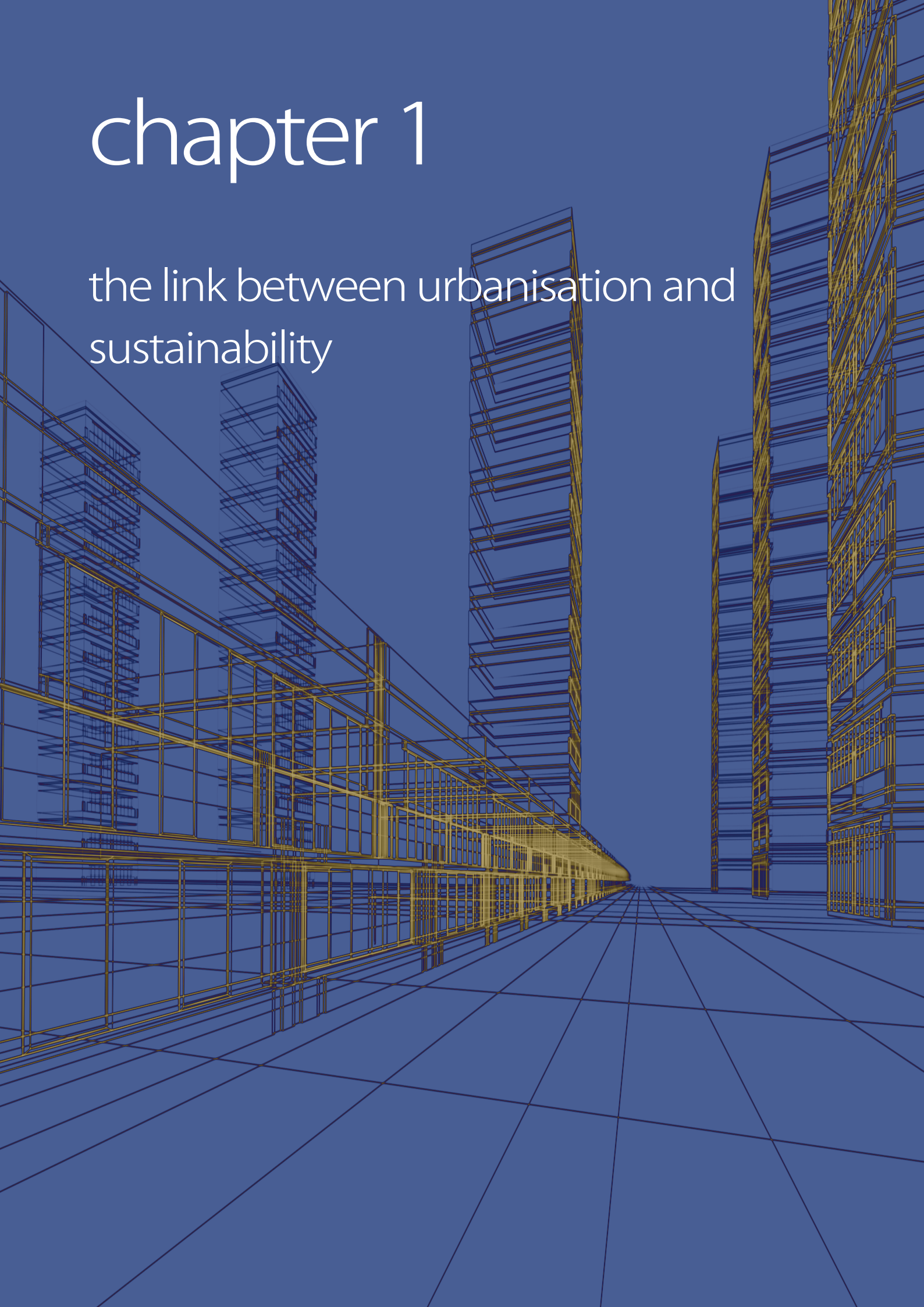
chapter 1

the link between urbanisation and sustainability



1.1 what is urbanisation?

In India, like elsewhere, "urbanisation is the sociological and spatial counterpart to economic processes that shift workers away from subsistence agriculture to more productive sectors. It is the physical manifestation of all the construction activity that accompanies rapid growth[13]." Figure 1 below illustrates both the drivers and impediments to urbanisation. A shift from subsistence agriculture is primarily driven by an increase in educational and aspiration levels, growth of agricultural productivity, focused and deliberate government policy and growth of non-farm activity. On the other hand the factors that prevent the shift from subsistence agriculture to other economic activities and thus impede the process of urbanisation include: poor civic infrastructure, lack of focussed and deliberate government policy, a planning bias towards metropolitan centres of growth, the decay of small towns and the slow rate of industrialisation.

India has a history of urbanisation since ancient times. The most well known examples are of the city-settlements of Harappa and Mohenjo-Daro which date back to the Indus Valley civilisation of 3000-1700 BC. Archaeological evidence reveals the high level of urban planning that existed in the cities of the Indus Valley. The settlements had clearly demarcated public and private areas, streets laid out in grids, as well as an extensive and sophisticated system of drainage and waste removal. These are arguably the earliest "planned" urban settlements in the world.

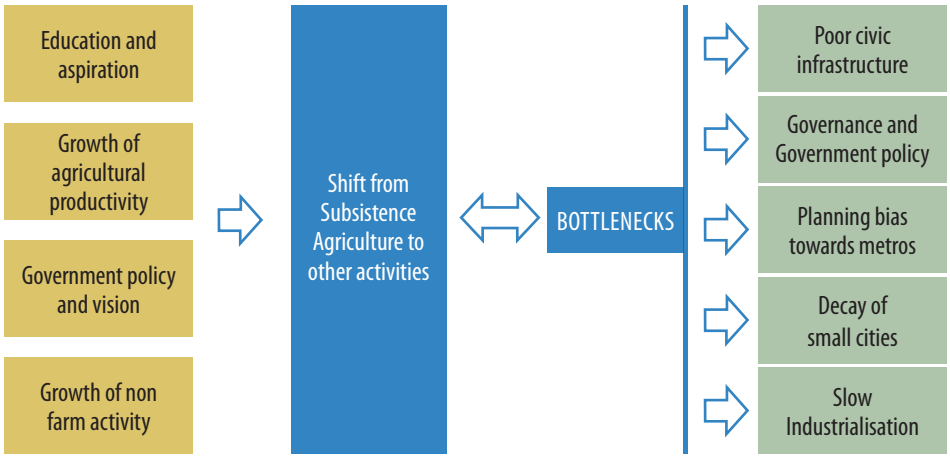


Figure 1: Factors (Drivers and Impediments) Influencing Urbanisation

Source: MAPL Analysis

Cities and urban areas have since set the foundation of modern civilisation – they have proved to be the engines of economic growth, and the centres of innovation, culture, knowledge and political power. This report defines sustainable urbanisation as a process by which urban settlements contribute to environmental sustainability in the long term. Such urbanisation would require conservation of non-renewable resources, mass-scale deployment of renewable resources, and a reduction in the energy-use and waste-production per unit of output/consumption. Moreover, the pattern of urban growth should facilitate a fair distribution of resources, both within the present generation and between present and future generations. Finally, we need to be aware at all times that environmentally sustainable cities must also be vibrant economic and social agglomerations – environmental sustainability is meaningless in an economic/social wasteland.

[13] Sanyal, S. (2008), 'The Indian Renaissance: India's Rise After a Thousand Years of Decline', Penguin (India)

1.2 decoding the link between urbanisation and sustainability

Economic development is closely linked to urbanisation. As people move from subsistence farming to other activities, we invariably see some form of urbanisation. Cities are hubs of production, consumption, and waste generation. As cities grow, so does their ecological footprint; they consume more and more natural resources to meet the rising demand for food, water, energy, and goods and services.

The industrialisation of Asia has led to a large increase in its use of energy. For instance, in 1990, emerging Asia energy accounted for 15 per cent of total world consumption – this figure rose to 22 per cent in 2002 and is projected to increase to 31 per cent by 2025[14]. Much of this energy comes from non-renewable sources such as coal, oil and natural gas. Asia's rapidly growing cities are the hubs of the boom in economic activity and, consequently, are the source of the growth energy use, waste generation and pollution. Sewage disposal from cities is an important source of pollution in lakes and in coastal seas areas. Yet proper treatment of sewage is extremely inadequate in most cities in the developing world. Another rapidly emerging problem is access to water. It is estimated that the number of people impacted by water scarcity could rise from 1.7 billion today to 5 billion by 2025[15].

Construction Site, Gurgaon © Verma, A.

As discussed earlier, India's average per capita ecological footprint of India[16] is 0.8 global hectares[17]. This figure is very low when compared to the global average, which is 2.2 global hectares, or to that of most developed countries which average an ecological footprint of 6.43 global hectares[18]. Figure 2 below compares India's ecological footprint with that of Spain, United Kingdom and the United States of America which have an ecological footprint of 5.40 global hectares, 5.60 global hectares and 9.60 hectares respectively. The figure also compares the ecological footprint of different cities.

We can draw two interesting conclusions from this data. First, cities with roughly comparable standards of living can have very different ecological footprints – with Barcelona and Vancouver on one hand and

[14] International Energy Outlook (July 2005), Energy Information Administration (EIA), Table 1, 'World Marketed Energy Consumption by Region, 1990-2025'
[15] Roberts, B. and Kanaly, T. (2005), 'Urbanisation and Sustainability in Asia'; Water Resource Institute, 2005
[16] City-wise ecological footprint is not available for Indian cities
[17] World Wide Fund for Nature (2006), Living Planet Report
[18] Ibid.

Atlanta and Dubai on the other. For instance, the per capita footprint for Barcelona is 3.26 global hectares, London 6.63 global hectares and Atlanta 13 global hectares. Note that the link between standard of living and ecological footprint is not linear. Indeed, one could argue that Barcelona provides a higher standard of living than Atlanta but at a fourth of the environmental cost. Second, cities can have ecological footprints that vary greatly from the national average. Some cities do far worse while others do far better than the national average. The message is clear – the way the city is made i.e. the urban form of the city matters.

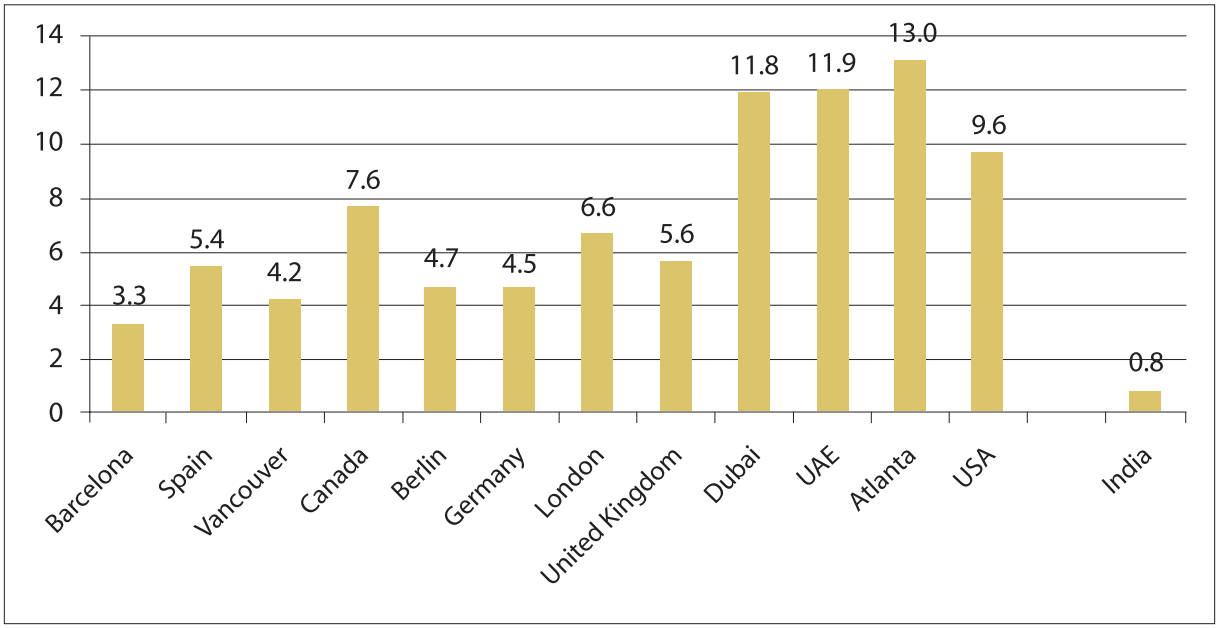


Figure 2: Comparative Ecological Footprint of Cities and Countries

Source: MAPL Analysis[19]

Unfortunately, no data is available on the ecological footprint of Indian cities. Our sense is that Mumbai would have an even lower ecological footprint than the national average. However, this is not a matter of pride because it is achieved by making significant compromises on the standard of living. 50-60 percent of Mumbai's population currently resides in accommodation that is not fit for purpose[20]. The city's suburban railway system, originally designed for a capacity of 1,700 people per 9-car train, runs with super-dense capacities of almost 5,000 people per train during peak time.

In short, the low ecological footprint for India has been achieved by extreme compromises on quality of life. Any increase in prosperity will lead to an increase in this footprint. This is bound to impact the environmental significantly. For instance, the urbanisation process dramatically affects energy consumption. A 2003 analysis from the World Bank showed that an increase of 1 per cent in urban population increases energy consumption by 2.2 per cent[21]. The Energy and Climate Change Report of the World Business Council for Sustainable Development (2007) estimates that with population growth worldwide, increasing development needs and rising standards of living, global energy

[19]Barcelona: Clos, J. (2002); Barcelona Metropolis Mediterrania, 'Agenda 21 – A Question of Balance' Canada, Germany, Spain, India, UAE, United Kingdom, USA: Footprint Network , Ecological Footprint and Biocapacity (2006 Edition); Vancouver: Richardson, H.W. & Gordon, P., University of Southern California, 'Sustainable Portland? A Critique, and the Los Angeles Counterpoint' (October 2001); Berlin: Urban Environmental Management, The Ecological Footprint of Berlin; London: Best Foot Forward,'City Limits London: A Resource Flow and Ecological Footprint Analysis of Greater London' (September 2002); Dubai: World Wide Fund for Nature, Major Environmental Threats in the UAE (http://www.panda.org/who_we_are/wwf_offices/united_arab_emirates/about/threats/); Atlanta: Head, P., ARUP, 'Entering the Ecological Age: The Engineer's Role', The Institution of Civil Engineers, Brunel International Lectures (2008), pg. 43

[20]Urban Age, London School of Economics & Political Science (2008), 'Integrated City Making, Governance, Planning and Transport'

[21]World Business Council for Sustainable Development (July 2008), 'Energy Efficiency in Buildings, Business Realities and Opportunities'

Rush Hour in a Mumbai Local Train © Nagrath S.

demands are estimated to rise by two to three fold by 2050. In per capita terms, as GDP per capita rises past USD 3,000 (in PPP), energy demand explodes as industrialisation and personal mobility takes off. From USD 15,000, demand grows more slowly as the main burst of industrialisation is complete and services begin to dominate. Beyond USD 25,000, economic growth can continue without significant energy increase[22]. According to the World Development Indicators, India's current GDP per capita in PPP is approximately USD 4,000. This implies that the country is only just beginning to enter into the initial stage of rapidly increasing energy demands. Therefore, it is very important India thinks hard about how to avoid the "Atlanta" path and to emulate the "Barcelona" option.

> ...THE URBANISATION PROCESS DRAMATICALLY AFFECTS ENERGY CONSUMPTION... INCREASING DEVELOPMENT NEEDS AND RISING STANDARDS OF LIVING, GLOBAL ENERGY DEMANDS ARE ESTIMATED TO RISE BY TWO TO THREE FOLD BY 2050...[INDIA] IS ONLY JUST BEGINNING TO ENTER INTO THE INITIAL STAGE OF RAPIDLY INCREASING ENERGY DEMANDS

[22]World Business Council for Sustainable Development (December 2005), 'Facts and Trends to 2050, Energy and Climate Change'

1.3 cities as key to sustainability

So, is urbanisation an environmentally bad phenomenon and should it be discouraged? We view this question at two levels.

First, we feel that it is an inevitable part of development and is the spatial mirror of the shift away from subsistence farming. The living standard of the average Indian is currently untenable and we should expect some form of urbanisation in the next several decades. Discouraging it may not be politically, economically or morally possible.

Second, and more importantly, the ecological cost of delivering a high standard of living to a rural inhabitant can be very high. Two case studies of rural areas indicate that their ecological footprints are on par or higher than footprints of certain cities. Rutland, a village in England, has an ecological footprint of 5.49[23] global hectares per person. Doon village in Ireland has an equally high ecological footprint of 4.5[24] global hectares per person. These are far higher than a city like Barcelona or Vancouver.

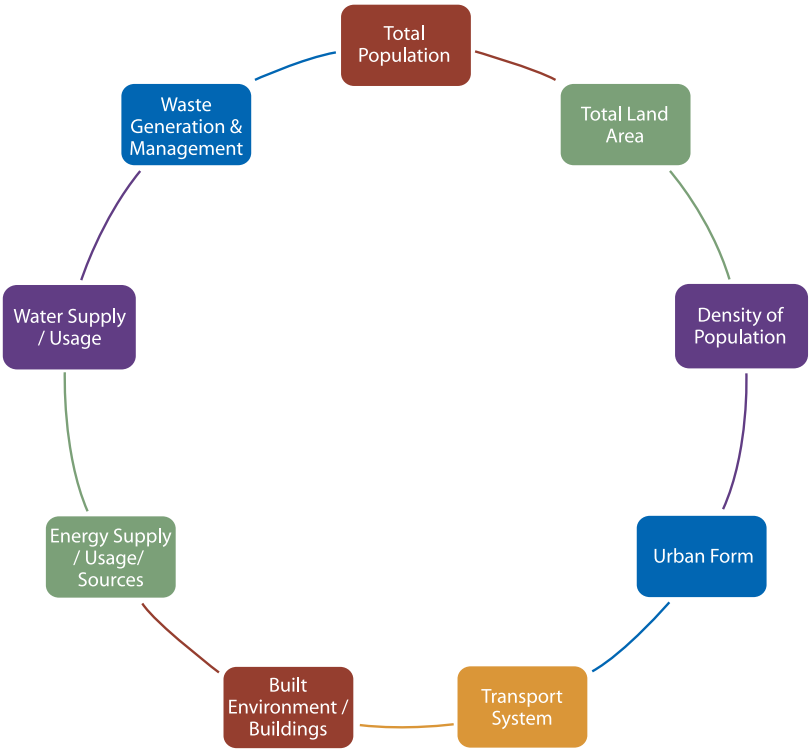


Figure 3: Factors that Determine the Ecological Footprint of any Country/City

Source: MAPL Analysis

Clearly, stemming the process of urbanisation, putting strict controls on migration and running to villages is not the solution to achieving environmental sustainability. Far better, we recognise that urban form is the crucial factor determining the ecological footprint of a city-dweller. As seen in Figure 2, a city can, despite having a relatively high standard of living, have a comparatively low ecological footprint.

A city's ecological footprint depends on a number of factors as seen in Figure 3. To determine alternate development trajectories for India's cities, we make a comparative assessment of the ecological footprint of six cities from across the world: Atlanta (USA), Dubai (UAE), London (UK), Berlin (Germany), Vancouver (Canada) and Barcelona (Spain). This can be seen in Figure 4, which is a graphical representation of what the total ecological footprint of urban India would look like by 2050, if its growth trajectory follows any of the six urban development models characteristic of each of the different cities.

[23] Stockholm Environment Institute (resource-accounting.org.uk/downloads/uk.xls)
[24] Ryan,B., 'Ecological Footprint Analysis: An Irish Rural Study', Dublin Institute of Technology

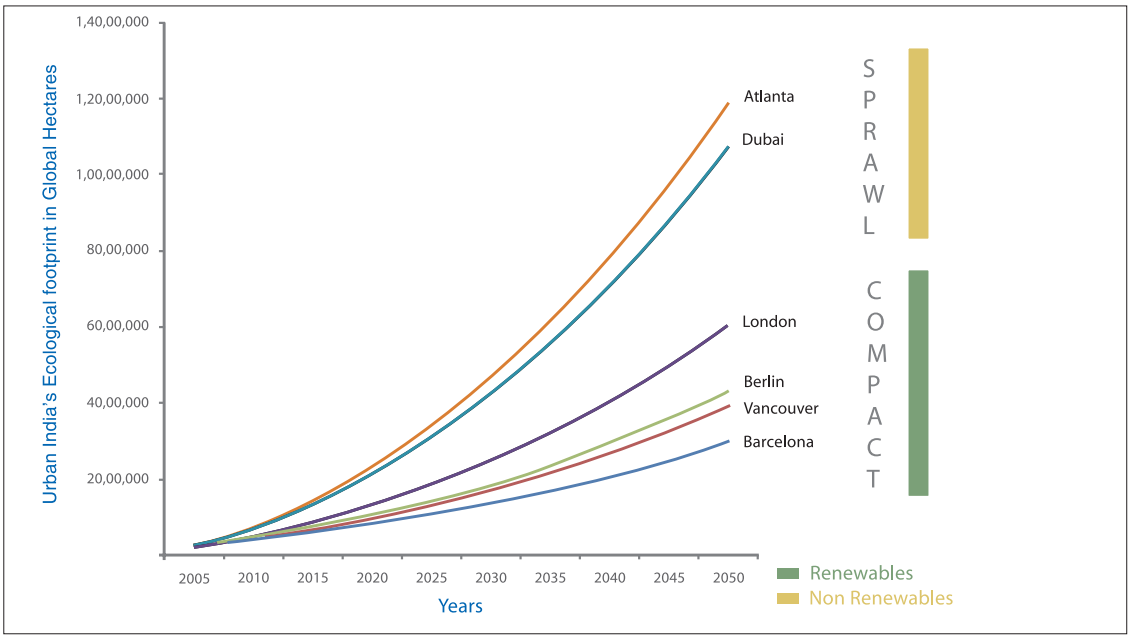


Figure 4: Alternative Urban Futures for India

Source: MAPL Analysis [25]

Figure 5 shows how the ecological footprint of the cities is determined by urban form. Atlanta, with a per capita ecological footprint of 13 global hectares, has an urban form which is sprawled. The population boom that took place between 1970-1990 resulted in the city's expansion wherein urbanisation swallowed acres adjacent to the main city. The city's public transport system, though cheap, is rather inconvenient and more than 90 per cent of the city's population relies on private vehicles to get around.

CITIES / PARAMETERS	PER CAPITA ECOLOGICAL FOOTPRINT	POPULATION DENSITY (PEOPLE PER SQ KM)	URBAN FORM
Atlanta	13	700	Sprawl
Dubai	11.8	2650	Sprawl
London	6.6	5100	Compact
Berlin	4.7	3750	Compact
Vancouver	4.2	1650	Sprawl
Barcelona	3.2	4850	Compact

Figure 5: Comparative Analysis of Cities' Ecological Footprint

Source: www.citymayors.com[26]

On the other end of the spectrum are the cities of Barcelona, Vancouver and Berlin which have much lower per capita ecological footprints at 3.2, 4.2 and 4.7 global hectares respectively[27]. The three cities have achieved this through moving towards a denser/more compact urban form, an extensive and efficient public transport system and more recently a shift towards using renewable sources of energy.

[25]Increase in Urban Population: United Nations Population Division, World Urbanisation Prospects: The 2007 Revision Population Database; Ecological Footprint: See Figure 3

[26]For Per capita ecological footprint see Figure 2, Population Density (People per sq Km): City Mayors Statistics (January 2007), 'The Largest Cities in the World by Land Area, Population and Density

[27]See Figure 2

cities as key to sustainability

Barcelona had traditionally been a compact and well planned city, with most important locations falling within a small radius. 56 per cent of trips in the city are done on foot. The city has encouraged the development of a strong pedestrian culture[28].

Berlin too has a compact urban form, with inner city districts dominated by heavily built up residential areas. While Vancouver has a more sprawled urban form, most commercial buildings are located in the city core. The city authorities have, since 1996, consistently worked at reducing the total number of vehicle trips and have succeeded in achieving a 10 per cent reduction[29].

As illustrated by Figure 5, the ecological footprint of a city is impacted by the population density of a city. Atlanta with a population density of 700 persons per square kilometre has a much higher ecological footprint than Barcelona, Berlin and Vancouver which have population densities of 4850, 3750 and 1650 respectively[30].

Of course, one cannot view this as a mechanical formula. In the case of London, a compact urban form still results in a relatively high ecological footprint of 6.6 global hectares; the city has identified transport reform as a means of reducing its ecological footprint. Over the past six years it has become the only major city in the world to achieve a palpable shift away from private car usage to public transport and a more recent study will probably show an improvement.

In short, cities can provide a number of opportunities for improved sustainability:

- Higher densities within urban settlements drag down the costs per household for the provision of various sorts of infrastructure – transport, piped water, sewers, power, and allows the possibility of near-universal provision.
- Higher concentrations of populations also provide more potential for recycling – water and waste.
- Larger and yet more compact cities allow the provision of better public transport infrastructures, which has a direct impact on the environment through reduced emissions and fuel-use.

Singapore's Master Plan for 2020 © Nagrath, S.

Urban settlements, if planned to maximise density, provide an excellent opportunity to exploit vast economies of scale for the provision of infrastructure, resources and services. It is not far-fetched to say that cities hold the key to the age of sustainability. Sustainable cities allow their citizens to live within their fair share of the earth's resources without giving up on an urban lifestyle. It must be remembered that a "green" city must still be a socially and economically vibrant city. This requires careful balancing – much can be learned from cities like Singapore which have taken great pains to try and integrate all the various elements.

[28]Clos, J. (2002), 'Agenda 21 — A Question of Balance', Barcelona Metropolis Mediterrania
[29]City of Vancouver, Engineering Services (2007), 'Transportation Plan Update'
[30]See Figure 5