

Energy for Mega Cities

A WEC Study



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Energy for mega cities

Objectives of the Study

- Develop a concept of a secure energy supply and distribution system for large cities based on modern developing technologies, including the transport sector, in order to ensure a sustainable future.
- Policy formulation and recommendations, suited to specific regions.
- To disseminate lessons learned that can provide the benefits of urban living to those in rural areas and thus relieve one of the main drivers of migration to cities and help achieve the goal of access to basic energy services for all.

Energy for mega cities

Methodology

- The Study Group will examine electricity supplies, transport fuels, water (including clean potable water), retrofit costs, lack of infrastructure, and solutions such as city innovation partnerships.
- These will be examined on both a regional and global scale, with particular attention paid to urban needs tailored to specific regions.
- Finally, policy actions and investment needs will be identified and communicated in the report.

Energy for mega cities

Proposed Framework

- **Population trends in Megacities**

Number and population of megacities in 2050, including slums and other "illegal" settlements.

- **Energy consumption, availability, affordability and related GES emissions in Megacities**

- Actual and trends, Breakdowns
- Buildings: households and commercial
- Transportation
- Urban services: water, sanitation, solid waste, public lighting, etc

Energy for mega cities

Proposed Framework

Energy efficiency and city shape

- density, activity mix, urban sprawl, number of automobiles in the city, etc...
- No single efficient shape...
- Focus on: how to control a city dynamics
- Importance of market forces and general scope for public policies
- Differentiate by regions

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Proposed Framework

Technical “building blocks” for efficient energy (and related networks) supply

- Description, costs, technical and organisational affordability of: plants, networks, end of pipe equipments
- The case for technologies adapted to low income populations
- The case for centralised vs. decentralised networks/plants

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Proposed Framework

Efficient energy “packages”, their implementation and financing

- By regions, with in depth study of one representative city in each region
- A mass transportation system, for example, must be coupled with a land use policy aimed at increasing density along the network. If not, it favours urban sprawl at the end of the lines. Power, water, sanitation, solid waste networks are linked, etc.
- Describe, by regions, “good” practices, including implementation (organisational framework including: roles of public/private, central/local, municipalities/civil society) and financing.

Energy for mega cities

Proposed Framework

- **The global investment challenge**

Assessment of the need for investment, by specific cities, regions, worldwide

- **Policy recommendations & Case Studies**

The report will include the city case studies and policy recommendations

- **Annexes**

Annexes will host the case studies used in the report, in particular, the city case studies

Energy for mega cities Proposed Framework

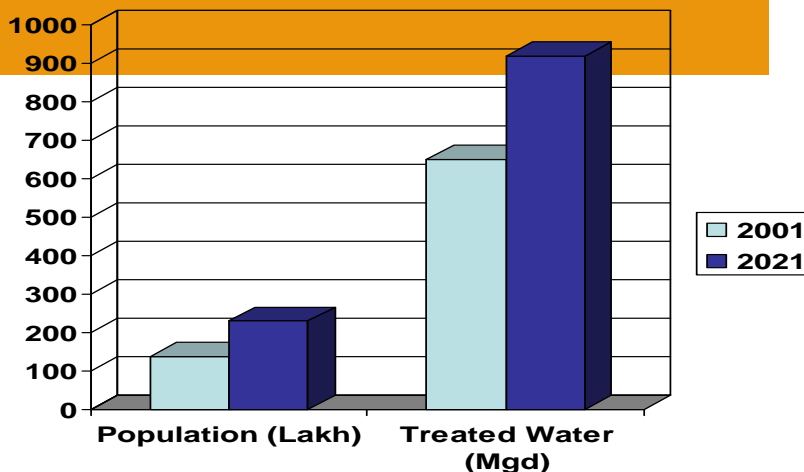
City Case Studies

- Mexico City
- Cairo
- London
- Tokyo
- Delhi

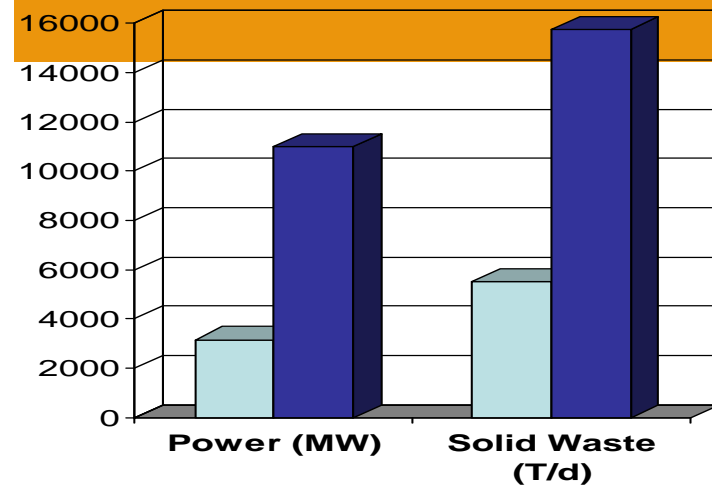
Delhi A Case Study

A brief look at

- Population Growth
- Land Availability
- Water availability
- Power



- Intercity Passenger movement
- Solid waste
- Sewerage



Population Growth

Five yearly estimates of Projected Population

Year	Population (in lakh)
2001	138.0
2006	162.0
2011	182.0
2016	199.0
2021	230.0

Source: Census of India and projections by DDA Sub-Group(MPD-2021)

Increase of population in NCT -Delhi

Year	Additional by Natural Growth	Increase by Migration	Net Increase (in Lakh)
1981	12.0 (55.8%)	9.52 (44.2%)	21.54 (100%)
1991	18.9 (59.2%)	13.054 (40.08%)	32.0 (100%)
2001	26.66 (60.18%)	17.64 (39.82%)	44.30 (100%)
2011	24.2 (54.8%)	20.0 (45.2%)	44.2 (100%)
2021	24.0 (50%)	24.0 (50%)	48.0 (100%)

Note: Figures(in bracket) indicate percentage to total net increase

Source: Census of India and projection by DDA Sub-Group (MPD-2021)

Availability of Land

S.No.	Land Use	Area(Ha.)	Percentage to Total Area (Ha.)
1	Total Geographical Area-NCT Delhi	148300	100
2	Built-up Area(As per IRSIC LISS III Satellite data 1999)	70162	47.31
3	Natural Features (Forest, Wild Life Sanctuary, Ridge, River Yamuna and Other Water Bodies/Drains)	19509.10	13.16
4	Sub-Total (Built-UP+ Natural Features)	89671.10	60.47
5	Balanced Land available in NCT- Delhi(1-4)	58628.90	39.53
6	Land to be kept reserved for:		
	(i)Disposal of Solid Waste generated up to 2051 (sanitary landfill & statutory green belts)	10000	6.74
	(ii)Metro Services/Utilities e.g. power plant, grid station waster and sewerage treatment plant, etc.	10000	6.74
	(iii)Agriculture zone in NCT Delhi including dairy farming, horticulture, greenbelts etc.	11000	7.42
7	Sub Total-6	31000	20.90
8	Proposed/Actual Land available for urbanization (5-7)	27628.90*	18.63
9	Total Urbanisable area 2021 (including built up area1999) (2+8)	97790.90	65.94
10	Population, which can be accommodated in 97790.90 ha. @225 PPH=220 lakh		

* This included unplanned and built up area

Water Availability

Although, Delhi has an average water availability of 225 lpcd, the distribution of the same is not uniform. Some areas get 24 hrs water supply, whereas some get hardly 1-2 hr water in a day. In line with the norms laid down in CPHEEO Manual 1999, in respect of mega cities, after taking into account 15% losses, the minimum water supply @ 172 lpcd will have to be ensured for domestic use for the projected population.

Water Augmentation Plan

S.No	Water Treatment Plants	Capacity 2001 (in mgd)	Capacity* 2020 (in mgd)
1	Chandrawal I & II	90	100
2	Wazirabad	120	130
3	Haiderpur I & II	200	216
4	Bhagirathi	100	110
5	Dwarka	-	40
6	Sonia Vihar	-	140
7	Nangloi	40	40
8	Bawana	-	20
9	Okhla	-	20
10	Ranney wells at Okhla	100	12
11	Palla and other ground water sources	-	91
	Total	650	919

Power

Based on the 17th Electricity Power Survey of India, Central Electricity Authority (CEA), requirement of power for Delhi in the year 2021, as tentatively estimated by the Delhi Transco Ltd. is 11000 MW. To meet the additional requirement of 7830 MW, the concerned agencies need to augment the power supply and improve the transmission and distribution system.

The present total availability of power is 3170 MW.

Existing Power generation Stations in Delhi

Station	Installed Capacity (MW)	Present Generation (Max) (MW)
Rajghat Power Station	135	105
IP Power Station	247.5	160
GT Power Station	282	210
Pragati Power Station	330	330
Badarpur Thermal Power Station	705	630
Total	1699.5	1435

Source: GNCT-Delhi

Source: Master Plan Delhi 2021

Intercity Passenger movement

Passenger Trips at Outer Cordons per Day

In 2001, on a normal weekday, 57.46% of the commuters visited Delhi by Road, 42.67% by Rail and 0.87% by Air.

Medium	Total Passengers	Commuters
Road	15.98 lakh (57.46%)	9.59 lakh
Rail	12.08 lakh (42.67%)	9.06 lakh
Air	0.22 lakh (0.87%)	N.A.

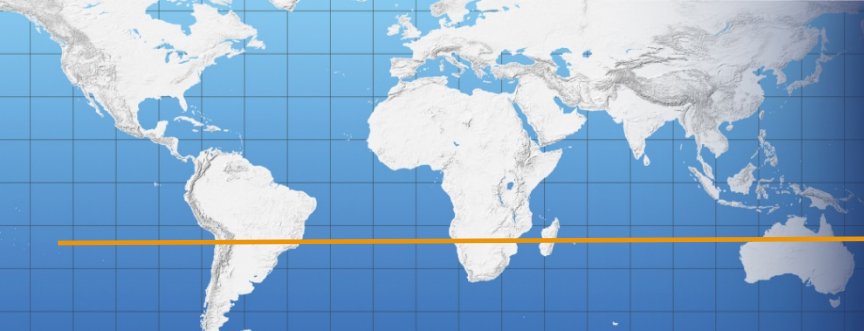
Solid Waste

Quantum of Municipal Solid Waste (Tons/Day)

Local body area	Existing capacity 2001	Projected generation for 2021
MCD	5250	15100
NDMC	245	550
Cantonment	48	100
Total	5543	15750

Sewerage System

- The existing capacity of sewerage system in Delhi grossly inadequate
- Only about 55% of the population is covered under organised sewerage system and about 15% under on-site sanitation systems.
- The sewage treatment facility is also inadequate. Oncreasing pollution in the river Yamuna is a major indicator of lack of sewage treatment facilities.
- The sewerage system is designed to handle domestic liquid waste @ 80 % of the water supply, which has to cater to 1100 mgd (4950 mld) of waste water by the year 2021.



Proposed Representative actions in NCR Plan

Check Population Growth / Migration

- As per NCR Plan, no new Central Government and Public Sector Undertaking offices should be located in NCTD. However, this would be possible only after a time bound action plan is prepared together with suitable incentives and disincentives.
- Industrial growth in Delhi should be restricted to high-tech with emphasis on units, which require skill, less manpower and energy and do not create pollution / nuisance.
- Legal and fiscal measures should be adopted to restrict employment in industries and distributive trade.

Thrust on Energy Efficiency and Conservation

- Thrust on energy efficiency – Concept of Zero-fossil Energy Development (ZED), load management, high efficiency appliances and lamps, Renewable and solar energy
- The natural features such as Forest, Wild life Sanctuary, Ridge, River Yamuna and other water bodies should be conserved and kept free from unrestricted and unplanned urban development.

Multi modal Transport System

- Keeping in view the diverse built up physical forms within the city, it is logical to state that a single mode of transport cannot practically and effectively, serve the needs of the city.
- Major regional transport corridor and communication network needs to be strengthened to enhance economic development within the region and decentralization of the distributive trade.
- It is envisaged that the future transport system shall consist of a mix of rail and road based systems which may include Metro Rail, ring rail, dedicated rail corridors for daily commuters, (IRBT/ RRTS corridors as identified in NCR Plan 2021)
- A single unified Metropolitan Transport Authority, on the lines recommended by the National Transport Policy Committee, needs to be established on priority.



Thank you