chapter 4

an urban vision for india

4.1 urban form & density

India is at the threshold of rapid urbanisation. As we have seen, the environmental impact of this shift will depend on the particular trajectory of urbanisation that India chooses to take. Since we are still in the early stages of the phenomenon, we may be able to embed "good DNA" into the pattern of urban growth. This requires us to be very clear about the pros and cons of competing strategies. In previous chapters, we have looked at international experience, and at the historical development of existing Indian cities. We have also modeled the long-term impact of different urban choices. The results are clear and unambiguous, and we have listed the three most important ones below. Note that we can get very large gains from better management and application of well-known, existing technology without having to wait for game-changing new technology.

Urban form is a very important factor affecting the ecological impact of an urban system. There are many ways in which density helps limit environmental damage – reducing land use, encouraging people to live in apartments, the clustering of civic amenities and public transportation, supporting walkability and so on. The comparative analysis of different scenarios for transportation and buildings suggests that there are large gains from changing the way we design our cities. However, we found that the largest gains come from increasing density and it works both for transportation as well as for buildings. For instance, more than half the gain from creating "green design" can come simply from moving people from single family homes to apartments rather than through specific "green codes". At the same time, density is a pre-requisite for allowing public transport and walking to be used as the main forms of transportation. The implication is clear; we need to plan for density. Applying green building codes on individual buildings is important and necessary but they cannot compensate for the large gains made from changing overall urban form. As we saw in Chapter 1, this is the crucial difference between the "Barcelona trajectory" and the "Atlanta trajectory".

Of course, density does not mean that city planners blindly squeeze a lot of people and real estate into a small space. It requires thinking about creating the soft and hard infrastructure that can support such concentration. For instance, public spaces become very important in order to provide space to people to interact and/or get relief from the strains of dense living. Manhattan would not be successful as an urban space but for Central Park. Unfortunately, post-independence urban planning in India has either ignored density or deliberately discouraged it. This has either led to sprawls or even worse, densification without the supporting infrastructure. Mumbai provides a good example of both.

In the 1960s and 1970s, city planners decided that Mumbai's population should be controlled at about 7 million. Land regulation and infrastructure policies were designed accordingly. However, people flooded into the city anyway and today the city is more than twice the intended size, with the highest population density of any metropolitan area in the world. Yet, the policy response was not to try and support this density but to legislate it away. Floor Space Index (FSI)[131] regulations in Mumbai were introduced in 1964 stipulating the maximum building space for every square metre of the plot of land. It was set at 4.5. Almost all buildings in Mumbai with a legal FSI exceeding 4.5 were built before 1964.

[131]FSI is the ratio of the total floor space in a building to the area of the plot on which it is built. For example, suppose a building covers half of a plot that is 1,000 square metres in size and if the building has 10 floors, it exhibits an FSI of 5.

climate change calls for a different urban form, not slower urbanisation

Urbanisation is associated with industrialisation, which increases emissions of carbon dioxide (CO_2) and other greenhouse gases. And increasing wealth tends to be associated with higher energy consumption, for instance through motorisation. But to be concerned about the climate does not mean that urbanisation should be slowed. If anything, economic density may need to be encouraged even more.
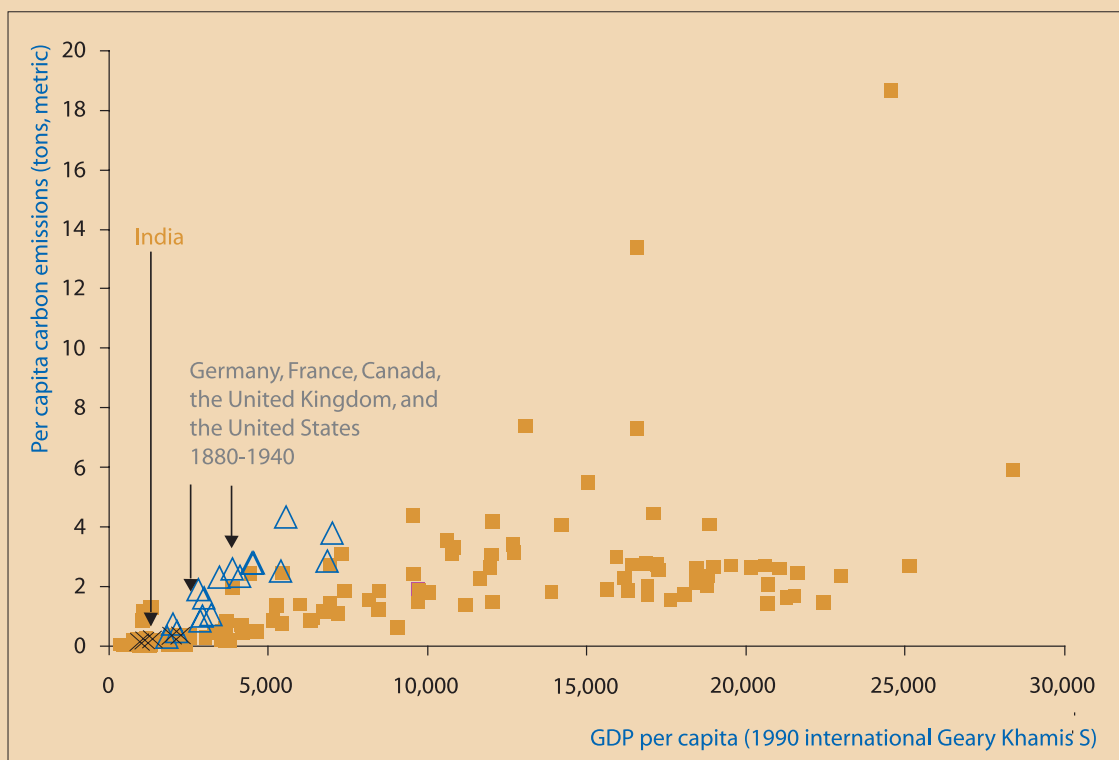

Figure 28: Countries can change their energy trajectories; India has the option to adopt a low carbon development trajectory

Source: Oak Ridge National Laboratory, US Department of Energy

Historical data going back to the nineteenth century shows that today's rich countries experienced rising per capita carbon emissions as they urbanised and industrialised through the twentieth century[132]. Industrialisation, motorisation, and consequently carbon emissions in developing countries follow the trajectories of developed countries in their earlier stages of development[133]. For instance, per capita carbon emissions in Germany doubled from 0.8 metric tons of carbon in 1880 to 1.6 in 1900. In the United States and the United Kingdom, carbon emissions were about 2.5 in 1900. Today's developing countries have lower average emissions at the equivalent GDPs per capita of Germany, the United Kingdom, and the United States in 1880 and 1900. Botswana's carbon emissions were 0.36 per capita in 1987 and 0.57 in 1996.

[132] World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Marland, Boden, and Andres (2007)

[133] World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from World Bank 2002, figure 2.1; Lanne and Liski 2003, figures 1, 4, and 5; and data in developing countries from http://cdiac.esd.ornl.gov

urban form & density

The trend in most developing countries suggests continuing growth in carbon emissions both in total and per capita. The policy response to projected increases in urbanisation and carbon emissions in developing countries should not attempt to prevent growth of cities. This would not be feasible or desirable in light of evidence on growth and poverty reduction. Instead, growth in cities—many of which might double in size over the next few decades—should be managed to create urban areas far more carbon efficient than many of today's mature cities.

Monocentric structures and high population densities tend to reduce the length and number of motorised trips[134]. Compact cities use less energy for transport, consume less land for housing, and use less energy for heating. Several studies find that high population density is negatively correlated with carbon emissions[135]. At the national level, Sweden and Japan have used incentives and regulation to greatly reduce the emissions intensity of their economies. At the urban level, an emphasis on density and smart choices that reduce distance can help do the same. This requires land use policies that favor compactness and transport policies that guide urban form and provide convenient and efficient public transit[136].

Atlanta and Barcelona illustrate alternative urban growth scenarios. They had similar populations of 2.5 million to 2.8 million, but Atlanta had a density of six people per hectare in 1990, and Barcelona had 176[137]. In Atlanta the longest possible distance between two points within the built-up area is 137 kilometres; in Barcelona, the distance is only 37 kilometres. Per capita CO_2 emission was 400 metric tons in Atlanta, 38 tons in Barcelona[138]. Atlanta's metro network is 74 kilometres long, but only 4 percent of its population is within 800 meters of a metro station. Barcelona's metro network is 99 kilometres, and 60 percent of its population lives within 600 meters of a metro station. Only 4.5 percent of trips are by mass transit in Atlanta, a fraction of the 30 percent in Barcelona. For Atlanta to achieve Barcelona's metro accessibility would require building an additional 3,400 kilometres of metro tracks and about 2,800 new metro stations. This would allow the Atlanta metro to transport the same number of people that Barcelona does with only 99 kilometres of tracks and 136 stations.

Density makes the difference.

Source: World Bank[139]

The standard practice in cities with limited land is to raise the permitted FSI over time to accommodate urban growth, as in Manhattan, New York; Singapore; Hong Kong and Shanghai. Instead, the Municipal Corporation of Greater Mumbai went the other way, lowering the permitted FSI to 1.33 in 1991. Under the rules that existed until recently, new buildings, including those in the Central Business District, were subject to FSI of 1.33. The result is that density is now being achieved though unauthorised construction, slums and extreme compromises in the availability of built-up space per capita. World Bank estimates indicate that 54 percent of Mumbai's 16 million people now live in slums and another quarter in degraded apartments.

This last point is very important to understand. Most people tend to think that Indian cities are already too dense. This is because they are confusing density of population with density of built-

[134] World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Bento and others (2003)

[135] World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Scholz 2006; Vance and Hedel 2006; Golob and Brownstone(2005); Ingram (1997); International Union of Public Transport

[136] World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Bento and others 2003; Scholz 2006; Vance and Hedel (2006); Golob and Brownstone (2005)

[137] World Bank, World Development Report (2009), 'Reshaping Economic Geography', originally sourced from Bertaud (2004)

[138] World Bank, World Development Report (2009), 'Reshaping Economic Geography' originally sourced from Kenworthy (2005)

[139] World Bank, World Development Report (2009), 'Reshaping Economic Geography', Box 7.6 pg. 211, original source of graph: Oak Ridge National Laboratory, U.S. Department of Energy at http://cdiac.esd.ornl.gov/ftp/ndp030/nation.1751_2004.ems; Lanne and Liski 2003

up space. As Jane Jacobs puts it in her classic book The Death and Life of Great American Cities: "One reason why low city densities conventionally have a good name, unjustified by the facts, and why high densities have a bad name, equally unjustified, is that high density of dwellings and overcrowding of dwellings is often confused"[140]. A city like Mumbai is certainly very dense from a population perspective but this density is being achieved through an inhuman compromise of space and quality of life. Yet, there are large tracts of space in Mumbai – such as the 22km of derelict Port Trust land along the eastern shore – that lies unused. Yes, even Mumbai can support more built-up space if it is properly redesigned.

4.2 public transport & walkability

Public transport systems are important because of the direct impact they have on energy use. Our scenario analysis clearly demonstrates the impact a shift in modal split in favour of public transport can have on the trajectory of energy use. Importantly, note that the transport infrastructure also has a long-term impact on the embedded DNA of a city and development of urban form. We saw in Chapter 2 how the development of Mumbai, Delhi and Kolkata was profoundly affected by the transport backbones created for them. Thus, density and public transport systems are closely linked.

Public transport systems range from buses to underground railways, but we would like to draw special attention to the issue of walkability. As discussed in detail in Chapter 3, walking is a form of transportation that is almost entirely neglected by urban planners in India. This is unfortunate because it is not just the least ecologically damaging form of transportation but it is a critical strategic enabler for other public transport systems to function effectively. Furthermore, it has large positive externalities from social and economic perspectives – it is socially equitable, promotes community/ social cohesion, improves health and can give the city a "buzz" factor.

In short, we strongly recommend investing in walkability. We feel that such a strategy will be met with very positive public response because studies show that a very large proportion of urban Indians already walk despite the poor pedestrian infrastructure. As discussed earlier, a 2008 study of 30 Indian cities[141] showed that almost 40% of all trips in urban India involved no motorised vehicles at all – 28% walked and 11% cycled. The proportion was sharply higher in smaller towns since distances were usually small and the roads less congested. However, in bigger cities, the proportion of people using conventional public transport was high, and consequently commuters walked the last mile. For instance, in cities with more than 8 million population: 22% walked all the way, 8% used cycles and 44% used public transport. This adds up to 74% of people who rely on non-motorised transport for at least part of the commute.

Note that walkability and public transport must be embedded in urban DNA as soon as possible because it is very difficult to retrospectively change urban form. As discussed in the box above,

[140]The Death & Life of Great American Cities, Jane Jacobs, Random House 1961
[141]"Traffic and Transportation Policies and Strategies in Urban areas in India", Wilbur Smith Associates (sponsored by Ministry of Urban Development), 2008.

public transport & walkability

Atlanta has a metro network of 74km while Barcelona has one of 99km. These may seem comparable but per capita CO_2 emissions for Atlanta are ten times that of Barcelona. The difference is mostly explained by Barcelona being compact while its American rival is spread out. As a result, less than 4% of Atlanta's population lives within a reasonable walking distance of a metro station compared to 60% for Barcelona. If Atlanta now tried to give its citizens the same accessibility, it would have to build 2800 new metro stations and 3400km of new tracks![142]

Despite this overwhelming evidence, very little thought is given to pedestrians in Indian urban planning. A brand new city like Gurgaon does not have any network of sidewalks at all! Note that it is not just a matter of building sidewalks. "Walkability" is about making it possible for the average citizen to be able to lead his/her life by relying largely on walking for day-to-day activities. This requires a whole gamut of urban design requirements like density, mix-use, street life, pedestrian crossings, tree-shade, public-spaces and so on. All these parameters are important in their own right but walkability is a simple way of encapsulating this philosophy of urban planning. This is why we strongly recommend walkability as the single most important urban design paradigm that must be adopted while thinking of India's urban future.

4.3 the need for an integrated but evolving framework

As the reader may have realised, many of our recommendations are closely interlinked. Walkability, for instance, is closely linked with density, urban software, social equity, and with the need to revive small towns. Furthermore, we are very conscious that an environmentally sustainable city will only work if it is also socially and economically vibrant. The Mirabilis Matrix is a simple analytical framework for bringing all these aspects together. It provides a way to think about how different elements - Hardware, Software, Urban Governance, Liveability, Competitiveness and Environmental Footprint - come together to form a successful city. This is not a priority list but a way to think about how a successful city comes together by combining different ingredients. Successful urban planning is about organically combining these facets. This is not a "mechanical" approach but one that explicitly thinks of the city as an evolving eco-system.

The Horizontals

Liveability:

At the most fundamental level, cities are meant to be lived in. To succeed, they must be pleasant places to live, work and play for a large cross-section of the society. Hardware, software and governance are all important factors that define liveability. There is no set formula for how these ingredients combine to make a city liveable. Different cities have evolved different recipes that fit the particular needs of particular societies.

[142]World Development Report 2009, The World Bank.

	HARDWARE	SOFTWARE	GOVERNANCE
LIVEABILITY	Good quality housing and amenities like parks, hospitals, clubs and schools	Social networks & interaction. Clustering of amenities to create "urban buzz", a sense of place and history	Safety and enforcement of Law. Simple and well enforced system of municipal regulation
ECONOMIC COMPETITIVENESS	Transport and communication links. Quality of office/commercial space	Clustering of human capital and ability to attract talent, socio cultural openness	Reasonable tax rates. Efficient governance structures
ENVIRONMENTAL FOOTPRINT	Public transport, density, green spaces, waste management	Environmental consciousness, low impact lifestyles	Air and water quality. Sustainable practices with regard to water supply & usage

Figure 29: The Mirabilis Matrix: An Analytical Tool for Urban Thinking

Source: MAPL Research

Economic Competitiveness:

For time immemorial, cities have competed for influence, power and commerce. In the nineteenth and twentieth centuries, this often meant growing and harnessing their industrial prowess. In the twenty-first century, however, cities will compete in terms of their ability to bring in human capital. Rather than lead to the dispersion of economic activity, the telecommunication revolution appears to have increased the value of clusters of human capital. Thus, London and New York have emerged as global cities while university towns like Boston, San Francisco-Bay Area, Oxford and Cambridge (UK) have witnessed extraordinary revival.

Environmental Footprint:

More than half of the world's population now lives in urban areas. India too is likely to be urbanised very quickly over the next few decades. There is a need to consider the environmental costs and benefits of this shift. A conscious effort will be required to design dense cities with public transport systems and sustainable energy, air and water practices.

The Verticals

Hardware:

This includes all the residential/commercial buildings, roads, theatres, museums, stadiums, airports and so on that constitutes the physical form of a city - the material manifestation of the city. Clearly these are very important but, in India, all urban thinking and planning seems sometimes to be limited only to this aspect.

Software:

This relates to all the activities that people conduct in the urban space. This includes economic activities as well as socio-cultural interactions that give a city its life. To provide an analogy, as a computer's

hardware must allow the software to function correctly, a city must provide adequate physical infrastructure to enable its citizens to perform well. Grand and expensive projects do not always create great cities if they do not actively engage with the lives of the citizens.

Governance:

Cities are complex systems and they require constant regulation/management in order to function efficiently. Rules must be rational and their enforcement must be visible and even-handed. Very little thought is given to this aspect in India even in its major cities. Gurgaon, for instance, is still run as if it was a small *moufassil* town, even as different promoters create a random mix of management systems for their individual developments. There is no consistent set of municipal rules or a transparent system for enforcement.

4.4 the problem of municipal governance

A major problem for urban India is the generally poor quality of governance and services. We have seen in Chapter 3 how absurdly high rates of transmission losses and pilferage are a major cause of water shortages in cities like Delhi (a loss of around half the water). This is also true of a number of other areas including power supply. Poor governance affects everything from traffic flows and sewage treatment to unauthorised construction. If municipal management is poor in the larger cities, it is even worse in the smaller towns. This has been a major reason why small town India went into decline in post-independence India. Poor municipal governance comes at a huge cost to urban sustainability. Take for example, transmission losses from the power grid. Frequent power outages have mean that much of urban India relies on back-up from diesel generators and battery inverters. This is very inefficient and environmentally harmful. It is not possible to "model" the challenge of urban governance but readers must remember that any solution for India's many urban problems must deal with this issue.

So what is the solution? There are many complex reasons for poor urban governance. However, we feel that two things need to be sorted out at the very least.

First, the institutional structure of urban governance must be simplified and cleaned up. Currently, there is a confusing multiplicity of agencies that manage the cities. A stylised rendition of Delhi's governance structure is shown in the chart below (for other cities see Annexure 1). As one can see, it involves the national government, the state government and local government. This structure needs to be urgently rationalised.

Second, the municipal laws that govern our cities need to be comprehensively revisited and then
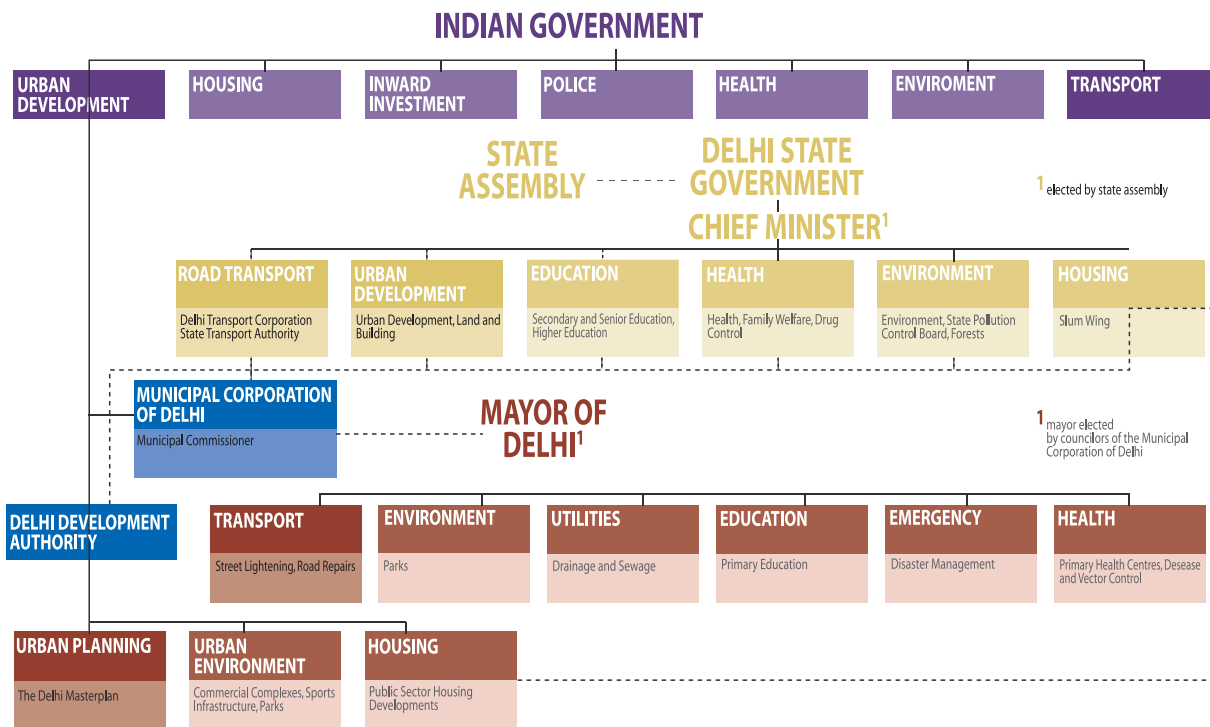
INDIAN GOVERNMENT

URBAN DEVELOPMENT	HOUSING	INWARD INVESTMENT	POLICE	HEALTH	ENVIROMENT	TRANSPORT

STATE ASSEMBLY - - - - **DELHI STATE GOVERNMENT**

1 elected by state assembly

CHIEF MINISTER[1]

ROAD TRANSPORT	URBAN DEVELOPMENT	EDUCATION	HEALTH	ENVIRONMENT	HOUSING
Delhi Transport Corporation State Transport Authority	Urban Development, Land and Building	Secondary and Senior Education, Higher Education	Health, Family Welfare, Drug Control	Environment, State Pollution Control Board, Forests	Slum Wing

MUNICIPAL CORPORATION OF DELHI
Municipal Commissioner

MAYOR OF DELHI[1]

1 mayor elected by councilors of the Municipal Corporation of Delhi

DELHI DEVELOPMENT AUTHORITY

TRANSPORT	ENVIRONMENT	UTILITIES	EDUCATION	EMERGENCY	HEALTH
Street Lightening, Road Repairs	Parks	Drainage and Sewage	Primary Education	Disaster Management	Primary Health Centres, Desease and Vector Control

URBAN PLANNING	URBAN ENVIRONMENT	HOUSING
The Delhi Masterplan	Commercial Complexes, Sports Infrastructure, Parks	Public Sector Housing Developments

Figure 30: Delhi's Governance Structure

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enforced. In the single area of green building codes, we have at least three sets of rules: the Energy Conservation Building Code constituted by the Indian Bureau of Energy Efficiency, a body under the Ministry of Power; the National Building Code of India 2005 constituted by the Bureau of Indian Standards, a body under the Ministry for Consumer Affairs; and Green Rating for Integrated Habitat Assessment (GRIHA), created by TERI, a well-known NGO, and supported by the Ministry of New and Renewable Energy. Of course, many Indian builders also use international standards such as the LEED. Surely, urban governance would benefit enormously by merely providing a clear set of rules. The good news is that Indians respond positively and quickly when presented with sensible rules that are enforced even handedly. We have many examples of this ranging from rain-water harvesting codes in Chennai to the wearing of seat-belts in Delhi.

4.5 strategic interventions versus masterplanning

Our argument for an "integrated" approach to urban planning may be misconstrued as an argument for traditional masterplanning. However, masterplanning has a dismal history in India. This should not be a surprise given the problems with governance discussed in the earlier section. Even the national capital has been unable to implement a master-plan despite repeated efforts.

According to the Delhi District Gazetteer 1883-84, Delhi had a population of 173,303 in the late nineteenth century. The grandeur of the Mughal court was long forgotten and, after 1858, it was no more than a large provincial town. That changed when the British colonial government decided to shift the capital to Delhi in 1911 and hired Edwin Lutyens to design a city to reflect imperial grandeur. Lutyens' created what is effectively the first "masterplan" for New Delhi. It was meant for a population of 60,000 – mostly government officials and their retainers. The old city was still expected to remain the commercial hub.

Lutyens' Delhi was completed in the mid-thirties but the urban plan collapsed barely a decade later as the city found itself with hundreds of thousands of refugees fleeing West Pakistan. The authorities dealt with the crisis with ad-hoc arrangements but in 1962, a new master-plan was devised. Given the thinking of the times, it was a framework for low-rise suburbia where the government would decree land-use and zoning. From their "commanding heights" the planners declared that "there is undesirable mixing of land-uses almost everywhere in the city." Just as the government has the right to control economic activity through licenses, it also has the right to tell people where to live and where to work.

The 1962 master plan was a dismal failure. The city developed in unpredictable ways while the government failed to deliver on many promises. Even by 1981, only three of fifteen district centres proposed in the masterplan had been developed. Offices, clinics and shops moved into residential areas as the designated commercial areas were grossly insufficient. Even by 1992, with the population now at 9 million, only six of the fifteen district centres were developed. Liberalisation created economic opportunities that pushed the gap between plan and reality to breaking point. Eventually the pressure

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exploded into brand new areas like Gurgaon and Noida. The official response was yet another master-plan announced in 2007 called Delhi 2021. Two years later it already looks outdated.

The most obvious problem with masterplanning in Indian cities is the lack of governance. The civic authorities simply do not have the ability to enforce the master-plan even in the national capital. Secondly, all master-plans require proper implementation and sequencing of public investment. As discussed earlier, a combination of corruption and incompetence meant that important aspects of the 1962 master-plan remain unimplemented even today. There is, however, a more fundamental flaw with the whole masterplanning approach. It cannot deal with organic evolution of a living and vibrant city. There was no way in which Lutyens could have predicted Independence and Partition in 1913 and the 1962 master-plan could have anticipated Gurgaon's BPO boom.

Indeed, masterplanning has failed in most cities in the world. Singapore is one of the few exceptions but, even in this case, success has been mostly due to the Singaporean government's unique ability to think strategically and to adjust the model constantly. India lacks the technical, administrative and political capability needed for continuous policy risk-taking. So what is the alternative? In our view, the governments who run the National Capital Region should concentrate on two things – basic governance and a few strategic interventions.

Our criticism of masterplanning does not mean that we are advocating a free-for-all. Even in a market economy, the State is needed to provide basic governance and public goods. Thus, the NCR needs a simple set of municipal rules regarding property rights, traffic, street-hawking, advertising signage and so on. The government should concentrate on enforcing these rules. Similarly, the authorities should worry about parks, public health, sewage disposal and other public amenities. The government should not be concerned about whether or not an up-market restaurant should be allowed in an abandoned mental asylum in Mehrauli.

Of course, the government will, from time-to-time, need to make large strategic interventions in order to cut through intractable gridlocks in the urban eco-system. However, these should strictly be interventions that will open out new urban vistas and have large multiplier effects. The Delhi Metro is an example of such a strategic investment that was necessary to get away from Delhi's reliance on roads. The Metro is changing the urban eco-system of Delhi in unpredictable ways, but that is the idea. Another intervention in the same vein is the proposal to clean Delhi's 300km network of nullahs and turn them into a network of walking paths criss-crossing the city. This would dramatically improve the last-mile connectivity of public transport, encourage walking for short trips and enable social interaction; not to mention improve drainage and sewage disposal. This is a cheap and simple intervention but has the potential to fundamentally change Delhi's DNA. Again, the exact outcome is not pre-determined but it opens up a whole new way for Delhi to evolve (interested readers can visit: www.delhinullahs.org).

To conclude, it is very difficult to maintain a master-plan in the best of times but in a rapidly evolving urban environment it is near impossible and probably counter-productive. This does not mean that India abandons all effort to guide its future urban trajectory. Instead, it may be easier to identify simple design paradigms that encapsulate the overall strategy and then implement them through strategic interventions that have multiplier effects. In this report, we have identified density, public transport and more specifically walkability as the paradigms for India's urban future.