

# Chapter 8

## Actualizing Smart Regional Aspirations: A Case of the National Capital Region, India



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**Abstract** National Capital Region (NCR) is one of the best known and economically fastest growing planning regions of India. Innovative real estate developments in the cities of Gurugram, Noida, and Greater Noida have caught the attention of policy makers and academic scholars alike. Most scholars however have focused on challenges presented by this region and critiqued inequitable developments. This chapter focuses on challenges as well as opportunities presented by this metropolitan planning region. This chapter speculatively seeks to answer the question of what holds for the people living in the NCR for the next 20 years. After brief introduction, the second part of the chapter used to set the context by examining planning and governance of the NCR. The third part of the chapter focuses on five smart spatial challenges and opportunities. Emanating from these challenges and opportunities are policy proposals that are discussed in the fourth part of the chapter that policy proposals would convert challenges into realizable opportunities, making regional aspirations a real possibility. The chapter ends with some conclusions.

**Keywords** Smart aspirations · National Capital Region · Smart economy Environment and mobility · Delhi-Mumbai Industrial Development Corridor Smart Meta City Delhi

### 8.1 Introduction

Although, it took nearly 40 years after independence to set up the Planning Board under the National Capital Region Planning Board Act, 1985, the first draft regional plan for the NCR was published in 1971 by town and Country Planning Organization Delhi [2: 224–225]. Prior to this, a number of regional and sub-regional studies were undertaken by the Town and Country Planning

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Organization. Even if we take stock of regional planning attempts made after independence, a number of regional planning studies were carried out by the Town and Country Planning Organization, Government of India, which include Growth Pattern of Public Sector Offices in the NCR (1969); Cropping Pattern for the National Capital Region (1973); NCR Plan Implementation: A Programme for Action (1977); Industrial Profile of Rajasthan Sub-Region of NCR (1985); Industrial Profile of Uttar Pradesh Sub-Region of NCR (1985); and Industrial Profile of Haryana Sub-Region of NCR of 1986 [17: 12–49]. Above inventory of research reports shows that before formal commencement of regional planning in the National Capital Region under an Act of Indian Parliament, not only there was awareness and conversation within government about regional planning among planners, number of significant studies was carried out by the TCPO on behalf of Government of India. As Tridib Banerjee underscores: “Although talks about preparing a plan for the National Capital Region began as early as the late fifties, serious efforts were under way only in the late sixties, when the Town and Country Planning Organization of the Ministry of Works, Housing and Urban Development began its preliminary research and studies” [2: 223].

Established in 1985, the NCR Planning Board was made responsible “for the preparation of a plan for the development of the National Capital Region and for coordinating and monitoring the implementation of such plans and for evolving harmonized policies for the control of land-uses and development of infrastructure in the National Capital Region so as to avoid any haphazard development of that region ...” [7: 3]. So largely based on studies undertaken by the TCPO between 1960 and 1980, the NCRPB prepared and enforced the National Capital Region Plan, 2001 in January 1989. The National Capital Region Plan, 2021 was notified on 17 September 2005. The NCRPB took nearly four year to prepare each of the two regional plans, which is not a long time to prepare and get approved plan for a large and complex region like the NCR. Since the current regional plan of the NCR will come to an end in 2021, preparations are being made to prepare and enforce the third regional plan for the NCR. This time however, the NCR has engaged the National Institute of Urban Affairs (NIUA) Delhi to support the efforts of making the regional plan for NCR, whose mandate is largely urban planning rather than regional planning as previous works of NIUA show that it has primarily focussed on urban studies and not on urban planning.

This brief overview about the NCR of India focuses on four elements of the smart regional planning and development. These are smart regional economy, smart regional accessibility, smart regional environment, and smart regional settlement pattern, which is also largely in line with the objectives of the Regional Plan 2021 (see [11: 18]). But before I do this, a brief discussion about the planning history of the NCR is imperative. Rapid urbanization and growth of the National Capital of Delhi was a cause of concern for the state and central government from the start. During the formulation of the first master plan of Delhi in 1959, the need of a regional plan was recognized to regulate and control growth of Delhi in a planned manner. National capital region was perceived as a vehicle to regulate population of Delhi with little emphasis on the intrinsic value of the region and regional planning

in the NCR. Thus Master Plan for Delhi in 1962 made a recommendation for the formation of the National Capital Regional Planning Board to strategize the growth of Delhi and the National Capital Region. National Capital Region Plan is consistent in its focus on two issues: “(a) that it is possible to define the carrying capacity of the regional environment and of its settlement system, and (b) that the growth of the core city must be limited by decentralizing future growth to other urban centers in the region” [2: 225]. This utopian policy of containment, control and regulation continues even today in the currently enforced regional plan for the NCR.

So it is in this context that the National Capital Region Planning Board was formed under the National Capital Region Planning Board Act, 1985. NCR is the largest metropolitan region in India and the third largest metropolitan region in the world covering approximately 33,600 km<sup>2</sup>. The constituents of National Capital Region are the National Capital Territory of Delhi (going to the smart meta city with population of 20 million or more in 2021) spanning over 1483 km<sup>2</sup>; Haryana Sub-region comprising of Faridabad, Gurgaon, Rohtak, and Sonapat districts in addition to Rewari, Bawal, and Panipat tehsils covering an area of 13,413 km<sup>2</sup>; Rajasthan Sub-region constituting of Alwar, Ramgarh, Behror, Mandawar, Kishangarh and Tijara tehsils with a total area of 4493 km<sup>2</sup>; and Uttar Pradesh Sub-region constituting Meerut, Ghaziabad and Bulandshahr districts with an area of 10,853 km<sup>2</sup>. The National Capital Region is also the largest populated metropolitan region in the world with a population of approximately 46.07 million (Census of India; for comparison see [6: 18]; also see Fig. 8.1). Present total area of the NCR is 45,888 km<sup>2</sup> after the Ministry of Urban Development vide gazette notification of 1 October 2013 included Bhiwani and Mahendragarh districts of Haryana state, and Bharatpur district of Rajasthan state in the NCR. This unfathomable and indecipherable geographical area of the NCR itself poses a great challenge of governance for regional planners for the realization of regional aspirations, hopes that are pinned on regional planning of such a large region. This also raises a concern about the delineation of the NCR, which appears to be made on the basis of political considerations (inclusion of three districts Bhiwani, Mahendragarh, and Bharatpur) rather than on the basis of any technical parameters (also see [9: 669]).

## 8.2 Planning and Governance of the Region

Planning process of the National Capital Regional Plan involves preparation of a draft regional plan by the NCRPB followed up with an exercise in public participation for inviting comments on the draft of the regional plan. The process of public participation is mandated under section 10 of the National Capital Region Planning Board Act, 1985. After obtaining objections and suggestions from the public, central government, state governments, local bodies and other agencies, regional plan is accordingly modified and submitted to Government of India for final



Fig. 8.1 National Capital Region of India. Source NCRPB [11]

approval. After approval by the government, regional plan is ready for implementation, which could be periodically reviewed. As could be imagined, planning process in the NCR is integrative and hierarchical. Since planning is considered to be integrative by nature, it is hoped that various parts of the NCR Plan would also reinforce each other. It is also hoped that the regional plan would continually speak to and guide sub-regional plans prepared by different state governments for their sub-regions. Integration among regional and sub-regional plans becomes critically important because plans are not prepared in a top down order, regional plan first and sub-regional plans later, but in any random order. For example, this time sub-regional plans for Haryana and Uttar Pradesh were prepared after the preparation of the NCR plan. But this order could reverse in future. Hierarchy of plans for National Capital Region is given in Fig. 8.2).

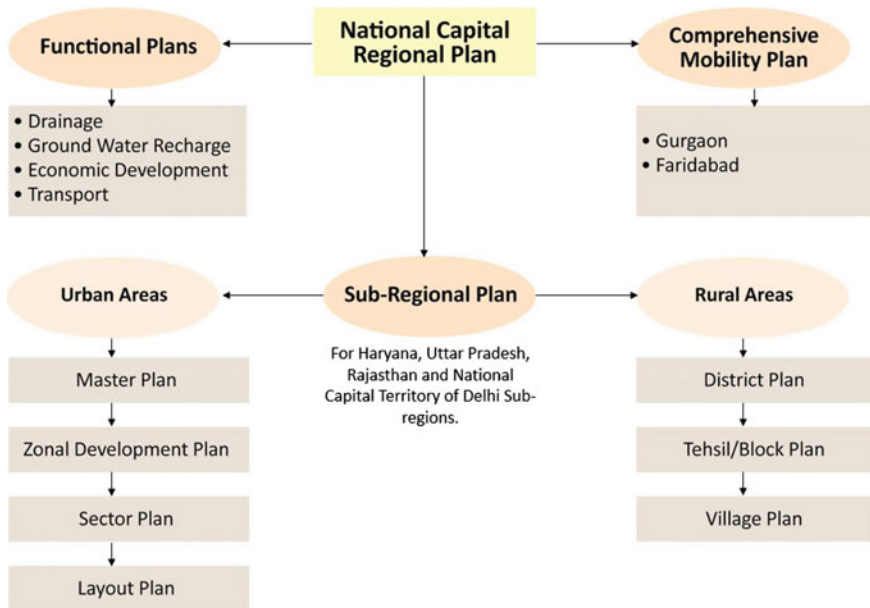


Fig. 8.2 Hierarchy of plans in the NCR of India

Two regional plans have been formulated till date for the National Capital Region with perspective years of 2001 and 2011. Regional plan for the National Capital Region is followed by Sub-regional Plans for the sub-regions of Uttar Pradesh, Haryana, Rajasthan and Delhi. However, from the start sub-regional plan for Delhi was never prepared, arguing that the area of Master Plan for Delhi and proposed Sub-regional Plan for Delhi is coterminous i.e. area of master plan and sub-regional plan is same. This argument is flawed because even if area is coterminous, a sub-regional plan would throw up different planning issues than the Master Plan for Delhi. For example, a regional plan would focus on forests while a master plan would concern itself with green spaces in a city, both implying different emphasis on environmental issues. Nonetheless, in order to implement the regional and sub-regional plans and elaborate a particular element of the regional plan, functional plans are prepared for drainage, ground water recharge, economic development of the region as whole and seamless transport connectivity. Finally, for the urban areas of Faridabad and Gurgaon, comprehensive mobility plans have been also prepared to ease traffic problems in both these areas.

Apart from the regional plan and sub-regional plans, the urban areas in the metropolitan region formulate their own master plans (example Master Plan of Delhi, 2021). Rural areas in the region make their own plans (largely economic plans) at three levels including district development plans, block development plans, and village development plans, mandated under local government acts of the relevant states since 1992 when 73rd and 74th constitutional amendments were

made. Why economic plans are not prepared? The simple answer is that collector centered project planning remains popular in government as a British legacy. Dominance of the collector culture makes all other administrative structures such as District Planning Committee, Block Samiti and Village Panchayats defunct. Governance becomes abstruse in this maze of development plans. For example, how far district development plans, block development plans, and village development plans, within the NCR conform to and seek guidance from the NCR Regional Plan 2021. Since development plans and the NCR Regional Plan are statutory documents, which one should prevail if there is a policy conflict among these development plans? Additionally, each development plan is a carrier of state politics, which may or may not gel with the NCR Regional Plan.

As quoted in Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (2014: 26), Blotevogel and Schulze [4] and Taylor et al. [16] identify four functions for metropolitan regions. These include decision-making and control function; innovation and competition function; gateway function; and the symbol function. The decision making and control function involves planning and development of place nodes which are capable of attracting global business, industry and politics, for example headquarters of corporate houses, and global organisations. The innovation and competition function involves production of regional knowledge economy where efficiency is the key to attracting highly skilled and creative people. The gateway function presents the region as a gateway to the world for access and exchange of information, knowledge, ideas and services. If a region is able to perform the gateway function effectively it should be able to benefit regional development from a diversity of people and cultures. The symbol function involves production of authentic cultural signs and symbols, which represent uniqueness about the region. Authenticity would depend on a mixture of cultural, historical, economic and spatial elements, and also if these elements are experienced on a daily basis.

More in line with ground conditions of the present day economic and political environment, Tridib Banerjee [2] argues that the chief purpose of regional planning and development is “to develop a dynamic approach to allocating and distributing future population growth. Growth management, rather than growth control, should be the operative concept. That requires effective tools for continually monitoring the stresses and strains within the regional settlements system, and for guiding the policy process and investment decisions according to that intelligence” [2: 225]. The NCR plans have followed the rigid and static planning strategy of growth control rather than growth management.

The NCR governance is coherent to the extent that three state governments excluding NCT Delhi have established dedicated administrative offices at sub-regional level and tasked these with matters of regional planning including preparation of sub-regional plans. However, Government of the NCT of Delhi does not have any dedicated office for regional planning because Delhi Development Authority is responsible for planning and development of the city of Delhi and also land is controlled by DDA not Delhi Government. Second aspect of the NCR governance is that it is highly fragmented because there are a large number of

districts, tehsils, blocks, villages, towns and cities, making coordination among these entities impossible and adversely affecting efficiency. When coordination at a decentralized level is not possible, this situation causes decisions to be made at state level, again affecting efficiency. Furthermore, District Planning Committees being largely dysfunctional adversely affects regional planning by creating inefficient administrative and planning framework. These elected development authorities should be given adequate funds to start with after which they could be allowed to raise funds from the markets because raising funds in a buoyant region is not difficult. Lastly, a number of private developers colonizing different parts of the region under different statutes give rise to fragmented spatial development in the region, which is least, connected to larger utility networks. Developments around Gurugram provide a relevant example.

Due to peculiar nature of administration of the national capital Delhi, little scope is left for the constitution of the Metropolitan Planning Committee in Delhi. Delhi state government does not even have enough powers to enact a law for setting up of a Metropolitan Planning Committee. Even if it is made, it will add to further confusion with the DDA. Metropolitan Committee becomes useful only if it is set up for the Central NCR including Delhi and DDA is abolished altogether and its powers are handed over to Delhi state government.

## **8.3 Smart Regional Planning and Development**

### ***8.3.1 Smart Regional Settlement Pattern***

A region where all rural and urban settlements are planned and developed on the basis of the principle of 'balanced growth' would be able to obtain smart regional settlement pattern. In such regions, all settlements would be allowed to develop according to their different potentials in terms of natural and human resources. Regional planning would not make deliberate attempts to seek to equally develop all parts of the region. Regional inequalities, particularly, economic inequalities, would remain because of diverse potentialities of each area in the region. Therefore, to obtain a smart regional settlement pattern, no deliberate economic equality is emphasised. Certain parts of a region would grow faster than others; equality being addressed through free movement of people and goods, and also through welfare policies of government. However, deliberate attempts (read planning) would be made to create decent access to housing and basic services to all people of the region.

Having defined the idea of a smart regional settlement pattern, let us now examine national capital Regional Plan 2021. Regional Plan 2021 proposes six-tier hierarchy of settlements including Metro Centre (population 10 lakh and above), Regional Centre (3–10 lakh), Sub-regional Centre (0.5–3 lakh), Service Centre (10,000–50,000), Central Village (5000–10,000), and Basic Village (below 5000). A robust system of mass public transport is proposed to be developed to make these settlements accessible for movement of people and goods [11: 29]. This excludes

Central National Capital Region or CNCR. Regional Plan 2021 continues to maintain the primacy of Delhi, which is further reinforced by the development of proposed seven Metro Centres with combined population of 127.69 lakh excluding population of Delhi. Metro Centres are expected to “act as powerful growth nodes to attract capital functions and activities and help in population dispersal from the national Capital. Because of their special functional status and size, a very high level of physical, social and economic infrastructure better than that in the Capital is required to be developed within these towns/complexes. This would include efficient intra-urban mass transportation systems as well as strong transport and communication linkages with Delhi, other Metro Centres and NCR towns” ([11: 30]; also see Table 8.1).

Proposed settlement pattern partially continues to perpetuate the existing settlement pattern dictated by the existing road and rail networks (see Fig. 8.3). Accessibility continues to play crucial role in developing regional settlement pattern for 2021. However, with proposals like RRTS, circular movement of people and goods is expected to increase manifold in future.

Another crucial proposal made by central government, which would have significant consequences for the region is setting up of mega infrastructure project of Delhi-Mumbai Industrial Corridor (DMIC) worth nearly US\$ 100 billion by central government, a part of which is located in the NCR. This corridor project significantly involves building of Multi-Modal High Axle Load Dedicated Freight Corridor between Delhi and Mumbai covering the length of 1483 km. This freight corridor will pass through the six states of U.P., Delhi, Haryana, Rajasthan, Gujarat and Maharashtra. Starting from Dadri in the National Capital Region, the freight corridor will terminate at the Jawaharlal Nehru Port near Mumbai. This corridor is to be used for long haul freight movement with additional purpose of sparing the existing track space for short haul freight movement. Former Economic Adviser to the Prime Minister of India in his Brief Conceptual Note: Development of the Delhi-Mumbai Industrial Corridor explains that the DMIC will have nine junctions and three terminal stations along the route, and the ports of Mumbai, Navi Mumbai,

**Table 8.1** Metro Centres, 2021

S. No.	City and complex	Proposed population	
		2011	2021
1.	Faridabad-Ballabgarh	16.00	25.00
2.	Gurgaon-Manesar	4.50	16.50
3.	Ghaziabad-Loni	19.00	30.19
4.	Noida	6.00	12.00
5.	Sonepat-Kundli	3.50	10.00
6.	Greater Noida	7.00	12.00
7.	Meerut	15.00	22.00
Total		71.00	127.69

Source NCRPB [11]



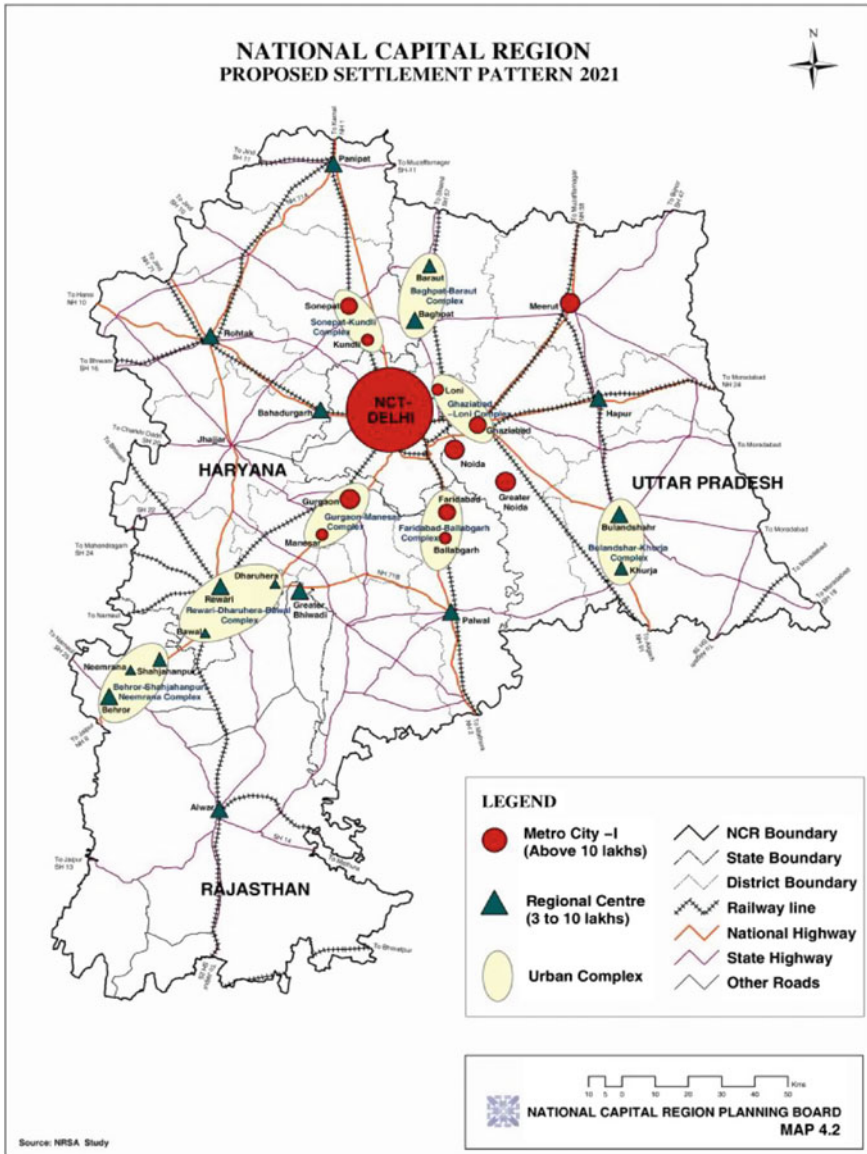


Fig. 8.3 Settlement pattern, 2021. Source NCRPB [11]

Pipavav, Kandla, Dholera, Navlakhi, Dahej, Mundra, Mandvi, Mahuva, Rewas and Dighi would serve this corridor (Narayan, undated: 2). Dadri-Noida-Ghaziabad Investment Region would take direct positive economic impact of the DMIC. Evidently, the DMIC is expected to speed up economic growth of the NCR, which is already one of the fast growing regions of the country. As government’s own

concept paper also notes: “The objective of DMIC, supported by world-class infrastructure, would be to optimize on the present potential, enhance investment climate and promote the economic development of the region through creation of a long term enabling environment [8: 1]. However, there is also a real possibility of other consequences such as increased regional ‘inequality and environmental degradation’ [14: 15].

### 8.3.2 *Smart Regional Economy*

Smart regional economy refers to sustainable economic growth that simultaneously protects physical environment and enhances general quality of life. National Capital Region of India is a buoyant region, its economy being one of the fastest growing regional economies in India. Economic growth is sustained over the last two and half decades, fulfilling the first condition of smart regional economy. But it is evident that the NCR planning policies and the kind of development it gives rise to lag much behind on protection of physical environment. A degraded environment such as Delhi Ridge in the southern parts of Delhi is just one notable example. Rampant mining activity continues unabated in spite of regular interventions by various courts.

Nevertheless, economy of the National Capital Region is surging ahead in the wake of sustained growth of the service sector and the real estate sector. Measured in terms of per capita income, the NCR stands among the top five regions of India. National Capital Region is counted among the top economic performers of the country and Delhi and the Haryana Sub-Region play an important role in making NCR an economic powerhouse. NCR contributes 6.7% to the GDP of India [13: 42]. As noted below:

The NCR occupies an important place in terms of share of GDP of India. India’s GDP at constant (2004–05) prices in 2009–10 was Rs. 45160.7 billion whereas the GDP of NCR for the same period was Rs. 3193.4 billion accounting for 7.1%. In the year 2009–10, the GDP of India has seen a growth rate of 8.6% as per CSO and total GDP in year 2013–14 was recorded at Rs. 57417.91 billion. The average growth rate of GDP in the NCR (11.2%) is greater than that of India (8.7%) during 2004–05 to 2009–10 [13: 52].

Accordingly the ‘Study of Economic Profile of NCR’ conducted by Apex Cluster Development Services Private Limited in 2015, points out that the tertiary sector is the main contributor to the GDP of the NCR. For instance, contribution of the tertiary sector to NCR’s GDP is 67% while secondary sector contributes to the tune of 25% and primary sector only contributes 8% to the GDP of NCR. The same study concludes that “Delhi is the largest economic contributor to the GDP of the NCR. Growth rate of GDP is the fastest in Haryana sub-region amongst all states. Uttar Pradesh sub-region’s share in GDP has been declining consistently. On a yearly basis, Uttar Pradesh Sub-Region has touched the highest growth rate at 21.39% and lowest by Rajasthan Sub-Region at 0.01%. 2006–07 is the year with

highest growth rate at 13.64% followed by 2009–10 at 10.60%. 2008–09, 2007–08 and 2005–06 followed at 10.45, 9.99 and 9.51% respectively in NCR economy” [13: 18–19]. While Delhi and the Central NCR are fast emerging as the mainstay in respect of service sector, the other three sub-regions are gradually shifting from agriculture to manufacturing. More precisely and in comparative sense, Uttar Pradesh and Rajasthan remain dominated by agriculture while the Haryana Sub-Region is restructuring itself into an area predominated by services and manufacturing. Districts of Gurugram and Panipat contribute greatly to the Haryana Sub-Region’s economic growth. Gurugram district in the Haryana Sub-Region has been experiencing faster economic growth due to IT and ITES and Panipat has distinguished itself as a prime trade centre. As a whole, per capita income of the NCR remains higher than the per capita income of the country for the periods between 2004–05 and 2009–10. Restructuring of the regional economy is fast transforming the NCR. For example, over 71% of the total workers would be engaged in trade, commerce and services by 2021. This is an increase from nearly 64% in 1991. Overall worker participation rate has been consistently increasing and is expected to touch 40% by 2021 [11: 40]. Worker participation rate of NCR is slightly higher than India’s worker participation rate, which is 39.8% [5].

Hastened process of industrialization presents a number of challenges. Environment of the region, for example, remains one of the major concerns. The ridge, wetlands and sanctuaries need to be protected, particularly from the process of industrialization, and unauthorized urbanization. Another important aspect is that productive agriculture land should also be protected from industrialization and urbanization. Government is steadfast in dealing with these issues as it has already published regulations for setting up SEZ in areas, which are not agriculturally productive. Regional Plan 2021 intends to enforce Environment Protection Act, 1986. However, mechanisms for enforcement are largely ineffective, leaving authorities responding to violations after they have already caused major adverse environmental impacts.

Another less known aspect of the regional economy of the NCR is the function of the NCRPB to provide interest bearing loans to state governments, parastatals of state governments and urban local bodies under section 7 of the NCRPB Act 1985. Section 7 (ii) of the NCRPB Act 1985 provides that the Board would “arrange for, and oversee, the financing of selected development projects in the NCR through Central and State Plan funds and other sources of revenue”. Further section 7(e) of the NCRPB Act, makes the NCRPB responsible for arranging and overseeing financing of selected development projects in the NCR and in CMAs. The report titled ‘National Capital Region Urban Infrastructure Financing Facility (RRP IND 41598-01) notes: “In fulfilment of its mandate, the NCRPB has been playing a significant role in the development of infrastructure in the NCR by financing infrastructure development projects selected under powers vested in it by section 8 (e) of the NCRPB Act. These projects cover a wide spectrum of basic infrastructure development, sewerage, drainage and solid waste management, water supply, power, transport, hospitals, abattoir and civic centre” [1: 1]; also see Table 8.2). Traditional sources of funds have been shrinking, central government has almost

**Table 8.2** National Capital Region: budget allocation and expenditure

Five year/ annual plans	Plan funds released by Central Government	GNCTD contribution	Loans released	Total expenditure including loan released (plan)
<i>Eleventh five year plan</i>				
2007–08	100	50	705.37	741.97
2008–09	50	50	723.6	777.85
2009–10	50	00	814.56	894.88
2010–11	50	00	598.77	948.24
2011–12	50	00	613.65	790.14
<i>Twelfth five year plan</i>				
2012–13	55	00	418.51	637.05
2013–14	60	00	355.44	643.76
2014–15	80	00	237.91	523.56
2015–16	80	00	165.15	514.40

INR in crores

Source <http://ncrpb.nic.in/ncrconstituent.php>

halved its contribution and Government of the National Capital Territory of Delhi (GNCTD) has stopped funding since 2009–10; Delhi has not made any contribution to NCRPB since 2009–2010. Accordingly loans released by the NCR have also been drastically reduced from INR 705 crore in 2007–08 to merely INR 165 crore in 2015–16; a fall of over four times.

One of the crucial questions is: who is benefitting from the NCR funding? Of the total loan sanctioned by the NCRPB for all sub-regions, nearly 60% of that loan went to Haryana, and 29% of the sanction loan was given to Uttar Pradesh. Of the NCR sub-regions, the National Capital Territory of Delhi got least amount of loan from the NCR. Some amount of loan was also sanctioned to Punjab and Madhya Pradesh, which is not part of the region but both, has been identified as counter magnets to the NCR. Loans are rightly sanctioned based on transparently laid down criteria rather than population size (see Table 8.3).

**Table 8.3** National capital region project summary as on 30 September 2016

S. No.	States	Status	Number of projects	Estimated cost	Loan sanctioned	Loan released by NCRPB
1.	Rajasthan including CMA Kota	Ongoing	6	285	214	68
		Completed	30	1679	631	594
		Sub-total	36	1964	845	662
2.	Uttar Pradesh including CMA Bareilly	Ongoing	9	7237	2654	329
		Completed	49	1949	834	609
		Sub-total	58	9186	3488	938

(continued)

**Table 8.3** (continued)

S. No.	States	Status	Number of projects	Estimated cost	Loan sanctioned	Loan released by NCRPB
3.	Haryana including CMA Hisar	Ongoing	30	2971	2050	921
		Completed	160	12,249	5178	4615
		Sub-total	190	15,220	7228	5536
4.	NCT Delhi	Ongoing	1	102	76	20
		Completed	2	521	310	310
		Sub-total	3	623	386	330
5.	CMA Patiala, Punjab	Ongoing	0	0	0	0
		Completed	2	79	46	46
		Sub-total	2	79	46	46
6.	CMA Gwalior, Madhya Pradesh	Ongoing	2	104	63	32
		Completed	4	134	101	101
		Sub-total	6	238	164	133
Total			48	10,669	5057	1370
			247	16,610	7100	6275
Grand total			295	27,309	12,157	7645

INR in crore

Source <http://ncrbp.nic.in/ncrconstituent.php>

Total amount of loan sanctioned to the sub-regions is too little when compared with the costs of regional level projects. Even a part of the RRTS project would cost several times more than the total sanctioned funding of INR 12,157 by the NCR. For example, the National Highways Authority of India, which granted in principle approval for the construction of the Delhi-Panipat and Delhi-Alwar Regional Rapid Transit Systems corridors of the RRTS. Both corridors would cost INR 53,500 for 291 km high speed rail track [10].

### 8.3.3 Smart Regional Accessibility

Smart regional accessibility is crucial to the realization of regional planning and development. Without smart regional accessibility—fast, safe and affordable regional commuting, and economically viable movement of freight—regional planning and development would remain a pipedream. Movement for work, leisure, trade, education and other purposes remains at the heart of regional planning and development. Moreover, accessibility is pivotal to real estate development. Accessibility is crucially critical for inter-settlement linkages in order enhance interactions among small as well as large settlements. Overall accessibility is one of the primary aspects that determine overall prosperity of a region by directly influencing economic, social and cultural relations. Transport facilities in the

National Capital Region play a very important role by providing connectivity to and from the National Capital Territory of Delhi with respect to its neighbouring areas as well as within the region. A discussion below briefly examines policies of the Regional Plan of NCR of 2001 and 2021 pertaining to the transport sector.

National Capital Region is spread across approximately 33,578 km<sup>2</sup> with portions from three states other than the Union Territory of Delhi. In view of this large geographical expanse, it is important to plan and develop an extensive intra-regional as well as inter-regional transport networks in order to meet the needs of people in the region. Here it should be stressed that Delhi acts as the primary collection and distribution centre for freight goods that makes the transport sector so critical for the functioning of the NCR as well as the areas surrounding the region.

Currently existing transport network has developed in the form of a well laid out roadway system as well as rail network that extends out radially. Major policies and strategies as part of Transport Plan 2021 aim to decongest road and rail terminals by diversion of through traffic, and by providing improved connectivity to regional and sub-regional centres, even outlying areas of the region. In fact the road network was proposed to be developed in the form of a three tier hierarchical network consisting of primary roads (expressways, national and state highways), secondary (major district roads) and tertiary (single, intermediate or double lane metalled roads) networks.

The primary road network in the region consists of ten national highways and ten state highways. Five of the national highways meet in Delhi forming a part of the Ring Road, i.e. NH1 (Delhi to Panipat), NH2 (Delhi to Palwal), NH8 (Delhi to Behror), NH10 (Delhi to Rohtak) and NH24 (Delhi to Hapur). The proposal was made to extend these national highways to CNCR towns i.e. NH1 (Delhi to Kundli), NH2 (Delhi to Ballabgarh), NH8 (Delhi to Gurgaon), NH10 (Delhi to Bahadurgarh) and NH24 (Delhi to Ghaziabad). Above mentioned national highways along with NH58 (Ghaziabad-Meerut-Muzaffarnagar) and NH91 (Ghaziabad-Khurja-Aligarh) extend radially out from NCT Delhi connecting it to regional or priority towns and are in the form of four lane divided highways on most stretches, proposed to be developed as expressways. The other national highways in the region include NH71 (Rewari to Rohtak), NH71A (Rohtak to Panipat) and NH71B (Rewari-Sohna-Palwal).

Another major policy decision with reference to the primary road network was taken to connect all CNCR towns through the Eastern and Western Peripheral Expressway (WPE and EPE). Kundli-Manesar-Palwal (KMP) Western Peripheral Expressway and Kundli-Ghaziabad-Palwal (KGP) Eastern Peripheral Expressway were proposed to be implemented on priority in the first phase (2001–2011), both about 135 km long. In addition all metro and regional centres are proposed to be connected with perimeter roads of expressway standard to serve the purpose of bypass for enabling through traffic.

The EPE and WPE constitute a combined project forming a ring road around Delhi, connecting NH-1 and NH-2 from western and eastern side of Delhi with a total length of 270 km; about 183 km length passing through Haryana and about 87 km length passing through Uttar Pradesh.

The Western Peripheral Expressway, being implemented by HSIIDC, Haryana Government, is proposed to be completed by November 2017, the stretch from Palwal to Manesar is ready for use while the section between Manesar and Kundli is under construction, and is targeted to be completed in August 2018. There were several delays in the project including termination of the initial contract with KMP Expressways Limited. However, the project was revived in 2015 with fresh bids. The work on EPE also began in 2015 and was given about 900 days for completion. However, it faced several issues along the way. Mostly the project was stalled due to unsatisfactory compensation with respect to land being acquired. Its implementation is being done by the National Highways Authority of India.

The two expressways together would serve as a bypass for traffic not meant for Delhi and headed towards the neighbouring states of Uttar Pradesh, Uttarakhand, Haryana, the Punjab, and Jammu and Kashmir. This will not only decongest Delhi but also cut down pollution by almost 50%. EPE is estimated to provide a network for almost 80,000 freight vehicles every night, which would have passed through Delhi in its absence. The EPE is also being promoted as the 'first smart and green highway' with an intelligent highway traffic management system (HTMS), and video incident detection system (VIDS). Bringing in the concept of 'green and sustainable', it is proposed to be electrified by solar panels and faster electronic toll collection system at toll booths.

On the whole enhanced accessibility through these two expressways is expected to boost the economy of the region by providing better connectivity among settlements and also by managing traffic within the region. It would give a major boost to transport infrastructure of the region, making it speedier, efficient and less polluting, which in turn would make the economy buoyant as a whole. Moreover looking at the economic impact from the point of view of employment generation, these projects have created both direct and indirect jobs. The construction work of EPE has generated 4,000,000 man days of employment with 2100 engineers and 5200 workers employed on a basis. Besides this, local population would be involved in creating and maintaining green belt and roadside amenities such as petrol pumps, shops, etc. Furthermore these projects would add markets for local produce.

Other than road network, connectivity is provided by rail network. Existing rail network consists of five broad gauge railway lines converging at Delhi and also two special lines known as the Goods Avoiding Lines (GAL) and Delhi Avoiding Lines (DAL). The GAL provides a direct entry from Ghaziabad to New Delhi by bypassing the congested Delhi Railway Station Complex. The DAL provides a direct passage from the major yards such as Tughlakabad and Ghaziabad directly into Delhi-Ambala-Kalka section and through Lajpat Nagar, Patel Nagar, Daya Basti and Azadpur link.

Looking at these proposals about enhancing rail network in the Regional Plan 2021, one of the major policies is to build a primary regional rapid transit system connecting regional towns to each other and with Delhi along the following corridors with feeder links at sub regional centres (Table 8.4).

**Table 8.4** Transport corridors in the NCR

Order of priority	Name of the corridor	Length in km
1.	Delhi-Ghaziabad-Meerut	90
2.	Delhi-Gurgaon-Rewari-Alwar	180
3.	Delhi-Faridabad-Ballabgarh-Palwal	111
4.	Delhi-Faridabad-Ballabgarh-Palwal	60
5.	Ghaziabad-Khurja	83
6.	Delhi-Bahadurgarh-Rohtak	70
7.	Ghaziabad-Hapur	57
8.	Delhi-Shahdra-Baraut	56

*Source* Revised as per feasibility report

Feasibility studies of the first three prioritized corridors have been completed. Draft Detailed Project Reports are at an advanced stage of finalization. It is important to note that Metro Rail would be extended to the CNCR towns and integrated with the Regional Rapid Transit System (RRTS) with feeder services. In order to provide connectivity to the CNCR towns of Gurgaon, Faridabad and Bahadurgarh in Haryana Sub-region, and Noida and Ghaziabad including Vaishali in U.P. Sub-region through Delhi Metro, work is continually being pushed on a fast track with Delhi Metro Rail Corporation and metro links has already been extended to Gurgaon, Noida and Ghaziabad. In addition the Rapid Metro has been commissioned in Gurgaon. Work on Badarpur-Faridabad-Ballabgarh and Mundka-Bahadurgarh Metro line is in progress, which is likely to be completed by December 2017.

The orbital rail corridor, parallel to proposed Peripheral Expressways connecting radial rail corridor of the Indian Railway in CNCR towns and directional terminals was required to be made. No progress has been seen with regard to this proposal. Looking at airways connectivity, at present two airports are located in the NCR where Delhi-Indira Gandhi Airport is used for international flights and Palam Airport for domestic flights. A proposal is under active consideration for the development of another international airport in Greater Noida and also a suitable domestic air terminal. In June 2017, the second international airport for this region has been approved in Greater Noida's Jewar Region in Uttar Pradesh. The new international airport would cater to 30–50 million passengers per year over the next 10–15 years. The only difficulty with this project is that it is a Greenfield project, which would permanently encroach upon a large piece of fertile agriculture land in western U.P.

International airport project to be built in the Greater Noida's Jewar Region in Uttar Pradesh is proposed to be completed by 2021. However, looking at the speed of progress being made, it appears to be hardly satisfactory. Some major projects scheduled for the first phase are yet to be completed, which implies postponement of projects to be completed in the second phase. The Peripheral Expressways and rail transit systems including metro rail link with CNCR towns, once completed



would ease traffic burden on the roads of the region and provide improved connectivity and also pave the way for further economic development.

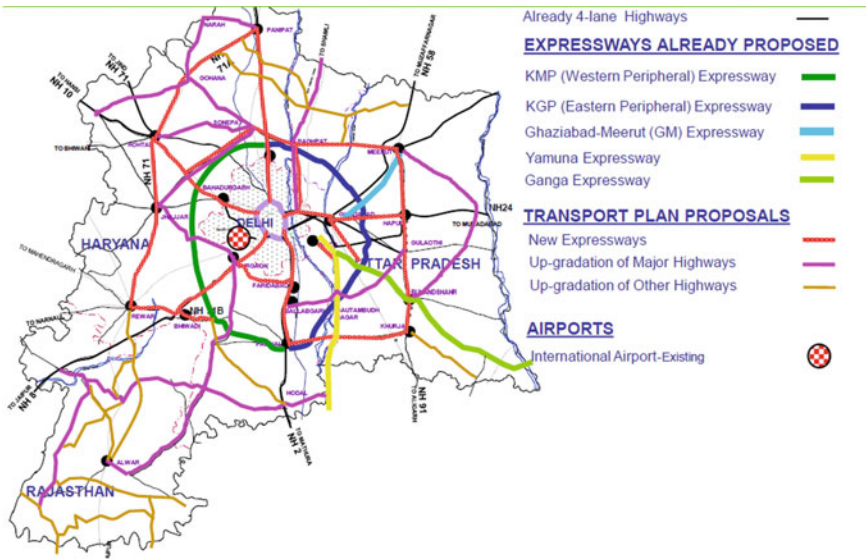
From the above review of the transport related major proposals in the region, it appears that the National Capital Region Planning Board clearly recognised regional accessibility as central to the development of the NCR. In this line of thinking, the National Capital Region Planning Board has prepared a Functional Plan on Transportation for NCR. This is an integrated multimodal transport plan with planning perspective of 2032. According to the National Capital Region Planning Board [11: 91], the major objectives of transportation in NCR Regional Plan, 2021 are:

- To provide transport system that tends people to shift towards use of public transport more.
- To provide efficient and economical rail and road based transportation.
- To discourage the movement of passengers and goods transit through core city by planning peripheral road expressway and bypasses.

As is obvious, the objectives of the NCR Plan place greater emphasis on promotion of public transport in opposition to travel through private automobile. Although air transport is directly mentioned in the transport objective of the Plan, all three modes—road, rail and air—when integrated provide the most efficient system of movement of people and goods. Hence the network of road, rail and air together form the transportation system in the NCR Delhi. The NCR Plan also intends to discourage through traffic from NCR Delhi. In order to achieve the regional plan's objectives, one of the actions taken by the NCRPB is that it has proposed Regional Rapid Transit System (RRTS) in the National Capital Region Plan 2021 notified on 17 September 2005. Functional Plan on Transport for National Capital Region, 2032 was prepared by a private consulting firm under the close supervision of the NCRPB in order to detail out implementation of the transport policies entailed in the National Capital Region Plan, 2021. The Functional Plan for Transportation in NCR, 2032 was approved by the NCRPB on 11 November 2009.

Even before the proposed RRTS is implemented, other major transport projects that would considerably enhance accessibility are at various stages of implementation. Notable among them include ([12: 84–88]; also see Fig. 8.4):

- Upgradation of national highway within NCR
- Peripheral Expressways around Delhi
- Upgradation of roads through NCR financed projects
- Delhi-Meerut Expressway
- New rail links on Rewari-Jhajjar-Rohtak, Sonapat-Gohana-Jind, Tuglakabad-Palwal Fourth Line and Sahibabad-Anand Vihar third and fourth line
- Extension of Delhi Metro to NCR Towns
- Dedicated Freight Corridors (DFCs)



**Fig. 8.4** Integrated transport plan for the NCR: road networks and airports. *Source* [www.ncrpb.nic.in](http://www.ncrpb.nic.in)

- Western DFC: Mumbai-Delhi (Dadri)—1515 km
- Eastern DFC: Ludhiana-Dadri-Son Nagar—1278 km

- Delhi-Mumbai Industrial Corridor
- Yamuna (Taj) Expressway
- Ganga Expressway

Nonetheless, the Functional Plan for Transportation in NCR, 2032 makes some radical transport planning proposals. Extensive network of 1107 km long regional expressways has been proposed connecting major urban nodes in the region with lane length of 9398 km. to be developed through public private partnership mode, the regional expressways would be developed with the right of way of 100 m and design speed of 120 km [12: 93–94]. Following are expressway links:

- Delhi–Sonipat–Panipat
- Delhi–Bahadurgarh–Sampla–Rohtak
- Delhi–Gurgaon–Manesar–Rewari
- Gurgaon–Faridabad
- Delhi–Faridabad–Ballabgarh–Palwal
- Delhi–Ghaziabad–Hapur
- Dadri–Ghaziabad–Meerut
- Loni–Baghpat (with potential to extend to Baraut and beyond)
- Sonipat–Baghpat–Meerut

- The entire outer grid from Panipat–Gohana–Rohtak–Jhajjar–Rewari–Palwal–Jewar–Bulandshahr–Hapur–Meerut

Marked as high speed, high capacity, safe and affordable mode of public transport, the Regional Rapid Transit System is expected to connect major regional nodes in the region with Delhi and with Sub-regional Centres; orbital rail and Mass Rapid Transit System (MRTS) for Delhi and CNCR towns. RRTS is proposed to run at an average speed three times that of the Delhi Metro with higher acceleration and deceleration. Average speed of Delhi Metro ranges from 30 to 40 km per hour. In order to cover the NCR, the RRTS stations would be placed at an average distance of 5–10 km.

Website of the National Capital Region Transport Corporation (NCRTC) shows that it is a Joint Sector company of Government of India and States of Delhi, Haryana, Rajasthan and U.P. and is mandated for implementing the Regional Rapid Transport System (RRTS) project across the National Capital Region, ensuring a balanced and sustainable urban development through better connectivity and access (also see Figs. 8.5 and 8.6).

At this stage it is worthwhile to take an example of a sub-regional plan to understand how far regional planning policies of the NCRPB are being translated

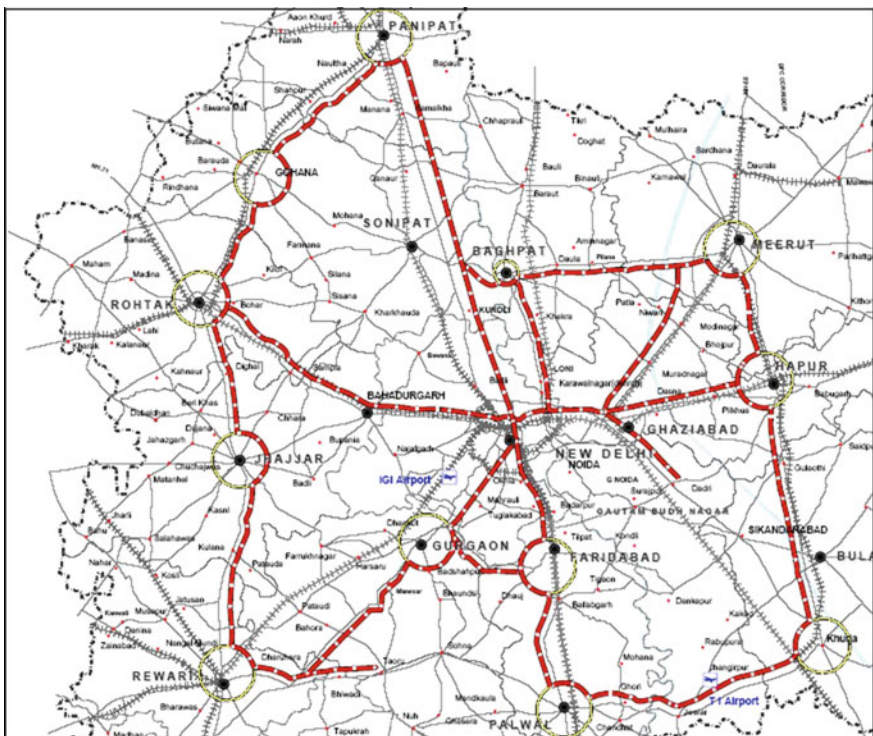


Fig. 8.5 Network of regional expressways in the NCR. Source [www.ncrpb.nic.in](http://www.ncrpb.nic.in)



Fig. 8.6 NCR transport plan, 2032. Source [www.ncrpb.nic.in](http://www.ncrpb.nic.in)

through lower order plans. For these purposes I will take the Sub Regional Plan of Haryana, which details out major transport proposals of the NCR Plan 2021. The Sub-Regional plan rightly points out that transportation is a system that promotes mobility of people and goods from one location to another. The Sub Regional Plan of Haryana, 2021 makes the following policies and strategies in order to achieve its objectives:

- To provide linkages among all six tier hierarchy of settlements and urban settlements.
- Connect Metro/Regional Centres with the Capital by an efficient and effective transport network.
- Unrestricted movement of public transport within NCR.
- Develop activities keeping in view rail and road linkages in the Central NCR.
- Transit Oriented Development (TOD) need to be promoted.
- Proposals of Integrated Mass Rapid Transport System (MRTS), Regional Rapid Transport System (RRTS), Expressways and Bypasses shall be implemented.
- Provide multi-modal stations wherever required.
- Promote unified fare collection system.
- Promote non-motorised transport in the Sub-region.
- Use of Intelligent Transport System for traffic management.
- Integration of land use and transport planning.
- Roads shall be made more pedestrian and disabled friendly.
- Efforts shall be made to provide cycle tracks.
- Regular training shall be conducted for the capacity building of road users and pedestrians (Sub Regional Plan—Haryana 2021: 122).

There are several proposals, which translate Regional Plan policies such as RRTS, MRTS, and enhancing accessibility of metro and regional centres. However, there are other proposals such as ‘integration of land use and transport planning’, which are generic in nature. There are other proposals including ‘the capacity building of road users’ that are completely incomprehensible.

In Haryana Sub-Region, there is only one expressway i.e. Delhi–Gurugram, 6 National highways, 12 state highways and 12 major district roads. Comparative analysis of road density shows that Delhi has the highest road density with 2103 km per 100 km<sup>2</sup> followed by Haryana Sub-Region with 59.30 km per 100 km<sup>2</sup>, Rajasthan with 50.79 km per 100 km<sup>2</sup> and UP with 50.71 km per 100 km<sup>2</sup>. The state highways cover 60% of the sub-Region of Haryana. National Highway 44 is the busiest route of the sub-region with 60,000 PCU traffic volume. Level of services describes operational conditions of road networks. These include parameters such as speed and travel time, freedom of manoeuvre, traffic interruptions, comfort, convenience and safety. Based on that the services has been designated from level A to F, whereas Level A represents best operating conditions, Level F represents the worst. In this sub-region many lane configurations operate at level of service F and only few roads and lanes operate at level of service A. Fewer vehicles on the roads and more people moving to public transport could also improve the

level of service in the Haryana Sub-Region. Transit oriented development is such a planning concept that is designed to overcome traffic congestion. It is a designed to build urban area consisting of mixed use residential and commercial areas in order to promote and maximise access to public transport. In the Haryana Sub-Regional Plan, high density corridors are proposed to encourage people to settle in these areas. Master plans are required to identify several potential TOD zones (Sub Regional Plan—Haryana 2021: 91–102).

Delhi Metro Rail Corporation is continually expanding its network within Delhi and the NCR. Regional Plan 2021 for the NCR has proposed Delhi metro rail system for the NCR region. As far as Haryana Sub-region is concerned, metro is further expanding to Gurugram, Faridabad and Bahadurgarh. Delhi Metro Rail Corporation's future proposals cover extension of metro rail network further into the Haryana Sub-Region in order to improve connectivity with the NCT, Delhi and among settlements within the sub-region. Delhi Metro Rail Corporation's upcoming metro extension projects would cover Sonipat, Panipat, Rohtak, Palwal, Manesar and Rewari, making a large part of the Haryana Sub-Region accessible through metro. Accessibility within the Haryana Sub-Region will get big propulsion through the construction of Regional Rapid Transit System as the following links will get connected through the RRTS.

- Delhi–Sonipat–Panipat
- Delhi–Bahadurgarh–Sampla–Rohtak
- Delhi–Gurgaon–Manesar–Rewari
- Gurgaon–Faridabad
- Delhi–Faridabad–Ballabgarh–Palwal
- Sonipat–Baghpat–Meerut
- The entire outer grid from Panipat–Gohana–Rohtak–Jhajjar–Rewari–Palwal–Jewar–Bulandshahr–Hapur–Meerut

Except the last two links, other links promote accessibility between Delhi and other urban areas located in the Haryana Sub-Region. This goes against the grain of the National Capital Region Plan 2021, which aspires to enhance connectivity between urban settlements other than Delhi. But it must be emphasised that the Integrated Transportation Plan for NCR 2032 has identified eight regional rail based rapid transit corridors. Out of the eight corridors, and most these corridors have some link with the Haryana Sub-Region.

Apart from the RRTS, regional Bus based Public Transport System (BPTS) has been conceptualized for the NCR. For the Haryana Sub-Region 9283 buses are required for the base year, which could increase in future. In order to deal with the situation, the State has made provisions for bus terminals in the respective Development Plans and transport department acted actively to provide buses for intra city movement across cities like Gurugram and Faridabad. All buses have sophisticated features such as GPS systems, Intelligent Transport systems, passenger feeding systems and electronic ticket verification machines. All buses run on clean fuel Like CNG. For air travel, the Haryana Sub-Region depends on the Indira

Gandhi International Airport. However, in the Integrated Transportation Plan for NCR, small airports are proposed in Rewari, Jhajjar and Sonipat district. However these airports come under the influence zone of IGI, Delhi. Haryana state government also intends to set up an international cargo terminal on the confluence of Hisar, Rohtak and Bhiwani. Similarly a small airport is proposed in Panipat. Both projects will be undertaken after approval from the Ministry of Aviation, Government of India (Sub Regional Plan—Haryana 2021: 102–103).

Road development programme in the NCR assumes equal significance. The NCRPB proposes to develop road network as indicated below:

- NCR regional plan proposes to develop existing Ring Road, Outer Ring Road and Five radial roads as expressway upto NCR towns.
- The Plan proposes fast development of Eastern Peripheral Expressway (Kundli–Ghaziabad–Palwal) and West Peripheral Expressway (Kundli–Manesar–Palwal corridor).
- The Plan also proposes Metro and Regional Centres to be connected with perimeter roads of expressway standard to act as a bypass for through traffic.

In a modern and globalized world, it is necessary to develop a world class infrastructure, high speed connectivity and favourable environment in order to attract inward investment in the region. Hence, the Haryana Sub-Regional Plan envisages the Sub-Region as an arena where it is possible to create a strong economic base through world class infrastructure. Thus, the Sub-Regional Plan focuses on connectivity, economic activities, logistics hubs, and infrastructure. Presently Haryana has developed a good road network infrastructure. It supports the socio economic growth of the state. This may be the reason behind the high density of vehicles plying on these available roads. But to cater to future needs of traffic volume on roads, present roads and lanes need to be widened, new roads to be constructed and proposed bypasses and parallel expressways to be built.

On the basis Primary surveys and secondary sources information, it has been found necessary to the augmentation of existing roads as well as additional corridors will have to be implemented in a phased manner. The additional corridor in the form of expressway can cater to large volumes of traffic as it will provide better mobility and safety. The Sub-Regional Plan of Haryana has advantage of accessibility provided by KMP expressways, proximity to national capital and its geological situation. Government of Haryana proposes to develop 12 new hubs along expressway, designated as ‘Global Corridor’. There are also plans to upgrade roads from two lanes to four lanes and from four lanes to six lanes (Sub Regional Plan—Haryana 2021: 104–106).

In the Haryana Sub-Regional Plan, transit interchanges—a place where passengers and cargo are exchanged between vehicles or between transport modes—can be designed along the Kundli–Manesar–Palwal Expressway where many national highways meet across the corridor. Orbital Rail Corridor is also planned along this Expressway. For promoting public transport to facilitate faster travel within the Sub-Region, the existing and proposed metro network and the proposed

RRTS is being developed in an integrated manner. Further in order to improve user facilities on roads stretches, it needs to facilitate roads with 'highway facilities centres' on comprehensive basis including common services like parking, fuel stations, restaurants, etc.

Haryana currently has about 1700 km of rail network. About 625 km i.e. 35% of rail routes in the state serve the sub-region. Presently all rail lines are used both by freight and passenger trains. The Regional Orbital Rail Corridor (RORC) was referred to enable the bypassing of a number of trains, which presently pass through Delhi. The proposed RORC would aim at integrating the existing and proposed radial rail lines originating and passing through the NCT Delhi and also to provide commuter services to the proposed urbanization along the RORC. In addition to the RORC, three other rail lines within the Haryana Sub-Region are proposed to strengthen connectivity through the rail system which will form the 'Inner Regional Orbital Rail Corridor' (IRORC).

Ministry of Railways, Government of India, is developing DMIC, a dedicated freight corridor between Delhi and Mumbai. A band of 150 km on both sides is being developed as Delhi Mumbai Industrial Corridor. DMIC Sub-Region in Haryana covers about 29,362 km<sup>2</sup> area, which covers about 66.4% of the total area of the state. According to the Perspective Plan Report, the value of output in the DMIC Sub-Region of Haryana is estimated to grow by 15 times over the next 30 year period (2010–2040). Development of proposed road network, which includes Expressways, NH, SH, MDRs, bypasses, flyovers and ROBs in the first phase would cost INR 17,442 crore and in the second phase it would cost INR 12,015 crores by the year 2021 (Sub Regional Plan—Haryana 2021: 113–121).

### **8.3.4 *Smart Environment***

NCR Regional Plan, 2021 encourages a balanced approach for incorporation of environmental features in the planning process for sustainable development of its sub-regions. Good quality environment is essential in order to achieve sustainable development. It is mandatory that development takes place with environmental considerations. It is also important to point out the factors, which are crucial for environment depletion and degradation, which might cause irreversible damage to regional water resources, forest cover, flora and fauna, ecological sensitive areas, good quality agricultural lands, and heritage areas, etc. It is in this context that we may have focus on environment factors i.e. forests, air, water, and other environmentally sensitive zones in the region and sub-regions.

Importance of the forest cover could not be overstated under any circumstances because the forest cover has great bearing on ground water occurrence, soil erosion, reduction of floods, and protection of the environment. National Forest Policy, 1988 aims to have a minimum of one third of the total land area of the country under forests and tree cover. But the ever increasing demand for food, fuel, fodder and growing demand of land for urbanization has put tremendous pressure on the scarce

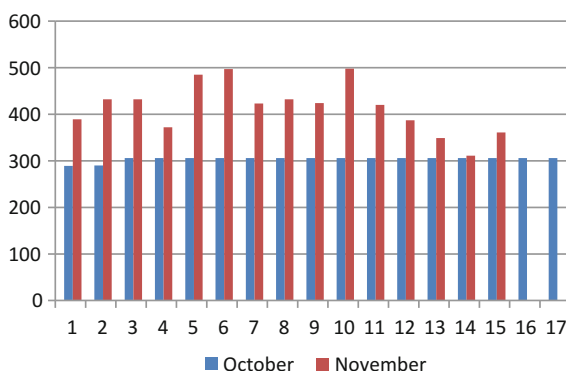


forest resources of the Haryana Sub-Region. At an all India level, forest cover forms 21% of the total geographical area. In the National Capital Region, forests are spread over an area of 2131.2 km<sup>2</sup>, which is 6.2% of the total land area of the NCR. Haryana Sub-Region of NCR has 3.94% area i.e. 529.41 km<sup>2</sup> under forests.

National Capital Delhi, which host a large percent of Delhi's population has been recently suffering from 'very poor' air quality (see Fig. 8.7). Several times in November 2017, Air Quality Index nearly touched the 500 level whereas the safe limit is only 40.

Present status of forest cover in the Haryana Sub-Region is that this sub-region is primarily an agriculture area with almost 80% of its land under cultivation. As per India State of Forest Report (2011) the forest cover in the state is 1608 km<sup>2</sup>, which is 3.64% of the state's geographical area and the tree cover in the state is 1395 km<sup>2</sup>, which is 3.16% of the geographical area. Thus the forest and tree cover of the state is 6.80% of its geographical area. The forests in Haryana are classified under Reserved, Protected, Unclassified and areas closed under section 38 of Indian Forest Act and under section 4 and 5 of the Punjab Land Preservation Act, 1900. The forest cover is unevenly distributed in the Haryana Sub-Region. The southern districts of Rewari, Gurugram and Faridabad have large areas under the reserve forest. Total area under reserve forest is 10.59 km<sup>2</sup> in Haryana Sub-Region and protected forest covers 290.96 km<sup>2</sup> followed by other forest, which covers 227.85 km<sup>2</sup> geographical area of the region. It is interesting to understand the temporal change in the forest cover in Haryana Sub-Region during 2001–11. From various studies, it is quite clear that forest cover in the Haryana Sub-Region has been continuously increasing since 2001. During the year 2011, total forest cover of the sub-region increased to 456 km<sup>2</sup>. Gurgaon district has the highest forest cover i.e. 231 km<sup>2</sup>. In the state, there are 9 wildlife sanctuaries and 2 national parks out of which 3 wildlife sanctuaries and 1 national park exist in the Sub-Region. A Zonal Master Plan for the Eco-sensitive Zones has to be prepared by the state with due involvement of all concerned state departments such as environment, forests, urban local bodies, tourism, municipal and revenue department and the Haryana State Pollution Control Board for integrating environmental and ecological

**Fig. 8.7** Air quality index from 15 October to 15 November 2017. *Source* Central Pollution Control Board (2017) as quoted in Sunday Times [15]



considerations. This will include restoration of denuded areas, conservation of existing water bodies, management of catchment areas, watershed management, groundwater management, soil and moisture conservation, needs of local community and such other aspects of the ecology and environment that need attention (Sub Regional Plan—Haryana, 2021: 281–285).

Hills of the Aravalli Ranges constitute a critically significant part of the environment of the Haryana Sub-Region. Government of India has devised several statutory mechanisms for the protection of the Aravalli Ranges. In order to protect these fragile areas falling under Aravalli Ranges and restrict activities, which are likely to cause environmental degradation in the Aravalli Region, Ministry of Environment and Forests, Government of India prohibits carrying out of any of the following operations:

- Any kind of mining activity to be stopped with immediate effect
- Cutting of trees
- Electrification (laying of new transmission lines)
- Any kind of construction work e.g. dwelling units, roads, etc.

This appears to be a list of reasonable restrictions for the protection of the Aravalli Range. However, due to lack strict enforcement of laws and rules by concerned government agencies, depletion of the physical environment in the Aravalli Ranges continues unabated in spite of the fact that various courts have adjudged against environmental violations. For example, vested commercial interests continue to carry out mining activities in this area. Environmental arguments are continually defeated in the face of market centered arguments premised on profitable commercial exploitation of natural resources.

Recently air pollution has grabbed headlines in the media and all attention of political leaders and administrators in the wake of very poor air quality in northern India. Chief Ministers are holding parleys to combat air pollution. Central government has been sending advisories to state governments. People are asking questions with the hope of making politicians accountable. Air quality meanwhile continues to deteriorate. Air pollution occurs when harmful substances including particulate matter and biological molecules are introduced into Earth's atmosphere. Continuous mixing, transformation, and trans-boundary transportation of air pollutants make air quality very poor. Since the last one month people in the NCR are suffering from extremely poor air quality. Responding to this situation, government has declared this condition as a health emergency. Stubble (crop residual) burning has been considered as the chief source of air pollution. Some newspapers have reported quoting studies that claim that nearly 90% pollution in the NCR Delhi is caused by stubble (crop residual) burning in the neighbouring states of Punjab and Haryana. Historically high growth of population, polluting industry, and the most crucial factor being rapid growth of vehicles has been regarded as the main causes of air pollution. For example, it is said that vehicular pollution contributes more than 70% of total air pollution in towns of Haryana Sub-Region. This does not add up and perhaps long term research could answer these complex questions.

There are at present 3 online air monitoring stations at Gurugram, Faridabad and Rohtak and 9 other manual air monitoring stations within the Haryana Sub-Region. Ambient air quality status provides for permissible limits of 12 air pollutants, out of these 4 pollutants are regularly being monitored. These are PM 10, PM 2.5, SO<sub>2</sub>, and NO<sub>2</sub>. After analysing the air quality of the sub-region, it could be concluded that the concentration of PM 10 and PM 2.5 has been high; in fact both the PM levels have been higher in the entire NCR. However the SO<sub>2</sub> levels have been recorded within the limits in all the three monitoring stations. However, NO<sub>2</sub> levels were recorded beyond the permissible limits in Faridabad and Rohtak.

Maintenance of water quality standards and monitoring is another important challenge facing the Haryana Sub-Region. Haryana has two major river basins namely, the Ganga and the Indus. Yamuna is the only perennial river in the Sub-Region. The Yamuna sub-basin covers parts of Panipat, Sonapat, Rohtak, Gurgaon and Faridabad districts. The Aravallis bring a number of small rainy streams in Gurugram, Rewari and Jhajjar. In the Sub-Region a number of small ponds or lakes also exist. Canals are the most popular and important source of irrigation in the Sub-Region due to easy supply and regular flow of water to agriculture fields (Sub-Regional Plan—Haryana 2021: 285–288).

Water (Prevention and Control of Pollution) Act, 1974 was enacted with a basic objective to maintain and restore surface aquatic resources. CPCB's classification of surface water in India notifies primary water quality criteria for the following five uses.

- A—Drinking water source without conventional treatment but after disinfection
- B—Outdoor bathing
- C—Drinking water source after conventional treatment and disinfection
- D—Propagation of wildlife and fisheries
- E—Irrigation, industrial cooling, controlled waste disposal

National Water Quality Monitoring Program is meant for water quality monitoring and it collaborates with the State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) in order to implement various water related policies and regulations governing water quality management and also monitors water quality of various water bodies. In the Haryana Sub-Region of NCR, HSPCB regulates control of pollution and implements National Water Quality Monitoring Program. For water quality monitoring, state government has established eight monitoring stations in the Haryana Sub-Region.

Water quality in rivers is one particular challenge. The maximum and minimum values of core parameters in the River Yamuna have been observed at two monitoring stations. Biochemical Oxygen Demand and pathogenic bacteria indicate that there has been degradation in water quality. While Nitrates and Nitrites are in the range of 0–13.9 mg/l, pH level is within limit for all uses in the River Yamuna. As per CPCB, the contribution of pollution load from NCR is 80% and non-NCR states contribute only 20%. Thus River Yamuna water is not suitable for class A, B and C uses in almost the entire length of the NCR due to high total coliform, high BOD

and low DO levels. Significantly water quality of canals in the Sub-Region is also deteriorating. Major canals in the Sub-Region are Yamuna Canal, Gurugram Canal and Agra Canal. It is found that water in these canals is not suitable for Class A, B and C uses. High BOD and high coliform levels make water quality below permissible limits. Environmentally Sensitive Conservation Zone is another cause for concern. Some of the natural features in the Sub-Region have been identified as environmentally sensitive areas. Extension of Aravalli ridge, sanctuaries and other ecologically sensitive areas are to be conserved with utmost care and afforested with suitable species. An area measuring approximately 340 ha has been reserved as 'Water Recharge Zone' to check run-off and replenish ground water (Sub Regional Plan—Haryana 2021: 289–291).

Depleting underground water table around Sohna town in district Gurugram has become a major concern for the state government planners. Further a complete sector namely 72A has been carved out in Gurugram for developing artificial water body. The City Forest in an area of 33 acres has been set up in Sector 52-A, Gurugram. A Biodiversity park is also proposed to be established on the Gurugram-Mehrauli Road near Delhi-Haryana boundary. Aravalli ranges have been designated as Natural Conservation Zone in the Plan in accordance with Regional Plan 2021. Some of the important proposals for reducing water pollution include:

- Industries should treat their effluents and conform the specified requirements.
- Disposal of garbage, solid, semi-solid wastes into river, its tributaries and drains should be restricted.
- Existing water bodies, lakes and ponds in the NCR should be revived by filling with water by connecting them to existing tail-clusters.
- Rain water harvesting structures may be constructed along with drains under the MNERGA program.
- Community participation in various Yamuna water quality restoration programs should be encouraged.

For the Haryana Sub-Region, a number of environmental issues and challenges have emerged. First, State of Forests Report, 2011 published by Forest Survey of India shows that forest and tree cover area is only 6.8% as against the national average of 21%, leading to further degradation of forests in the Aravalli ranges. To promote sustainable development of forest resources in the state, Haryana Government has fixed the goal of achieving 20% forest and tree cover in the state in a phased manner.

Air pollution has emerged as a major challenge in the NCR. Haryana state government has setup two continuous online stations at Gurugram and Rohtak along with one fully operational in Faridabad. The number of ambient air quality monitoring stations is inadequate in the Haryana Sub-Region. As per IS codes Haryana Sub-Region requires well over 50 monitoring stations. In order to address this situation, Sub Regional Plan—Haryana 2021 makes a number of important proposals:

- Along with the existing monitoring station, efforts would be made to set up monitoring stations in all district headquarters of the sub-region.
- CNG stations are being set up in Faridabad and Gurgaon. Industries at Faridabad and Sonapat have switched over to PNG and LNG, which will further reduce air pollution.
- Environmental clearances have to be obtained by the applicant for construction projects.
- There is need to operationalize the proposed monitoring stations in Haryana under NAMP on priority basis (Sub Regional Plan—Haryana 2021: 292–293).

Further proposals could be made to reduce air pollution. For example, governments could make efforts to reduce air pollution from transport activities by making available clean fuels such as CNG, PNG, etc. in whole of NCR for public and private vehicles. Land use planning and zoning regulations could be enforced to control dust from construction activities.

Extension of Aravalli ridge, sanctuaries and other ecologically sensitive areas are to be conserved with utmost care and afforested with suitable species. Development in this area should be made in compliance with the Environment Act, 1986. Aravalli ranges in the Haryana Sub-Region have been designated as Natural Conservation Zone in the Plan in accordance with Regional Plan 2021 except those areas which are coming in the urbanizable area (Sub Regional Plan—Haryana 2021: 294).

- The goal of achieving 20% forest and tree cover in the state in a phased manner should be pursued. This goal can be achieved by adopting agro forestry practices.
- Requirements of prior environmental clearances for projects mentioned in EIA notification, 2006 should be strictly enforced by the state.
- To increase green cover in the Sub-Region, it is necessary to encourage planting of trees alongside roads, railway lines, canals, rivers, rivulets and streams, and other unutilised lands.
- Since the Sub-Region is highly urbanized and densely populated, village panchayats should take up community lands for cultivation of tree crops and fodder resources.

## **8.4 Smart Regional Planning Strategies for the NCR**

As shown above governance appears to the most important challenge of regional planning and development. Apart from regional governance, I have focussed on the smart economy, smart transport, smart settlement pattern, and smart environment. I will make recommendations for these five sectors only. This however does not imply that other sectors in the NCR are less important.

### **8.4.1 Smart Governance Strategy**

I propose that smart governance strategy should locate regional level coordination at its core. Implementation of 74th amendment to the Indian Constitution is critical for carrying out effective coordination, and for this to happen all district planners must proactively prepare District Development Plans as mandated under the Constitutional provisions. Further, all districts should be viewed by the NCR as sub-divisions of the three sub-regions and urban settlements as urban nodes within these districts. Thus a hierarchy of plans starting at the NCR, moving onto four sub-regions, a number of districts, and ending with equally good number of urban and rural settlements plans. In order to plan and develop the NCR, preparation and implementation of regional, sub-regional and district development plans should be made the central concern of the NCR, Sub-regional Planning and Development Authorities, and constitutionally mandated District Development Authorities. A constitutional amendment to create District Development Authorities is required. Similarly, an amendment in the NCRPB Act is also needed to establish Sub-regional Planning and Development Authorities. Delhi Government should also become full partner in NCR's regional planning efforts by setting up exclusive regional planning authority by amending the Government of National Capital Territory of Delhi Act, 1991 as has become evidently clear after severe air pollution in Delhi and the NCR. Planning and development authorities at all three levels must be duly elected with a small percentage of nominated members from the concerned state governments and central government.

### **8.4.2 Smart Spatial Planning Strategy Including Meta City Strategy**

National Capital Region Planning Board is crucially important organization for planning and development of the NCR, its urban and rural settlements, agriculture and industry among other sectors. Current practice is that the NCRPB extends loans for various projects to state governments, urban local bodies and parastatals of state governments for development in the NCR. These projects are too small and insignificant and do not make any regional level impact. The smart economic strategy would be that the NCRPB undertakes and implements projects of 'regional significance'. For example, projects like the Regional Rapid Transport System (RRTS) should be implemented by a regional agency. Appropriately, the recently established National Capital Region Transport Corporation, which is a joint sector company of Government of India and States of Delhi, Haryana, Rajasthan and U.P., is mandated to implement the Regional Rapid Transport System (RRTS) projects across the National Capital Region with funding coming from a diversity of sources including its own funds and central state and governments funds. Such joint sector companies could be created for other important sectors like water, sewerage,

drainage, etc. under the overall administrative control of the NCR. However, these companies must be accountable to respective elected regional planning and development authorities.

The NCRPB has prepared four functional plans on drainage, economy, transport and water. All four aspects covered by the four functional plans are hugely important to the economy and population of the region and the country. The NCRPB is also mandated to bring about balanced development of the region. So preparation of functional plans is insufficient; more needs to be done by the Board. I recommend that proposals of 'regional significance' should be implemented by the NCRPB because no other agency has an integrative and hierarchical overview of the region better than the Board. Regional drainage system, regional economic programme, regional mobility and accessibility, and regional water management would be better served if these major proposals are implemented by the NCRPB. Implementation of these proposals of regional significance is like setting up scaffolding within which district development plans, master plans and village plans could be fit appropriately depending on varied local contexts. Planning and implementation of regionally significant planning proposals could not be left to the private sector or any form of partnerships involving the private sector. Project centered developments in Gurugram led by the private sector has promoted dis-integrated development causing splintering of physical infrastructure. This could have been avoided if regional infrastructure was in place in advance.

On the conclusion of Census 2021, Delhi will have become a meta city alongside other Indian cities like Mumbai. With population exceeding 20 million, a different kind of planning is required. I believe that more rather than less devolution of power is required for governance of a meta city and at the same time more rather than less centralization is also required. We need to know what this really means. For certain functions like planning both centralized as well as decentralized governing institutions and plans are required because we cannot do away with a hierarchy of plans before plans get implemented. For sectors like transport, water, sewerage, drainage and power, a mix of centralization and decentralization is required. However, for services like basic education and health, decentralized governance is the best option. For meta cities like Delhi, largeness warrants transparency and technologies based on ICT and IoT would greatly help in making decision making regimes transparent. Day to day services such as grant of building permissions could be easily governed through online technologies if property ownership records are clearly recorded. So modern ICT and IoT will play critical part in managing the meta city Delhi, an economic hub of the NCR.

### ***8.4.3 Smart Transport Strategy***

Another significant proposal is about the speed of implementation of proposals pertaining mobility and accessibility. Proposals like Regional Rapid Transport System, metro links with all the Central NCR urban settlements should be

implemented by the end of the Regional Plan 2021. We still have about four years. While progress about linking all the Central NCR urban settlements with metro is on course although speed of implementation could be accelerated, the RRTS is yet to take off and year 2032 is too far to completion of the RRTS. As it is truism that there is no life without mobility, it is equally true that there is no economic buoyancy without accessibility, without unhindered movement of people and freight. Delhi-Mumbai Industrial Corridor will promote efficient movement of long haul freight in Uttar Pradesh, Haryana and Delhi. It is time that all concerned agencies should make plans for the use of spared track space for short haul freight movement.

In order to comprehend the actual import of the DMIC for the NCR, the NCRPB should prepare another functional plan focussed on this issue. At present it appears that economic activities in the DMIC would accentuate regional inequality proactively, going in a direction that is completely in opposition to balanced development of the region.

#### ***8.4.4 Smart Environment Strategy***

Air pollution is a classless phenomenon because all of us breathe the same air. Unlike sewerage system, water distribution system, solid wastes management, education and health, middle classes in India could not possibly create their own exclusive citadels and fortify themselves with exclusive enclaves leaving behind the common man and woman. Since air pollution affects all of us and also because all of us have caused this problem, all of us need to solve this problem. Based on Indicus Foundation's latest study, I make the following six recommendations. First, Crop stubble burning should be managed by changing the cropping pattern from paddy to other crops such as pulses, cotton, fruits and vegetables in Kharif season. Simultaneously regional planners could consider delineating some area around Delhi as the green belt. Second, all roads should be made dust free with construction and repair of roads by using world class construction materials and technologies so that these roads and areas around them could be easily cleaned with the help of machines. Innovative planting alongside roads could further reduce the impact of vehicular pollution. Third, solid wastes burning should be largely replaced with waste to energy situation by use of better technologies. All plants processing solid wastes should be kept at 100% capacity at all times. New landfill sites should be identified much in advance before the existing landfill sites could be no longer used. There is no place for solid waste dumping sites in modern city or region. In order to make a coherent planning statement on environment, the NCR should prepare a functional plan for energy like "The Tokyo Initiative on Smart Energy Saving toward a Smart Energy City" prepared by the Bureau of Environment of Tokyo Metropolitan Government in May 2012 (also see Chap. 1). An editorial in the Guardian published from London argued that wind energy makes economic sense too. "The precipitous drop in the price of electricity from



offshore wind turbines should be a tipping point for green technology. In 2014 the current generated by a forest of giant whirling fans out at sea was priced at around £150 per MWh. In the latest auction this week the comparable cost dropped as low as £57.50/MWh. Even when the cost of providing back-up capacity for still days is added, the cost of producing energy from offshore wind is little more than £70/MWh. Compared to the new Hinkley C nuclear plant which produces electricity at a cost of £92.50/MWh, one has to wonder whether as a nation we should persist with nuclear energy as an option to reduce our greenhouse gas output". Similar arguments hold true for India not only for wind energy but also for energy harvested from the sun. Britain's Climate Change Act stipulates that by 2050 the country's net emissions of greenhouse gases should be 80% lower than in 1990. The British Government is steadfast in producing enough wind energy that the country would no longer need nuclear energy by 2050.

Fourth, although government is planning to introduce Bharat VI fuel in 2018, all vehicles need to be made Bharat VI fuel compliant. Enhancing capacity of metro, speedy construction of metro in the Central NCR, and faster construction and completion of projects like RRTS would reduce pollution. Fifth, it has now become imperative that we move renewable energy to non-renewable energy as harnessing energy from sun has become affordable with declining prices per unit of energy and availability of modern technologies. With this use of coal would become unattractive with banning its use. Sixth, construction industry has to be reformed in various ways including covering of construction materials when they are transported to the site; covering of the construction sites, etc. (also [3]).

#### **8.4.5 Smart Economic Strategy**

Flexible governance, high mobility and accessibility, round the clock availability of smart energy (largely based on wind and solar power) and better physical environment free of pollutants is the mainstay of smart economy of the NCR. Free flow of information based on high speed internet; high speed and affordable movement of people, goods and services; a large number of housing options both for individual ownership as well as for rental purposes, etc. are critical for NCR's economy to continue to economically grow.

Four policy zones in the NCR include NCT Delhi, Central National Capital Region (CNCR), Highway Corridor Zone and Rest of the NCR. The 2021 NCR Plan proposes no further industrialization, wholesale trade and commerce in NCT Delhi. This is untenable policy because some industrialization, wholesale trade and commerce is required for a mega polis to sustain in the long run. Kolkata is one recent illustration. However, history has also shown that cities devoid of diverse economic activities soon begin to decline. On the other hand, there is not much mention of Information and communications technology like automotive safety applications, smart fleet management, and intelligent transportation systems, etc. in the NCR Plan 2021. A Delhi specific statement about e-governance, e-citizens and

e-services is made. Similarly there is no mention of Internet of Things. Regional plan may or may not make a mention about ITC or IoT. But on ground the region has developed a niche in providing services to the global companies as shown by cities like Gurugram and Noida. The first thing the NCR should consider when making a smart strategy for economic growth is that it should include plans about how it could use advanced technologies for regional development. No doubt automotive safety applications, smart fleet management, and intelligent transportation systems are some of the well-known applications. There are other areas where these technologies should be considered for use such as easily available and affordable broadband internet networks are hugely important for producers as well as consumers of various services and goods. Internet of things could offer better trade opportunities if affordable broadband internet networks become available all times at all places. Most importantly, Internet of Things should be embedded in the development of physical infrastructure. The next NCR plan should consider making governance and economic policies for the development of ITC or IoT through massive public private partnerships and alliances.

In the Central National Capital Region including the towns of Ghaziabad-Loni, Noida, Greater Noida, Gurgaon-Manesar, Faridabad-Ballabgarh and Sonipat-Kundli, the regional plan prohibits hazardous and polluting industries and allows only high-tech industries. Existing industries are also required to conform to the provisions of the Environment Protection Act, 1986. In the Highway Corridor Zone, seven national highways are identified where 500 m on both sides of the right of way of the national highways is proposed for development inclusive of green belt outside the controlled, developed or regulated areas [11: 20]. It is left to the state governments to determine the kind of activities to be permitted in this zone and the state governments will also delineate this zone. It is unclear how much area would be left for the green belt. Purpose of the green belt appears to be to separate highway traffic from activities proposed to be carried out beyond the green belt. Service roads and controlled access to highways are other proposed strategies for the segregation of highway traffic. This appears to be a smart strategy for economic growth as it uses the existing high accessibility for economic growth. With very little investment, greater economic dividends could be harvested with the implementation of this strategy.

Rest of the NCR occupying nearly 30,000 km<sup>2</sup> area is proposed for accelerated development particularly identified 16 Metro Centers and Regional Centers. The regional plan proposes workers participation rate at about 30%, which is low [11: 45]. By 2021 two third of population of the NCR will be living in urban areas. All these people will need jobs and with 30% worker participation rate, it is not possible to absorb all job seekers. A major shift from primary sector (that still predominates at least in Rajasthan and Uttar Pradesh) to tertiary and secondary sectors needs to be made to make the region economically sustainable. Unfortunately, even the functional plan proposes that the highest number of workers will continue to be employed in agriculture [13: 233]. Economically speaking, the Regional Plan 2021—NCR is not sufficiently ambitious. It appears to be written in the idiom of slow economic growth before the end of 1970.

## 8.5 Conclusions

Governing the NCR is a complex task as it involves a large number of urban and rural settlements spread out in a large geographical area, large population, spatial and non-spatial plans, private sector, multicity of planning, and industrial policies, uneven development but most importantly differential governance systems. Smart governance strategy, as outlined above, involves creation of elected planning and development authorities at regional, sub-regional, and district levels. These authorities should be armed with technical staff of planners, engineers, etc. and equipped with substantial funding (government as well as market funding) for effectively carrying out regional level infrastructure projects apart from implementation of other planning policies.

This contribution also advances the smart region approach, which seeks to address environmental and quality of life issues simultaneously. While economic growth is necessary for providing jobs and creating wealth for everyone living in the NCR of India, it is equally crucial to protect the environment for current and future generations. A preliminary sketch is presented here by constructing four dimensions of the smart region—smart regional economy, smart regional accessibility, smart regional settlement pattern, and a smart regional settlement pattern. Smart regional settlement pattern could not be planned and developed without smart regional economy, and smart regional accessibility. Major objectives of the Regional Plan 2021 appear to remain same as that of the Draft Regional Plan of 1971—contain and control population growth of the central core of the region, and direct population and economic growth to the secondary cities of the region. Market forces rather than regional planners are now able reverse the trend of population growth of the core in comparison to other parts of the region. However, in order to realize regional aspirations of citizens and planners in the NCR, all the above proposals need to be implemented.

## 8.6 Material for the Conclusions of the Book

National Capital Region centered on Delhi is a massive but complex region. With area exceeding 45,000 km<sup>2</sup>, the NCR is counted among the largest regions of the world. A multiplicity of plans (hierarchy plans with implications for the built environment), planned (citizens), and planners (planning organizations), the NCR is also one of the most complex regions in the country. Complexity increases and transparency is reduced because of less use of ICT and IoT in the governance of the NCR.

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