
Seamless urbanisation and knotted city growth: Delhi Metropolitan Region

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Characteristics of Indian urbanisation

Rural to urban migration
Natural population growth

Rapid population growth

Direct shift from agriculture to service sector

Slums

Population pressure with colonial regulations

Horizontal expansion

Agglomeration of economies
Infrastructure investment by gov.

Mega City Region

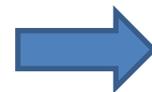


Year	2008	2030
Urban population (million)	230	590
Million plus Cities	42	68

(Source: Sankhe, et al. 2010)

Problems with mega cities

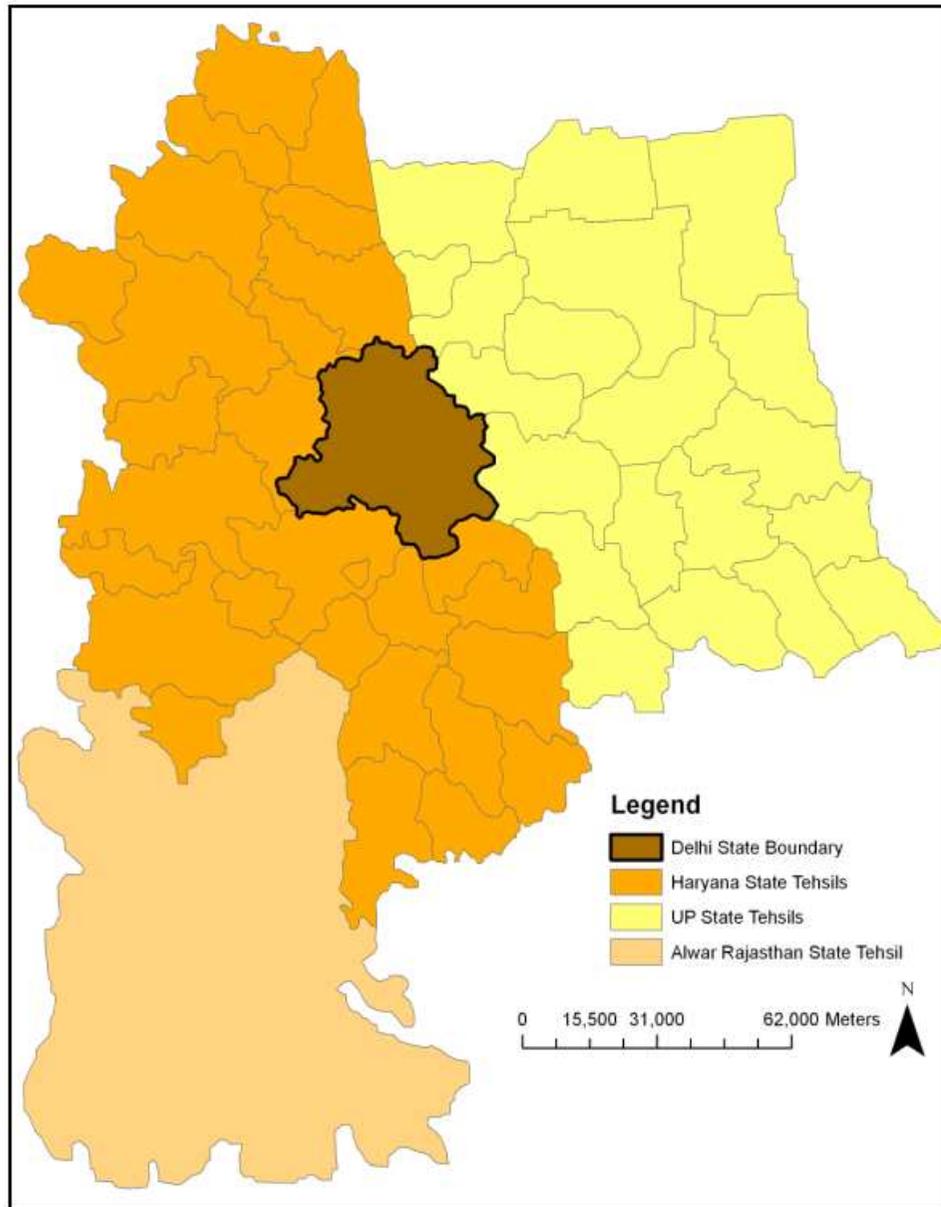
Acute shortage of infrastructure
Dualism



IT industries vs Low literacy rate
Condominium vs Slums

Delhi one of the five largest cities in the world by 2030

National Capital Region of Delhi-Some Facts



Composition of NCR

State	Area (Sq Km)
Delhi	1,483
Haryana	13,413
Uttar Pradesh	10,853
Rajasthan	4,493

(Source: NCRPB 1988)

Population

Year	million
Delhi-1951	1.7
Delhi-2001	13
Satellites-2001	18.2
Satellites-2021	36.7
Delhi-2030	26

(Source: Sankhe, et al. 2010 and NCRPB 1988)

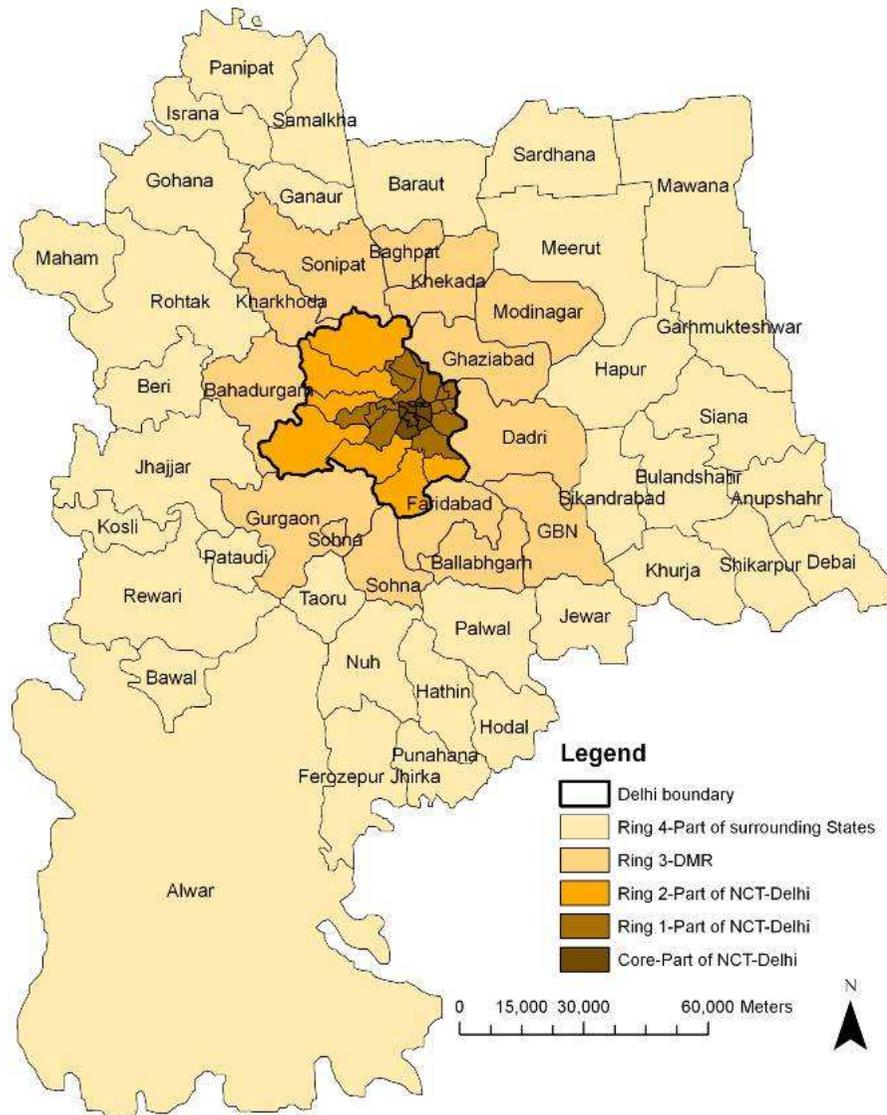
Objectives

Despite long history of GM strategies still problems....

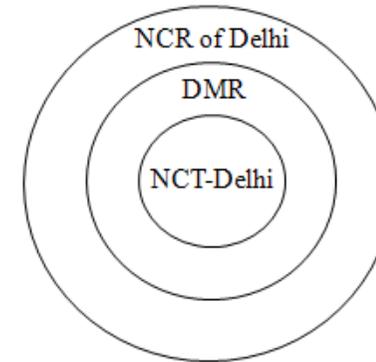
Need to evaluate effectivity of GM strategies.....
For better allocation of resources and population

- **Identify urban development stages for NCR-Delhi**
- **Identify character of development**
- **Identify policies and forces impacting UD in DMA**

Urban development stages of NCR-Delhi



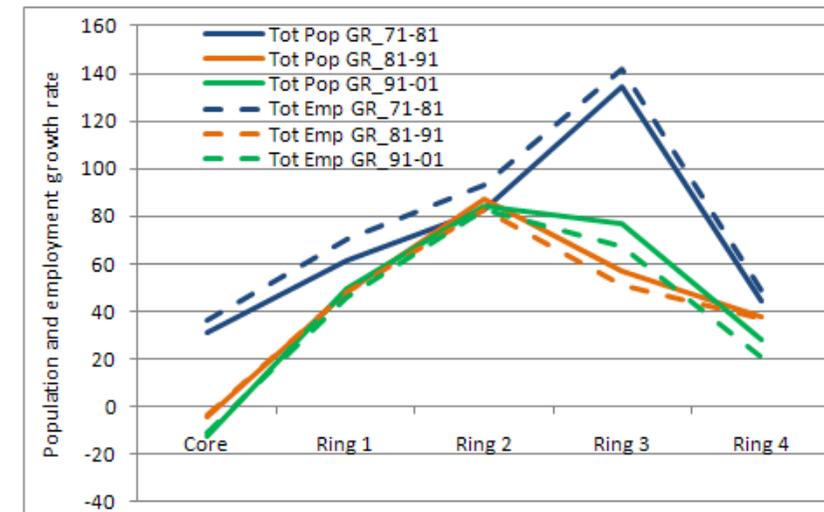
NCR of Delhi with core and ring division



Model of the study area

	Core	Ring 1	Ring 2	Ring 3	Agglomeration	Ring 4
1971-81	+	++	++	+++	++	+
1981-91	-	+	++	++	++	+
1991-2001	--	++	++	++	++	+

Total population-employment growth rates



Total population and employment growth rates

Demographic and Socio-eco indicator based analysis

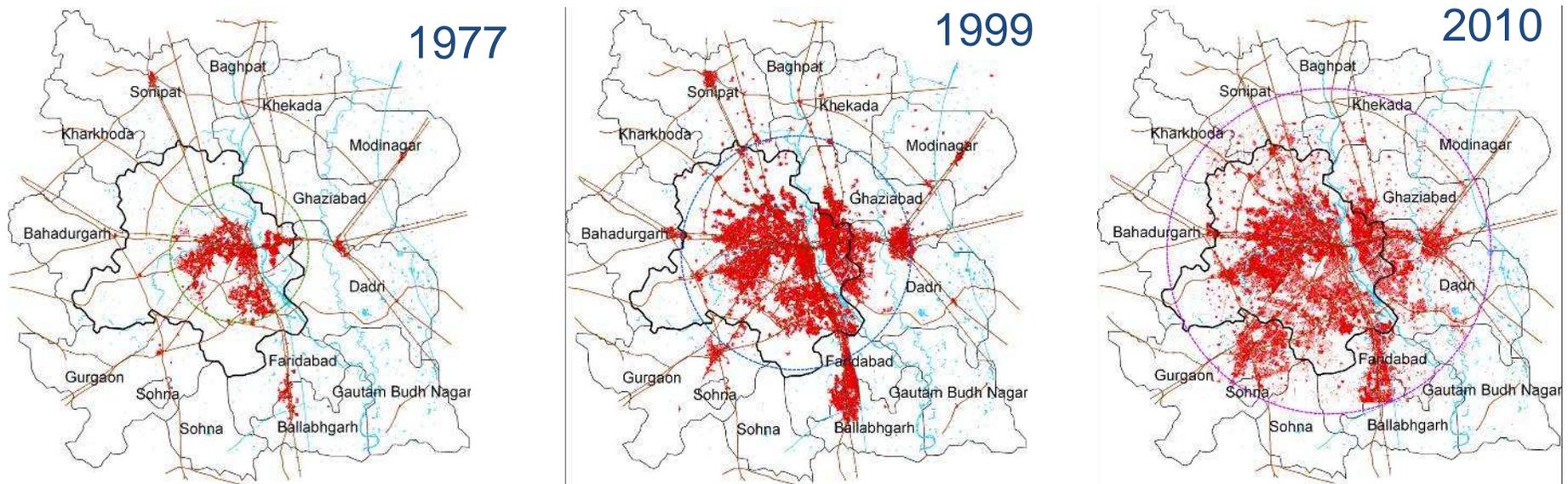
Year	No of HH	Tot SC-ST	Tot Unemp.	Tot Pop.	Tot	Tot	Tot Oth.Emp.
					Emp.	Literates	
1971	2.73	1.41	2.63	2.80	3.04	3.35	3.20
1981	1.53	1.39	1.62	1.56	1.72	1.84	1.86
1991	0.99	1.48	0.90	0.95	1.09	1.09	1.16
2001	0.47	1.71	0.43	0.47	0.58	0.49	0.59

Result of core to suburbs ratios in DMR from 1971 to 2001

(Source: Col 1971, 1981, 1991 and 2001)

Characteristic	Indicator	Result
Flight from Blight	Higher ratio of SC-ST	Suburbanisation of HH
	Higher ratio of unemployment	
	Lower literacy rates	
Decreasing gradient of HH	Decreasing ratio of HH	Suburbanisation of HH
Jobs follow people	Higher ratio of HH	Suburbanisation of HH and employment
	Higher ratio of employment	
Skilled jobs and literacy	Higher ratio of literacy	Concentration of skilled jobs
	Higher ratio of other employment	

Spatial indicator based analysis-1

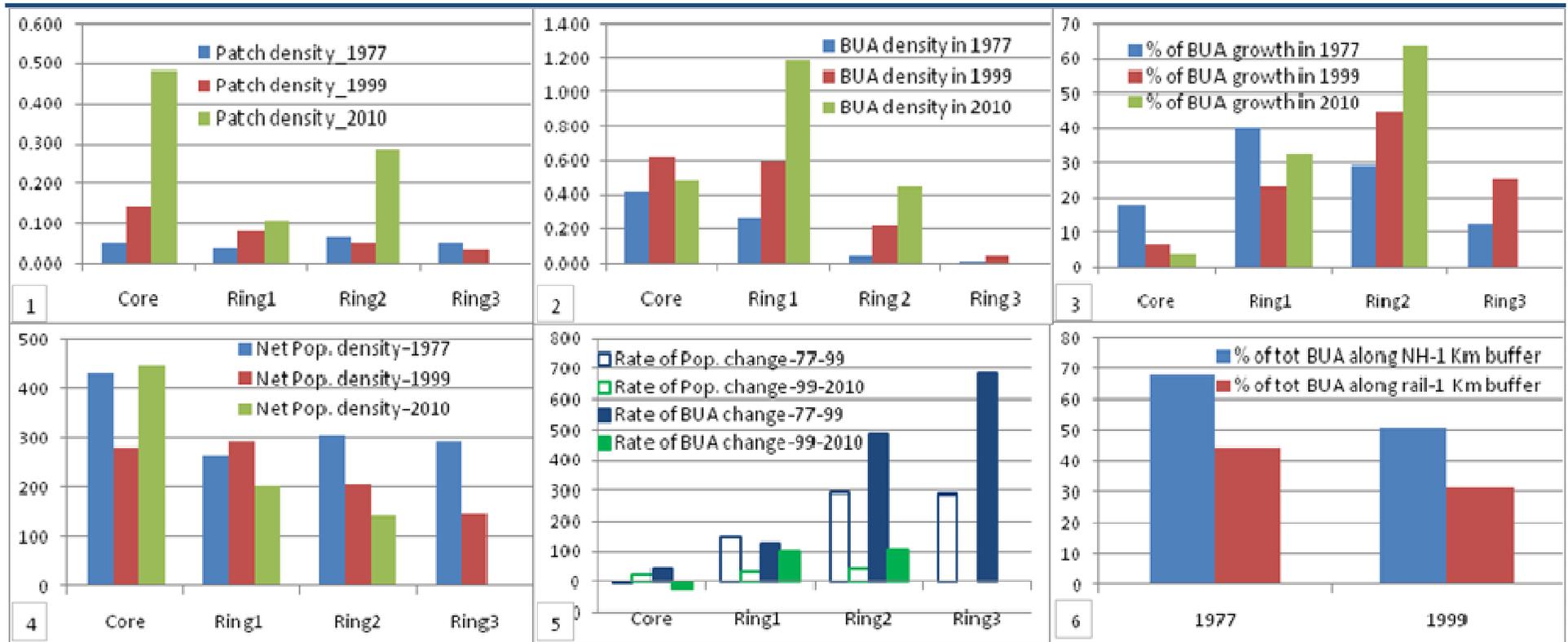


(Source: German Remote Sensing Data Center)

Expansion in 22 years 10 km, in next 11 years 10 Km than in next 5 years 10 Km

	1977	1999	2010
Transport	Bus	Bus + Automobiles	Buses +Automobiles +Metro
Economic reforms	Slow growth (Industrialisation)	Moderate economic growth (Pub sector)	Rapid economic growth (Prt sector)
Expansion	15 Km	25 Km	35 Km
Form	Core+Diffusion	Multi-nuclei	Coalescence

Spatial indicator based analysis-2



(Source: Census of India and German Remote Sensing Data Center)

Patch Density	Increases during expansion decreases during coalescence
BUA Density	Ratio of BUA to non-BUA gives LU character
% of BUA growth	Gives overall BUA growth and extent
Net Pop Density	Tidal wave phenomena
Rate of BUA change	Land consumption faster than population growth=Sprawling
% of BUA along transport network	Strip linear commercial development

Components of Urban Growth-Delhi

Natural growth and In-migration (Migration from other states)

	Natural growth	Net migration
1971-81	2.11	2.23
1981-91	2.13	2.11
1991-2001	1.7	2.18

Average annual rate of natural growth and net migration for Delhi

(Source: Dupont 2001)

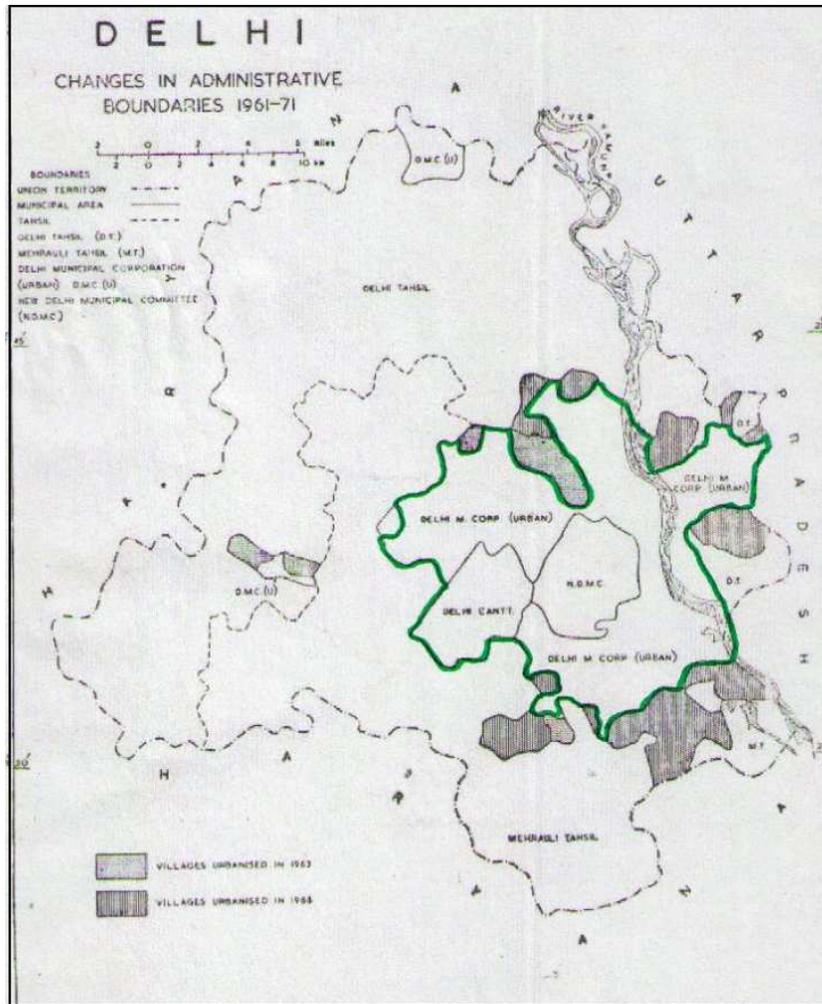
Name of the UA	2001 Population	In-migrants			Total in- migrants	Per cent of in-migrants to total population
		From within the state	From other states	From other countries		
INDIA (Urban)	286,119,689	24,974,372	11,157,574	348,060	34,480,006	12.7
Greater Mumbai UA	16,434,386	892,706	1,571,181	25,665	2,489,552	15.1
Delhi UA	12,877,470	77,663	1,988,314	46,386	2,112,363	16.4
Chennai UA	6,560,242	334,972	94,964	5684	435,620	6.6
Kolkata UA	13,205,697	470,601	297,279	54,509	822,389	6.2
Hyderabad UA	5,742,036	407,861	88,216	2406	498,483	8.7
Bangalore UA	5,701,446	401,932	353,156	6397	761,485	13.4

Percentage share of in-migrants in urban agglomeration

(Source: Human development report 2006)

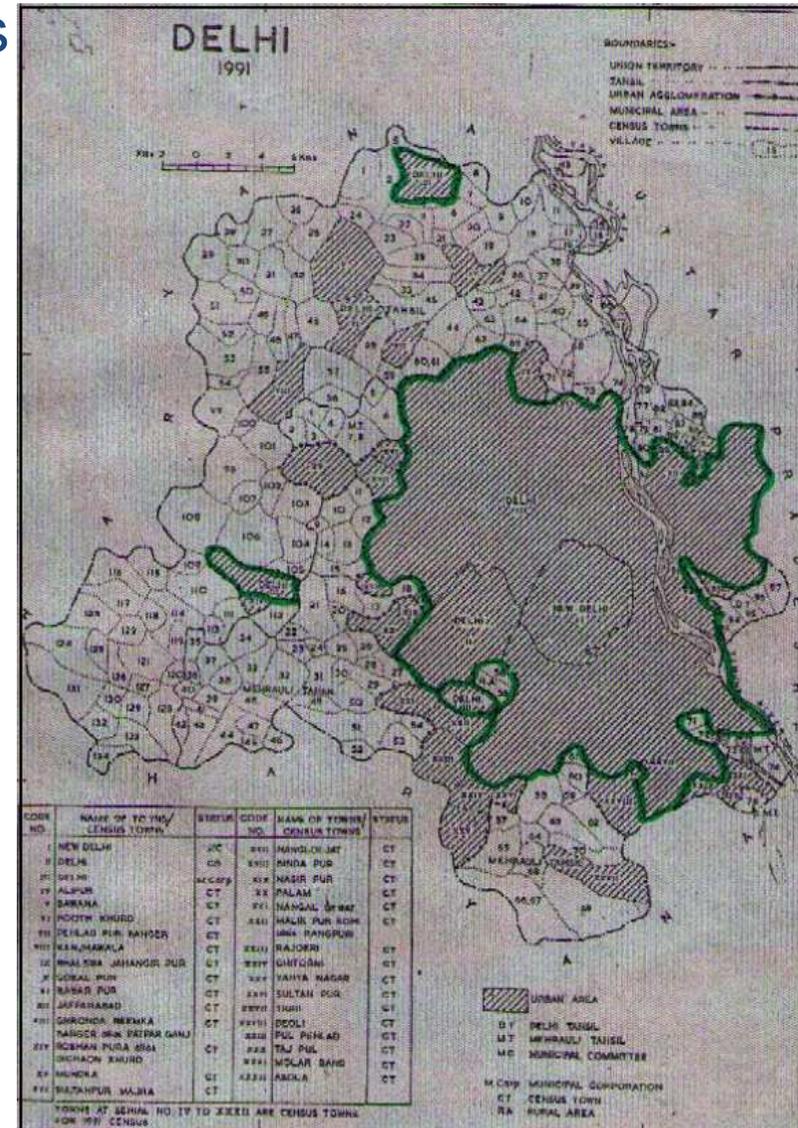
Components of Urban Growth-Delhi

Reclassification of urban boundaries



Delhi administrative boundary 1971

(Source: Census 1971)



Delhi administrative boundary 1991

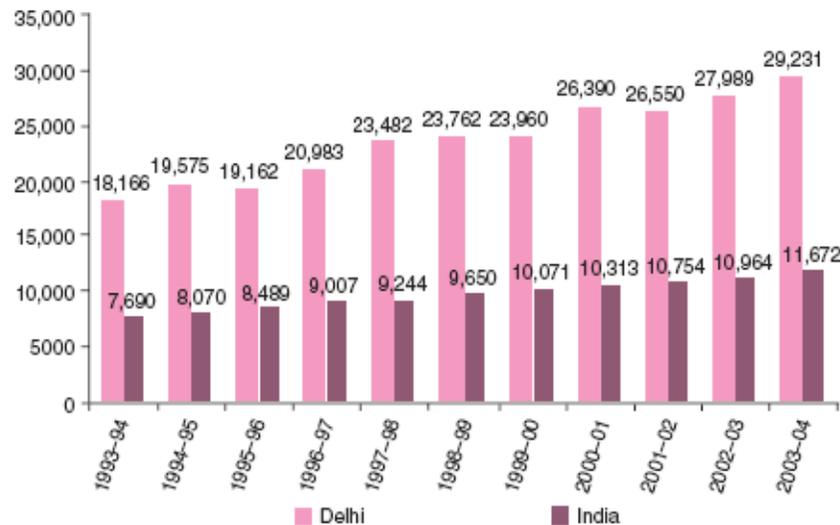
(Source: Census 1991)

Pull factors in Delhi

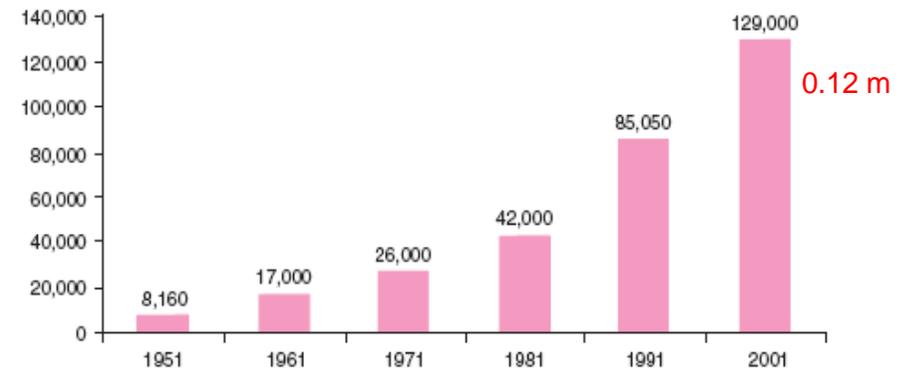
State	Per capita Net State Domestic Product		Average annual rate of growth (%)
	1993-4 (Rupees) at constant 1993-4 prices	2001-02	
1 West Bengal	6756	10,375	5.5
2 Karnataka	7838	11,516	4.9
3 Tamil Nadu	8955	13,108	4.9
4 Delhi	18,166	26,306	4.7
5 Andhra Pradesh	7416	10,590	4.6
6 Rajasthan	6182	8819	4.5
INDIA	7690	10,754	4.3
7 Gujarat	9796	13,684	4.3
8 Kerala	7938	11,046	4.2
9 Haryana	11,079	14,250	3.2
10 Orissa	4896	6105	2.8
11 Maharashtra	12,183	14,892	2.5
12 Punjab	12,710	15,255	2.3
13 Bihar	3037	3554	2.0
14 Madhya Pradesh	6584	7699	2.0
15 Uttar Pradesh	5066	5885	1.9

Growth of per capita net state domestic product

(source: Human development report 2006)

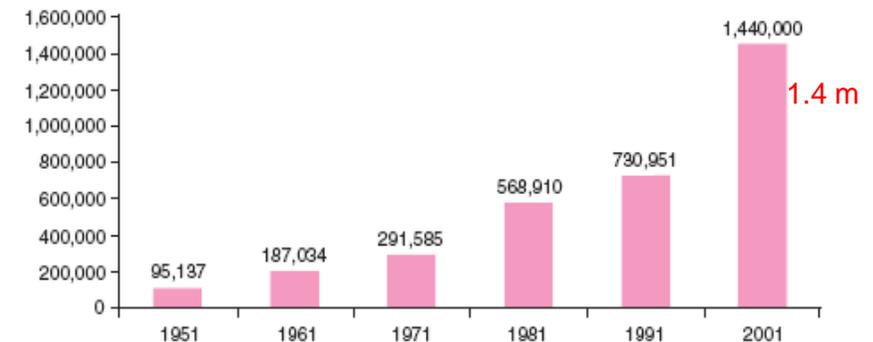


Per capita income Delhi and India (source: Human development report 2006)



Growth of small scale industrial units

(Source: Human development report 2006)



Growth of employment in industrial sector

(Source: Human development report 2006)

Push factors in Delhi

Increasing commercial and residential land rates in DMA towns

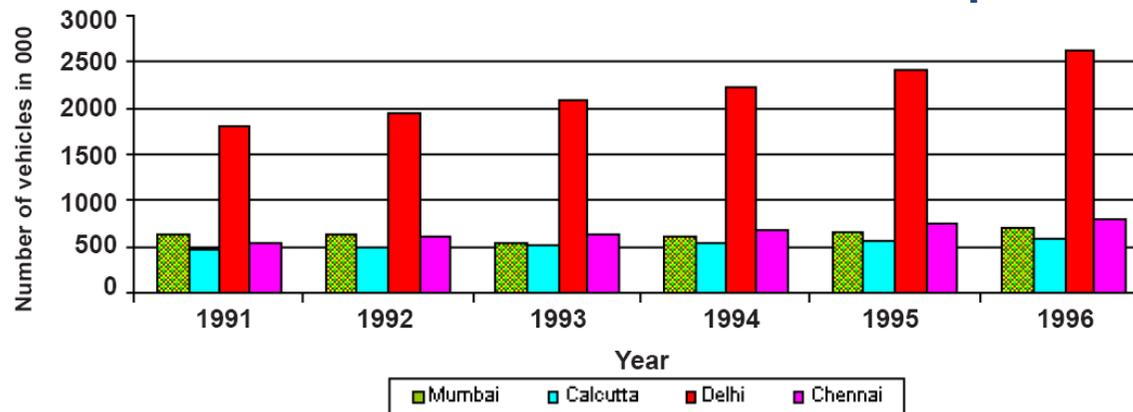
Residential market	Delhi	Gurgaon	Faridabad	NOIDA	Gr.NOIDA	Ghaziabad
Avg. capital value (in Rs /Sq. Ft)	10,000	4,100	2,125	4,500	2,800	2,500
Avg. apartment size (in Sq. Ft.)	1,900	2,000	1,700	1,800	1,800	1,600

Residential market values for Delhi and surrounding satellite towns as on 2009

(Source: Services Ip 2009).

Higher land values in Delhi push HH towards lower land values in suburbs

Increased automobile ownership



Growth (in numbers) in motor vehicles in four Metropolitan cities of India 1991-1996

(Source: Maiti S and Agrawal P 2005)

Increased automobile ownership increases spatial expansion with preference for residential suburbs

Jurisdiction-Institutional-Administrative complexities

Overlapping jurisdiction, lack of coordination & communication

Municipality and development authority **under federal control**

Many planning agencies in Delhi compared to **only 1** for Region

Interstate transport **problems**

Development Plan **vs** Master Plan

Urban planning unable to manage growth

Shifting relationship b/w authorised and unauthorised

Violation of planning and building norms

No prescribed laws for legal or illegal

Akshardham temple, IT Park and Metro depot- only **Slums demolished**

Planning is reactive rather than proactive

Hours of traffic jam -Toll highway to Gurgaon

Coordination failure – BRT corridor

Overcrowded and lack of frequency- Delhi Metro

Policy and Regulations

Policy shift from balanced regional growth to city centric growth

Master Plan 1962-Promoted decentralisation

74th CAA of 1992- Empowerment of local bodies

JNNURM in 2005-To encourage reforms and fast track development

But

Delhi government leapfrogged ULB's to reach residents

Laggard in implementing JNNURM reforms

Result

Increased regional imbalance by increased migration to UA

Policy and Regulations

Urban land policy of large scale acquisition and disposal-1961

Aim

Nationalise and create **land bank** for urban development

Result

high prices

Lack of developable land for Master Plan

Biased towards HIG and MIG

Entitlement of profit by DDA employee

Slow land acquisition

Urban land ceiling and regulation act-1976

Aim

To increase **land supply**

To facilitate **availability and affordability** of urban land

Result

high prices

Due to large scale freezing

Slow development and supply of land

Infrastructure Investment Policy

Infrastructure provision and transport connectivity

Aim

To maximise benefits of close proximity to Delhi

Result

Delhi experienced **negative population growth** b/w 1999 to 2000

Satellite towns registered **higher growth rates** b/w 3% to 6%

Land values and **land uses** impacted within 1 km Metro corridor

22% increase in **land values**

Increased **densities**

Slums replaced by commercial and middle class residential area

Delhi –Mumbai Industrial Corridor (DFC)

Aim

High speed connectivity for High Axle Load Wagons

Lined with **industrial estates** and **hubs** and **top of the line infrastructure**

Result

Will Spawn **27 new cities**

Policy and Regulations

LU Regulations (Zoning and building regulations)

Aim

Segregate incompatible land uses
Maintaining the aesthetic-low FAR

Result

Dependence on vehicles, **increase** commuting time, congestion and pollution
Lower FAR generate artificial shortage of office and residential space leading to
higher land prices and outward expansion

Policy and Regulations

Comparative analysis of the FAR'S

Name	CBD FAR/FSI	Suburbs FAR/FSI
Hong Kong	15	
Portland, Oregon	15	
Singapore	10 (8-25)	1.5-4 (Res.)
Jakarta	10	
Washington DC.	6.5	
Seoul	10	8
New York	15 (10 along trans. lines)	0.6 (Res.)
Bangkok	10	
Japanese cities		0.5-20
Indian cities	1	1.5
	Non-residential	Residential
Hyderabad UA	1	2.275
Greater Bombay UA	1.33	1.33
Bangalore UA	1.75	2.5
Chennai UA	4.125	2.5
Kolkata UA	2.75	3
<i>Delhi UA</i>	<i>2</i>	<i>3.5</i>
Meerut UA	2.66	1.995
Ghaziabad UA	2.66	1.995

Policy and Regulations

Low Property Tax

Aim

Source of revenue for local bodies

Result

Contributes **only18%** in 2006-07

Low registration (absence of formal count)

Assessment **30% lower** than market value

Lower collection rates

Rent Control Act

Aim

To counter scarcity of rental housing

Result

Housing shortage due to **biasness** in favour of **tenants**

Tenants have **no obligation** to maintain property or pay tax

Rent much **lower** than market values

Low rate of return

Policy and Regulations

Policies biased towards tertiary education and service sector

Result

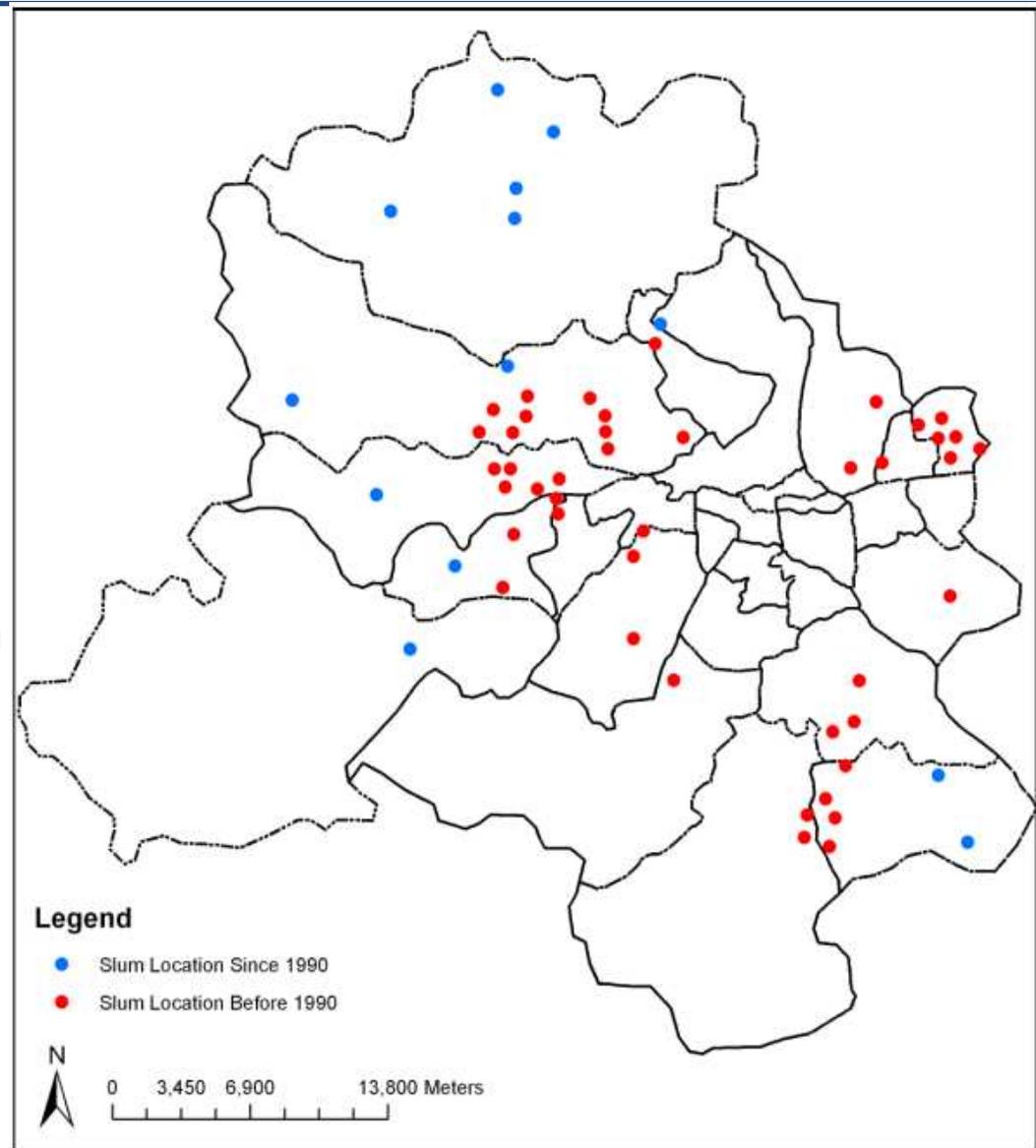
Increases informal sector

Slum proliferation

76% in 1993-94

80% in 1999-2000

Increase inner city land prices push slums outwards leading to spatial expansion of the city



Slum location in Delhi (Dupont V 2008)

Impact of Economic Reforms

Economic reforms since 1991

Boomed economic development, real estate and infrastructure projects

Fuelled demand for BPO's KPO's and IT parks

Result

Restructuring of central districts from residential to commercial

High land and housing **prices**

Special Economic Zones 2000

Preferred location for large spaces and world class infrastructure

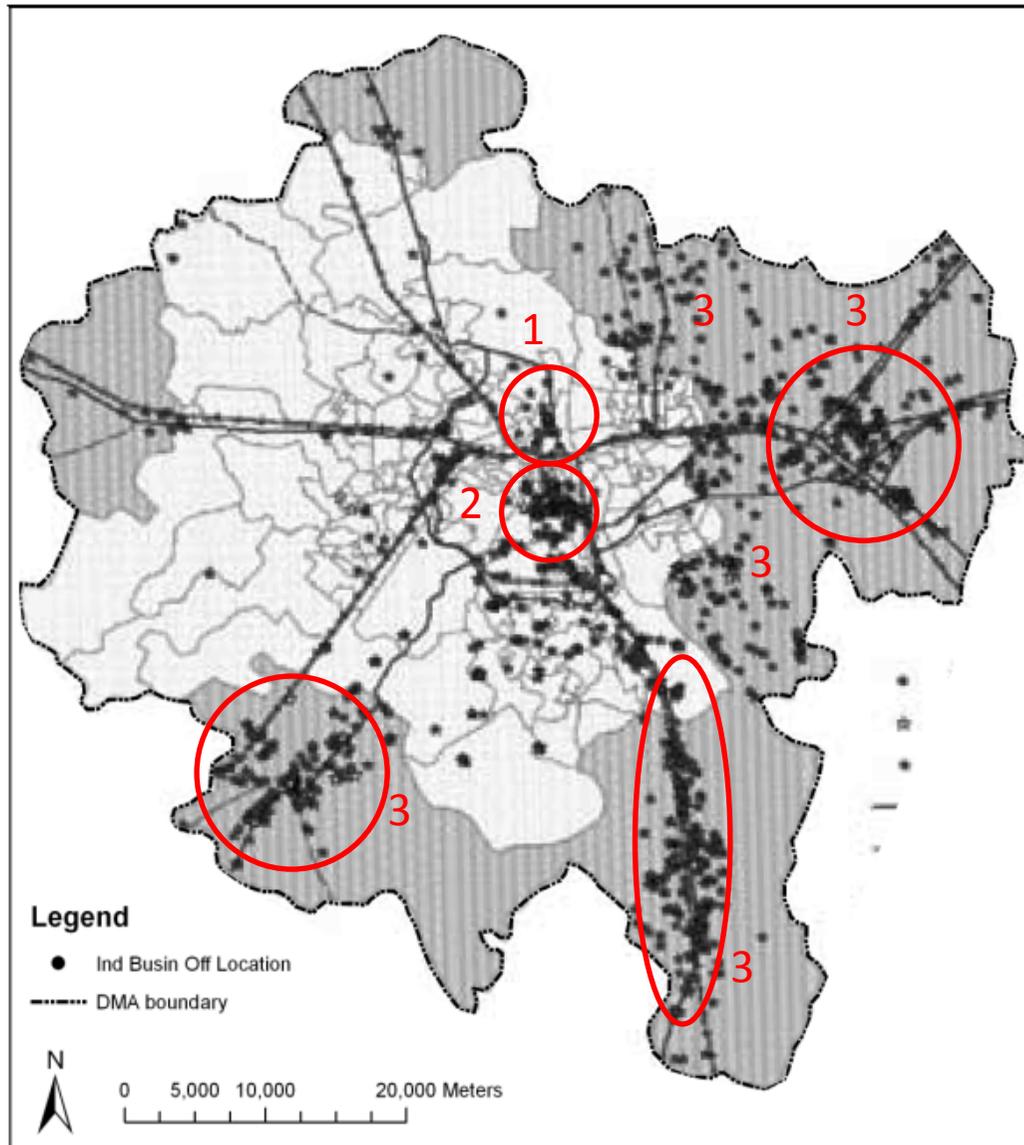
Peripheral decentralisation of jobs and services

Result

Periphery-High quality residences and office spaces, IT Parks and Golf clubs

Enclaves of rich surrounded by slums

Impact of Economic Reforms



Industries, offices and business location in DMA (Bhandari K, et al. 2008)

Segregation of CBD

- 1- Local-old CBD overlapping the old native town houses domestic companies
- 2- Colonial CBD houses the main foreign and domestic companies
- 3- Newly developed CBD's of the NCT-Delhi and satellite towns house the foreign MNC's

Conclusion

Both **Market** driven and **Policy** driven forces shape Delhi Metropolitan Area

Thank you for your attention