly, the need for a common understanding based on which of these elements can be measured, and secondly, the need to have statistically significant analyses to determine how these four elements inter-play in the Indian context, as well as to understand how they contribute to achievement of a sustainable urban form in conjunction.

Types of Urban Form

Given the distinct recognition of the extensive influence of urban form on wider sustainability issues, a number of concepts and models related to sustainable urban forms have been identified worldwide. Broadly four types of urban forms have been identified and advocated as sustainable urban forms, namely (i) new urbanism, (ii) urban containment, (iii) compact city, and (iv) eco-city.

New Urbanism. The new urbanism (neo-traditional development) is centered on redesigning cities so that people would rather walk, cycle or take the bus, rather than drive (O'Toole) – this differs from new town development by focusing only on Brownfield development. This concept focuses on regional planning approaches towards developing open space usage, context-appropriate architecture and planning, and the balanced development of jobs and housing by addressing issues such as historic preservation, safe streets, green building, and the redevelopment of Brownfield land. However, there are strong critiques of new urbanism, primarily based around two themes – first that it promotes elitism (as real estate prices tend to be very high) and second that forces the society to behave in a certain fashion that is against self-independence.

Urban Containment. This approach is centered on the principle of limiting the outward expansion of urban development through urban containment policies, with the underlying

assumption that if new territory is no longer available to the development market, the market will look inward and seize bypassed opportunities. Consequently, central cities would not need to expand their boundaries outward but merely wait for and facilitate the back-wave of development after it hits the containment boundary (Nelson and Duncan 1995). A key advantage of this technique is that costs of water, waste-water and public utilities provision can be kept low. The critiques of this approach include (i) elevated real estate values resulting from restricting potentially developable land limits, in turn leading to increase in property tax rates that eventually hurt the low-income population the most; and (ii) incentives to create high-rise high-density buildings everywhere rather than in select locations.

Smart Growth. Primarily an urban planning and transportation theory, Smart Growth is based on the primary goals of (i) concentrating growth in the center of a city to avoid urban sprawl; and (ii) advocating compact, transit-oriented, walkable, bicycle-friendly land-use, including neighbourhood schools, complete streets, and mixed-use development with a range of housing choices.

Key design principles of Smart Growth include (i) creating housing stock with choices, (ii) creating and promoting walkable neighbourhoods; (iii) encouraging stakeholder collaboration; (v) fostering distinctive, attractive communities with a strong sense of place; (vi) making development decisions predictable, fair and cost effective; (vii) encouraging mixed land use; (viii) preserving open spaces, farmland and ecologically sensitive areas; (ix) strengthening and directing development towards existing communities; and (x) taking advantage of compact building design.

Compact City. The compact city looks to address economic, social and environmental problems that result from suburbia and the proliferation of urban sprawl by propagating principles of (i) a revitalized core/central city area; (ii) high intensity development; (iii) mixed-use development; and (iv) easily accessible services and facilities such as hospitals, parks, schools and entertainment.

Gaps in Effective Sustainable Urban Development in India.

While gaps in the sustainable urban development context in India contains a plethora of issues, this section tries to focus primarily on the 'urban planning' context. The first is ambiguous policy, regulatory and institutional environment key critiques includes lack of complete devolution to local governments, regulatory systems that are ambiguous and non-inclusive, and perception of regulation as a 'limiting tool' rather than as a 'development' tool. Planning systems should recognize and give attention to identifying investment and livelihoods opportunities that can be built on, and play an important role in overcoming governance fragmentation (reducing gap between planners and implementers). There is a need to strengthen regulatory systems that must adhere to the principles of equity and must be broadly perceived as doing so. Lastly, the protective and developmental roles of planning regulations must be recognized in redesigning urban planning systems.

The second is a non-inclusive planning approach which is further accentuated by the straight-jacketed Master Plan approach that fails to take on-board ownership from political powers and other non-state actors. While the recently-initiated city development plan (CDP) preparation process under JNNURM do look at taking a more inclusive approach to urban planning, but is limited on count of three factors – its short-term vision period (5 years), weak local government autonomy that leads to restricted decision-making, and weak state and local level capacity leading to dependence on consultants. It is important for urban planners to find alternate planning solutions to the Master Plan approach wherein city managers have the flexibility of preparing short-term plans within an ambit of a long-term vision for the city – a structure plan approach needs to be considered.

The third is linking the green and the brown agenda. Urban planning is probably one of the most straight-forward means through which the green agenda (i.e. protecting the natural environment) and the brown agenda (i.e. protecting human growth) can be effectively linked. Unfortunately, this linkage has been hitherto missing in the Indian urban planning systems. Urban planning systems need to focus on how human and economic opportunities that fuel growth of cities sustainably align with issues of energy, land degradation and resources. A number of ongoing and proposed national programmes are taking positive steps in this direction, but parallel efforts relating to amendment of byelaws, zoning regulations, development controls, etc., also need to be put in place to ensure a more holistic outcome.

The fourth is the lack of integration of utilities and spatial planning: trunk infrastructure (water, sewerage, roads, electricity and telecommunications) largely determine the spatial outline of any city. This needs to be recognized and tapped towards creating integrated spatial-utilities city plans, complemented by regional governance structures that overcome traditional administrative constraints.

CASE STUDY FINDINGS

A study of two case study cities at regional, city and neighbourhood (10 studied in detail) levels led to a set of observations; only those observations that are not well explored in Indian literature are presented here.[1] On density, it was determined that quality of living improves with increase in density till a tipping point; after this, quality of living deteriorates with increase in density. It was also seen that residents living in moderate to high density neighbourhoods are more likely to have better access to services and facilities; they are also more likely to feel more secure. It was further determined that density patterns have strong linkage to income distribution. Higher income category populations prefer to stay away from city centre in low to moderate density areas. On land use, it was determined that mixed land use increases sustainability and growth of neighbourhoods, but also ensures that informal developments can be adequately checked. It was also observed that promoting mixed land use through controlled development allows greater economic sustainability of neighbourhoods - however, development of mixed use should be supplemented by ease of access and ease of parking. On accessibility, it was determined that neighbourhoods designed for primarily high and middle-income households should be located close to regional access points (e.g. major arterials, highways, etc.) away from the city centre, while neighbourhoods near city centre should focus more on making public transport accessible to commuters - this considerably reduces use of private vehicles. On layout, it was determined that cultural dimensions have an important role in designing sustainable layouts - these vary across regions and should be recognised before planning a layout of a neighbourhood. It was also determined that private green spaces contribute to a sense of greater perceived ownership – neighbourhoods with high private greens had greater proportion of owners residing.

Access to public green space varies by socioeconomic group; it is usually the low- to middle-income groups who prefer public greens, while middle- to high-income group prefer private green spaces. An important conclusion was that maintenance and supervision of green spaces (and other public spaces also) are more important than design for usage. Another interesting finding was that urban form is strongly influenced by market forces and transportation infrastructure in India – differing from findings of similar international studies, it was observed that utilities availability does not play a strong role in this.

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[1] For detailed findings and data presentation, please refer to NIUA, 2011, Sustainable Urban Form for Indian Cities.

Table: Findings of Key Elements in Faridabad and Rajkot

CHARACTERISTICS	FARIDABAD				RAJKOT					
	Old F,bad	NIT	Sec-15	Sec-30 & 31	Ward 8	TPS 1	TPS 3A	TPS 3B	TPS 5	TPS 22
Population	43390	21470	9500	29800	39000	36335	37000	29930	36360	12293
Total area (Ha)	157	112		121	135	154	152	162	157	108
Density (Ha)	276	141	95	472	300	236	242	185	232	113
Pre-dominant land use (after residential)	Open (5.24%)	Semi-public (14.05%)	Open (18%)	Industrial (39%)	Commercial (29.5%)	Transport (13.9%)	Industrial (21.79%)	Vacant land (29.05%)	Roads (26%)	Vacant land (36.41%)
Mix Land Use	3.15%	7.65%	1.46%	7%	6.9%	3.2%	6.98%	1.93%	2%	1.13%
Internal road pattern	Organic	Planned curvilinear	Grid Iron	Grid Iron	Organic and Grid Iron	Grid Iron	Semi-Grid Iron	Semi-Grid Iron	Semi-Grid Iron	Semi-Grid Iron
Internal Road Width	Low	Good	Good	Moderate	Moderate	Good	Good	Good	Good	Good
Access to public transport	Good	Good	Poor	Good	Moderate	Moderate	Moderate	Moderate	Weak	Weak
Mode of travel (most dominant)	2-wheeler	2-wheeler	4-wheeler	2-wheeler	2-wheeler	2-wheeler	2-wheelers and Cycles	2-wheeler	Walk	2-wheeler and walk
Social Interaction	Very High	High	Poor	Moderate	High	Moderate	Moderate	High	Moderate	Moderate
Predominant Income Type	Middle	Middle	High	Low	Medium	Middle	Low	Middle	Middle	Low

Recommendations

Draft recommendations focus on the need to coordinate city level strategic planning and investment planning exercises, guided by a single city- or regional-level vision for growth. The reform process would require strengthening the legal and regulatory structure, especially focusing on land availability and building regulations, and improve enforcement. At the city level, it is critical to engage with key stakeholders towards a common planning and development approach. The importance of integrated land use and transportation planning is highlighted as is the need to move towards more sustainable city form following the compact city approach. An evolving city structure approach, integrating the green and the brown agenda, and the importance of density and land use in determining the urban form is also highlighted. The report classifies recommendations into three groups; highlights are outlined below:

1. **Regulatory and Institutional Structures**: targeting issues around development regulations, land availability, role of the informal market, among others.

   a) Coordinating spatial planning and investment planning exercises. The role of the municipal government being the loci for all city planning activities is critical. At present, cities are tasked with the preparation of multiple planning documents. At the highest echelon is the CDP – investment plan of the city – and the Master Plan – spatial plan of the city – which are usually disjoint. It is important that these two documents 'speak' to each other: the investment solutions should reflect the spatial growth patterns and vice-versa.

   b) Need for transparent land management and acquisition model. It is critical for urban planning solutions to ensure that land market forces are taken into account. Market forces determine land pricing and therefore assume importance in effective plan execution. One of the least effectively implemented JNNURM reform remains in areas of land revenue records. Almost all states are grappling with multiple

challenges in implementing this. Effective regulatory tools in land management also support cities in managing their green cover and preservation of natural resources.

c) Amendment of development regulations (density, floor area ratio, height, land use, building codes) to achieve sustainable urban form.

d) Strengthen enforcement. Ensuring effective enforcement is critical to ensure success of planning exercises. It is critical to recognize that effective enforcement requires not only effective policing but also a set of supporting incentives and disincentives. Building byelaws may be amended to mainstream such incentives into development planning.

e) Move to improved governance and management including inclusive planning. Traditionally, the poor have been included in planning paradigms and service provisions as an 'after-thought'; this needs to change. In a country where more than 30% of urban population is poor, planning functions need to engage with the poor from the very beginning.

f) Clarifying role of stakeholders. It is important to identify all key stakeholders as well as clarify roles of each stakeholder. In generic sense, four primary stakeholders are identifiable: city citizens including the poor, civil society organizations engaged in development activities, the private sector, and the government primarily characterized by the ULB. Moving towards sustainable urban form requires sharing responsibilities between these four stakeholders. Efforts so far have led to institutional fragmentation, multiplication of institutions, complex relationships, weak attribution to the role that 'market forces' play in urban planning, among others. It is therefore proposed to set up a 'local area planning' process that allows better harmonisation between the four stakeholders.

g) ensuring political buy-in and leadership. More meaningful participation of elected representatives and non-state actors is critical – while the CDP is a positive step towards this, challenges of scope, autonomy and capacity needs to be addressed.

2. **City and Regional Planning Aspects**: looking at issues relating to present practices in spatial and investment planning, integrated land use and transportation planning, city form structures.

a) Strengthen linkage between city planning and multi-sectoral development activities by adopting an integrated planning approach comprising of the following:

- Setting of the regional/city strategic vision plan: a 10-year strategic vision plan may be developed that provides the broad tenets for preparation of city spatial and city investment plans. It is recommended that an approach is adopted entailing preparation of a non-statutory flexible plan that not only focuses on land allocation and infrastructure investments, but also indicates with certainty the intentions about land use policies and investment directions that the city should take. In short, it should focus on policies rather than precise proposals.

- City Spatial Plan: a land use plan may be developed on a 3- to 5-year cycle targeting translation of strategies laid down in the strategic vision plan into specific land use rules and guidelines. A 3 to 5-year cycle will ensure continuous updation of the plan to factor in ground realities and market forces rather than follow a 15- to 20-year vision cycle that leads to outdating of spatial plans. A caveat to success of this approach will be the ability of the city government to use modern planning tools such as GIS, etc. and its ability to integrate environment and socio-economic considerations into spatial policy making. It is also recommended that the spatial plan include components of slum free planning, integrated risk (or disaster) management planning and

integrated transport planning – all three critical to sustainable development of urban areas.

- City Investment/Development Plan: prepared on a 5-year cycle, the investment plan will lay down investment requirements in the short- and medium-term to achieve the city/regional vision and broad policy directions of the spatial plan. More importantly, the city investment plan should lay down the 'economics' of targeted development including potential sources of revenues and means to augment them. It is recommended that investment options be prioritised based on stakeholder consultation – it is possible that the 'city' may decide to invest in making their city (or parts of city) slum free in the short-term rather than invest on construction of a new bye-pass, which may be taken up in the medium-term. Inputs from city sanitation plan, e-governance plan, multi-modal transport plan (following from integrated transport plans), energy audit, among others should flow into preparation of the city investment plan. It is important that annual budget preparation exercise of the city government should look at implementation of the city investment plan.

- City Infrastructure Plan: prepare a series of key infrastructure plans including on transportation, water and sanitation, communications, energy, etc. for suitable design periods. These plans may be reviewed and updated on a 5-year cycle preceding the city investment plan so that costs for implementing these can be incorporated within the investment plan in a prioritised manner.

b) Integrate land use planning and public transportation systems moving towards transit-oriented development and smart growth. It is recommended public transportation systems should form the crux for managing growth in all Greenfield development, as well as for regulating growth in Brownfield development. Since land values are proportional to ease of public transport access point, the rich usually end up occupying land near major transport nodes. Spatial planning should keep this in mind while determining land use guidelines – integrating land use with transport development is critical not only for ensuring equity but also to ensure sustainable urban growth.

c) Promote sustainable city form by taking different for different sized urban centres; it is suggested that a broad categorisation based on population size be done to club cities into three groups – those above 5 million population; those between 2-5 million population; and those between 0.5-2 million population.

d) Adopt the compact city approach – recommendations are presented in Table below:

Table: Compact City Form Adoption according to City Size

	Cities with population >5 million	Cities with population between 2-5m	Cities with population between 0.25-2m
Density of buildings	Medium to high (200-250 PPH)	Medium to high	Medium to high
Local economic development	Around 4-5 city-level economic hubs identified complementing the CBD, supported by district and zonal level economic hubs.	Around 1-2 city-level economic hubs identified complementing the CBD supported by zonal level economic hubs.	CBD to be the primary economic hub supported by zonal level economic hubs.
Public transportation options	Economic hubs connected through a	MPTS optional, but hubs connected	CBD well-connected by strong public

	Cities with population >5 million	Cities with population between 2-5m	Cities with population between 0.25-2m
	MRTS option	through strong public transportation system	transportation system
Utilities options	Centralised approach	Mix of centralised and decentralised approach	Decentralised approach
Urban containment options	May be used primarily to protect natural resources such as water recharge areas, etc.	May be used primarily to protect natural resources such as water recharge areas, etc.	Should be used for protection of natural resources and also promoting sustainable growth.
Mixed use environment	Mixed land use and mixed use in vertical growth promoted	Mixed land use and mixed use in vertical growth promoted	Mixed land use promoted but largely restricted to CBD

e) City structure. Based on the above, it is recommended as cities start reaching the 2 million population threshold, they should start adapting to a poly-centric network structure graduating from the mono-centric city structure. As the city starts reaching the 5 million threshold, cities should start looking to graduate further into poly-centric network cities. International literature suggests that network cities work best with 4-5 city centres linked to each other with strong and efficient public transport system. States should modify TP acts towards adopting this approach.

f) Integrating the green and the brown agenda. Global best practices indicate seven thematic areas through which this could be achieved including (i) developing renewable energy (RE), (ii) striving for carbon neutrality, (iii) developing distributed power and water systems, (iv) increasing photosynthetic spaces as part of green infrastructure, (v) improving eco-efficiency, (vi) developing sustainable transport, and (vii) developing cities without slums (UN-Habitat, 2009). However, it should be mentioned that no one city has managed to innovate in all eight areas, most of them being advanced in one or two. The challenge for urban planners is to innovate across all seven areas, but in context of India, focus should be on developing sustainable transport, developing cities without slums and increasing green infrastructure.

3. **Micro-Level Interventions or Neighbourhood-Level Interventions**: provide recommendations on density, land use typology, layout and built form, accessibility and transportation options, and integrating the green and the brown agenda.

a) Density: medium-to-high density (200-250 PPH) with options proposed taking into view cost for providing and maintaining utilities, and reducing energy consumption – Urban blocks (1-2 sq.km. area) of about 4 to 7-storey with density around 4000-8000 people per sq.km. is recommended at the neighbourhood level.

b) Land use: promote mixed land use (and mixed income use): options include promoting mixed land use vertically (in central business district areas), promoting social housing in private sector developed area, etc.

c) Accessibility and transport: pedestrian focused within the neighbourhood supported by linked public spaces; strong (public) transport access on edges; restricting motorised vehicular movement within neighbourhoods (this is against the current thinking on smart cities in Europe and USA).

d) Layout: conical massing promoted (high density high rise in the centre - be it neighbourhood or district or city - tapering out towards the edges); provide play areas and public spaces next to taller building to ensure natural sun protection; horizontal and vertical randomisation of buildings coupled with low coverage (higher FAR).

e) Integrating green and brown agenda: numerous proposals including move to pre-fabrication, green roofing, solar panelling, energy efficient building codes, unpaved areas development, insulation, etc.

To conclude, next-generation cities in India should take into account aspects of urban form including density and landuse. This needs to be mainstreamed in urban thinking as retrofitting of urban form indicators is complex and expensive to implement. As much of urban India is yet to be built, we still have an opportunity to revitalize our model in time for the coming urban demand.

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