Transforming mobility in cities: Leveraging urban planning and transit oriented development for climate resilience and

Anumita Roychowdhury Centre for Science and Environment

Session: *Climate Strategies for Cities*

2nd International Conference and Exhibition – Augmenting Nature by Green Affordable New Habitat

Bureau of Energy Efficiency (BEE), and Indo-Swiss Building Energy Efficiency Project (BEEP)

September 14-16, 2022



What is IPCC saying about cities and climate change?



- Urban boom: Additional 2.5 billion people are projected to be living in urban areas by 2050, -- up to 90% of this increase in Asia and Africa.
- Focus on vulnerability of cities -- risk to people and assets from climate hazards
- Climate related economic losses have increased in urban areas
- Climate impacts disproportionate on economically and socially marginalized urban communities.
- Share of population in informal settlements increased from 23% in 2014 to 23.5% in 2018.
- Design and planning of urban settlements and infrastructure critical for resilience
- Urban heat island can add 2°C to local warming. Cities and Settlements are expanding into land that is prone to coastal flooding or landslides
- Many cities have developed adaptation plans but poorly implemented.
- Plans focus narrowly on climate risk reduction, missing opportunities of cobenefits of climate mitigation and sustainable development, compounding inequality and reducing wellbeing.



Cities need to be central to the strategies for 1.5 degree stabilisation pathways

Cities responsible for 80% of global GDP - By 2050, 70% of world population to be in urban settlements. (IEA 2021)

Urban emissions and consumption: Globally, cities account for 60-80% of energy consumption and 75% of carbon emissions, -- transport and buildings are the largest contributors. (The UN.org). Cities collectively consume 75% of world natural resources, generate 50% of waste, and emit 75% of greenhouse gases.

India: Nearly 44% of India's rapidly growing carbon emissions are urban emissions from from transport, industry, buildings, and waste in cities. - Over 44% of Indian cities are 'critically polluted' and 37% highly polluted.

Urban growth to influence future pathways, climate resilience and carbon intensity



Indian cities are expected to produce 75% of GDP by 2030. But huge deficit in housing, transportation services and jobs. (Coalition of Urban Transport, 2021).

Per capita energy demand has grown by more than 60% since 2000 in India (IEA report 2020)

Nearly 44% of India's rapidly growing carbon emissions are urban emissions from from transport, industry, buildings, and waste in cities.

Megacities, metro cities and class I cities to generate 59% of GHG emissions in the country.(wwF)

India has committed finance to urban infrastructure and urban renewal. Local climate action in cities can make this transformative.

Cities -- victims of climate change: Disregarding urban ecology and natural drainage





Annual Mean Temperature Temperature Anomaly from 1901-1930 baseline

Gurugram flood

Chennai flood: City built on lakes turns into a lake

Se al

lumbai lood

Mapping climate trends in smart cities...

Mapping climate trends in smart cities



INCREASE CONSTANT DECREASE



Vishakhapatnam

Surat

Udaipur

Data Source: Climate disconnect in India's smart cities mission, (http://indiaclimatedialogue.net)

Variation in land surface temperature over Delhi: Heat hotspots in Delhi on hot summer days









What determines cold and hotspots in a city: Delhi





Coldspot: Munirka, Sultanpur

Hotspot: Badarpur, Jaitpur

What determines cold and hotspots in a city: Mumbai



Hotspot: Chattrapati Shivaji International airport

Hotspot: Deonar dumping ground





3)

45°C

43°C

39°C

- 35°C

Sub-urban area

Growing carbon footprint in smart cities



Data source: Carbon footprints of 13,000 cities, June 2018 http://citycarbonfootprints.info/ 7000000 t 3000000 t New Delhi 1000000 t Total CO2 Emission: 69,645,290 tonnes Urban Clusters

23

The battle of car bulge: Is this sustainable or solvable?





What is IPCC saying about the transportation and climate change?



- Transportation infrastructure hugely vulnerable to extreme weather events and disruptions
- Mobility transition to improve mobility and accessibility,
- Influence urban form and reduce vehicular use and reduce infrastructure degradation
- Reduce vehicle miles travelled and vehicle-based emissions.
- Use of electric vehicles, hydrogen vehicles, and greater uptake of public transport can reduce exhaust emissions
- Safe, convenient walking, cycling and public transport infrastructure in cities to reduces carbon emissions and urban heat intensity

• UNEP Emissions gap report 2021: Post pandemic recovery: Most regions spending miniscule on clean transport. Of USD250 billion spending globally on economic recovery, share of traditional transport is

Motorisation and mobility demand: Explosive in India



14







- 2010 2015 2020 2025 2030 2035 2040 2045 2050
- Passenger km to increase more than 3 times by 2050
- Trip length and rate to increase with city size and income
- Private transport to overtake public transport by 2040.
- Peak traffic to crawl
- Energy intensity must drop by 3.2% on average annually from 2020 to 2030 – more than double the annual average rate of decrease since 2000
- Road vehicles account for nearly three-quarters of transport

Bigger opportunity for change in India: Majority still walk, cycle and use public transport





Source: Jindia Census 2011

But Bus transport in crisis

City bus services Declining bus ridership



Source: Data collected from different sources by CSE

Pandemic impact on ridership and revenue



 Ridership before covid (Dec 19 -Feb 20)

Last year, in budget 2021, centre has allocated 20,000 cr. for purchasing 18,000 buses,

*Calculated considering the cities above 2 lakh population

Urban India

Operational buses 35-40K Needed 115-120K Gap – **75-80K***





...Mass transit – inadequate plateauing



Operational BRT - 8

Total operational length: 412 km (Ahmedabad and Surat combinedly have more than 50% of total network length).



Only Ahmedabad and Surat has integrated (physical and IT) their BRT system with city bus services. Surat has integrated their fare system as well.

Mass transit services: **MRTS** (Metro+RRTS)

Operational metro -13 with network length of 723 km Under construction new metro -9



Source: CSE analysis

Urban commuting and heat trapping gases in cities



CO2 emission load from urban commuting in the 14 cities (in tonnes per day)



Urban commuting and energy consumption in cities (in MJoules per day)





Share of public and private transport in motorized trips





- **Mumbai and Kolkata:** Highest share of public transport trips followed by Delhi and Chennai.
- Bengaluru at lower level
- Metropolitan cities: High share of personal vehicle trips

Car centric road design locks in enormous carbon and pollution



- Road engineering to give advantage to vehicle movement limit commuting choices for sustainable modes
- Scale of street transformation for all road users limited walking, cycling and public transport users
- Hidden subsidies for car owners free parking, taxes do not reflect true cost of congestion and pollution – incite motorisation
- Urban sprawl undermining compact mixed use urban form and increasing distances
- A compact city can save 10-30% of transport cost, reduce travel time, increase productivity and energy savings, reduce emissions and demand for land
- Policies have changed; need implementation



How urban planning and transportation infrastructure locks in carbon and pollution?



Unliveable peripheries

Gated development

For the 12 largest Indian cities, satellite imagery shows that, the proportion of built-up area outside a city's official boundaries exceeds that within its boundaries --- also exceeds the proportion of population, -low density sprawl.(World Bank 2015)

Sprawled......

Sprawled development erodes transit oriented sustainable neigbourhoods



Mohali



Gurugram



Source: CSE analysis

Sprawled development erodes sustainable neigbourhoods



Noida





Source: CSE analysis



Hyderabad: New affordable housing schemes



Geo-spatial tools help in decision-makin



Legend



Delhi: Relocation plan pushing settlements to periphery





Average trip length high

Access to social infrastructure - a challenge





Average distance to services, journey time and number of trips have increased.

NMT use has declined.

Transport cost has increased for the bottom 50% of the population, ---on education and health has stagnated.

CSE study 2021, Mass housing and Liveability: Mapping of the ground reality

DUSIB's plan for slum rehabilitation: People move back





- 15 projects (52,584 units) for slum rehabilitation
- Only 8.76% occupancy: attributed to non-availability of required infrastructure, services, risks of losing livelihood
- Preference to in-situ rehabilitation as per MPD-2021



Towards transit oriented development and compact urban form to reduce carbon intensity and automobility

High density compact urban form allows more sustainable travel

(Percentage share of sustainable modes vs urban density)





Source: Multiple sources compiled by CSE

Transit network: An opportunity for transit oriented urban communities





The MPD 2021 and MPD 2041 set target of modal split of 80:20 in favor of public and shared transport. Needs 1% increase in the public mode trips every year and an equal reduction in private vehicular trips.

MPD 2041: 60% of urban area will be within 15-minute walking distance from the MRTS stations.

UTTIPEC: -- after the full implementation of Delhi metro about 80% of Delhiites will be within 400 meters of some metro station. ³²

National mandate for transit oriented development



National TOD policy: Not just high rise and high density; But liveable and people oriented planning

- -- High density, mixed land use development in TOD zones (500-800m) with spacing of metro station at 1km (mn 1 ha area).
- -- Improve accessibility, NMT, increase ridership, compact walkable communities, meet basic services within the zone etc
- -- Reduce private vehicle ownership, traffic and associated traffic demand,
- -- Prevent urban sprawl
- -- Small block size with finer street network
- -- Mixed income development -- EWS and affordable housing
- -- Requires MMI, complete streets, last mile connectivity, inclusive habitat, optimized densities, mixed landuse, connected streets, NMT network, street oriented buildings, managed parking etc
- -- Open areas (10-12 sqmt per person -URDPFI);
- -- Active frontage
- -- Value capture financing among others

Localise change in cities



Delhi MPD 2041 has integrated TOD policy:

-- Intense mix-use development within radius of 500-800 m around TOD nodes

-- Regeneration Schemes for mixed use, limited parking, built-to edge active frontage, off-street public parking facility outside the Intense Development Area, to serve as a 'park and ride' facility.

-- Multi-modal integration

-- Optimised density and diversification of uses and activities --

The FAR to be 1.5 times the existing permissible FAR on the plot or 300, whichever is more -- maximum FAR limit to be 500

-- Enhanced mobility - fine network of pedestrian and NMT routes and restricted and high- priced public parking with enhanced walkability and last mile connectivity. Public transport accessibility index And more....

Emerging TOD initiatives....



Several TOD projects announced or initiated

-- DDA has identified 12 transit hubs to be developed as TOD – (eg Karkarduma)

-- Pune Municipal Corporation (PMC) has sanctioned 78 proposals for TOD zone (on line one and two, and five proposals on line three of the ongoing metro rail route)

-- Gazhiabad development Authority – TOD alongside RRTS – 1.5 km radius of RRTS and 500m of radius of mass transit lines

-- L&T Metro Rail Hyderabad project And more....

Step towards urban form based code



IRSDC form based code: Pedestrian movement network plan



BO-150 Mts BO-150 Mts

Source: Indian Railways Station Development Corporation, Form based code



IRSDC form based code: Mandatory Pedestrian Passages through Sub-Plots shall align with Mid-Block Crossings

An illustration from a global city

Setting habitat standards for compact city design





National Habitat Standards

- -- 95% of residences to have daily needs retail, parks, primary schools and recreational areas within 400m walking distance.
- -- At least 85% of all streets to have mixed use development.
- -- Need small block size with high density permeable streets etc



Addressing the ground realities

Tension and conflict around redevelopment projects



Example: Kidwai Nagar redevelopment project etc -- Fear of induced traffic and additional parking pressure; But avoidable if TOD principles are implemented in totality





TOD not compatible with gated development



Gated development at C Block, Sector 62, Noida

-- Direct distance from society block to market – 150 meters.

-- But gated development blocks access

-- Motorised road access is 1 kilometre long -- 20-25 minutes walk also impeded by parking



Case Study – Outer Ring Road (Nehru Place Flyover)Travelling from A to BOriginally 30M across the road



Case Study – Outer Ring Road (Nehru Place Flyover)Travelling from A to B – Pedestrian Route 11000M via FOB





CR Tark



Source: CSE

FOB





Street Network



TIPEG

Car centric road design locks in enormous carbon and pollution Prevent car-dependent road desi



Prevent car-dependent road design and spatial planning

- Engineering changes once made cannot be reversed easily... It permanently decides our travel choices
- Unsafe access compromise public transport usage



Super size blocks, opaque boundary walls, lack of street activities and active frontage defeat the TOD objectives





It is possible to transform streets to make them people friendly







Scale of change still small

Delhi: Restructuring Ajmal Khan road







22 more streets in Delhi to be pedestrianized

Scale up this change across cities

Delhi: Restructuring Chandni Chowk





Eco-mobility Corridor: Good idea but not implemented



Developing drainage network as walk-cycle corridor and recreation zone

Eco-mobility Corridor to be developed in coordination by Landscape & Planning department, DDA To be coordinated with UTTIPEC.



Nallahs can be Cycle-Ecomobility corridors, forming a City-wide Network.

Multi-modal integration







Free and unlimited parking blocks transit oriented growth

Remove hidden subsidies; Pay true cost and change behaviour



51

Need parking management area plan and pricing: Lajpat Nagar III (Residential PMAP)



OBJECTIVES

- Designate parking for residents and guests
- Manage and restrict spillover from adjacent areas
- Provision of access for emergency vehicles
- Designate authorized parking area for excess parking demand
- Remove parking from pedestrianise stretch;
- Parking stickers, signages

DEMANDTotal demand in Lajpat Nagar III2,477Cars accommodating inside the houses905Cars getting parked outside / Capacity to Manage1,572

SUPPLY	
On-street parking in planned manner	1,414
OTHER SUPPLY	
Service lanes (behind the houses)	300
Upcoming automated stack parking **	246
Stretch no. 4, 5, 6, & 7 of Auth. Parking on Feroz Gandhi Marg **	220
SDMC School **	40
Total	806

* Available only during the night time.

CHALLENGES

- Seamlessly connected to one of busiest CBD, hence induced parking demand for residential area
- Lack of manpower and funds by RWA to manage parking



Pilot project Parking Management Area Plan (PMAP) in Kamala Nagar

Before

After







Before



After



Source: Anuj Malhotra

Whiff of change: TOD typologies evolving to bring work, home, retail and recreation closer





The TOD Building typology - in Kolkata:

-- Roof of retail used as public space for residents.

-- Zero Setbacks.

-- Mixed Use (Commercial/ Civic/ Residential within same block)

-- Privacy of residents ensured.

-- Retail facing the street with homes overlooking, keeps pedestrians 54 (women) safe

Reimagine and reinvent inclusive cities



- Cities need new urban agenda for clean air and climate neutral goals
- Mandate and implement urban form based code to have compact, connected, and accessible cities -- Mandate adoption of all TOD measures for project implementation
- Need restraint and demand management measures to reduce automobility: Parking policy, PMAPS with parking and congestion pricing
- Shift budgets from road-building to public transport, active transport and zero-emissions mobility
- Urban adaptation plan to make transport infrastructure climate resilient
- Fiscal reform to mobilise resources and tap new revenue streams to build sustainable and resilient transport infrastructure
- **Need just urban transition** include urban poor and informal settlements in urban planning for distributive justice
- Adopt measurable and verifiable impact monitoring systems





Thank You