



ANIL AGARWAL DIALOGUE 2022

Climate change and Urbanisation:
The co-benefit agenda for change

What is IPCC saying about cities?

- **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 co-benefits 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.



Our opportunity to influence new development.... Reinvent growth

In relation to 2015, 75% of global urban infrastructure that will exist in 2050 is yet to be built. (UN.org)

Indian cities to produce 75% of GDP by 2030. 60% of India is yet to be built....

India's committed and augmented finance to urban infrastructure and urban renewal needs leveraging for transformative changes and significant mitigation of urban emissions....



Cities -- victims of climate change

Disregarding
urban ecology



How will cities contribute towards India's promises of decarbonisation:

- Reduction of the total projected carbon emissions by one billion tonnes from now onwards till 2030.**
- Reducing the carbon intensity of its economy by less than 45 percent by 2030.**
- Achieving the target of Net Zero by 2070.**



Can we reimagine our cities to be more sustainable?

Mobility transition in our built environment

Energy transition – efficiency and sufficiency

Circular economy – close the loop of waste water and solid waste

Equity in space

Sustainable consumption

How do we change the practice and transform cities for low carbon growth?

Understanding mobility transition: Cities losing battle of car bulge



Source: CSE



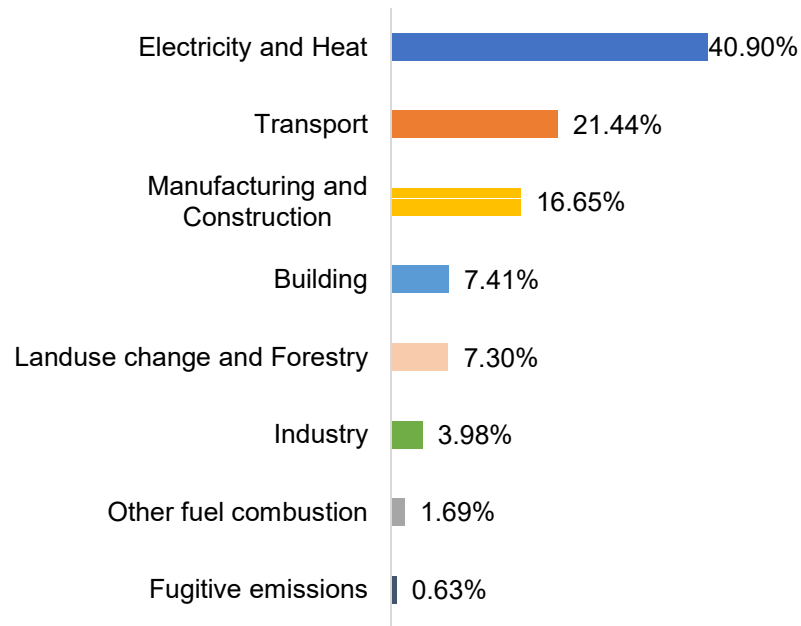
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What is IPCC saying about the impact of climate change on transportation?

- **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 and cycling and public transport infrastructure** in cities to reduces carbon emissions and urban heat island intensity

Transport is the 2nd largest CO₂ emitter globally and nationally; Still growing

Global: Sector-wise global CO₂ emission in 2016



Source: ourworldindata.org

India:

Transport sector is responsible for 9.7% of the country's total GHG emissions (without LULUCF) – **second highest**

Source: 3rd Biennial update report to UNFCCC



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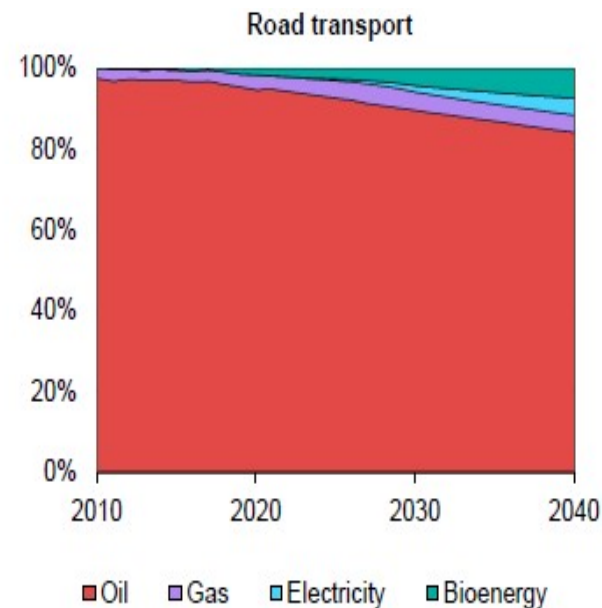
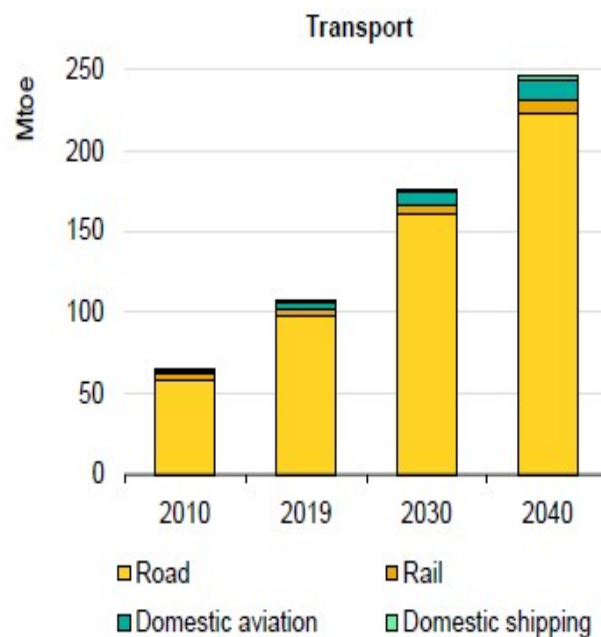
Taming energy guzzling in India

- Energy demand for road transport to more than double over the next two decades
- 300 million more vehicles to be added between now and 2040.
- Oil demand is expected to increase by almost four million barrels per day in 2040—to be the largest increase for any country.
- Over half of the growth to be fuelled by freight transport.
- Road freight activity will triple by 2040.
- Between 2005–06 and 2019–20, petrol and diesel consumption increased by three times and two times.
- Close to 85% of crude oil is imported.
- Oil splurge in the vehicle sector cannot remain untamed.

Source: IEA 2021, Air Quality and Climate Policy Integration in India

Road transport to upset energy budget in India

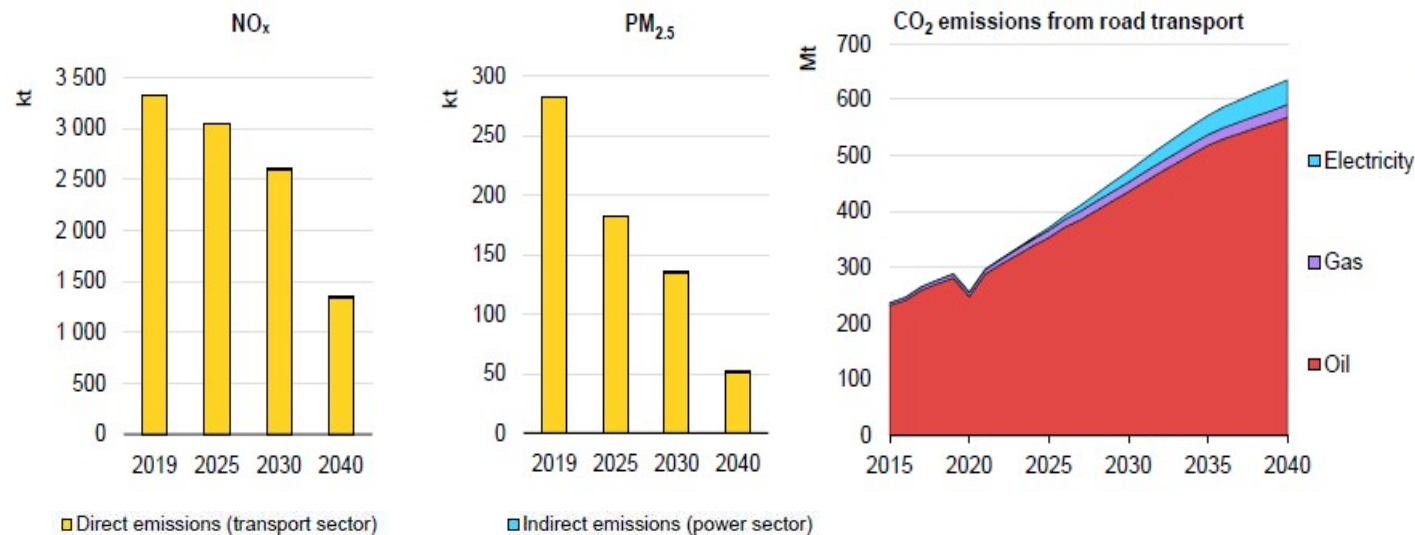
- IEA: India - Final energy use of transport by subsector and road transport by fuel in the Stated Policies Scenario, 2010-2040



Source: IEA 2021, Air Quality and Climate Policy Integration in India

Local pollutants to decline but heat trapping CO₂ emissions to increase

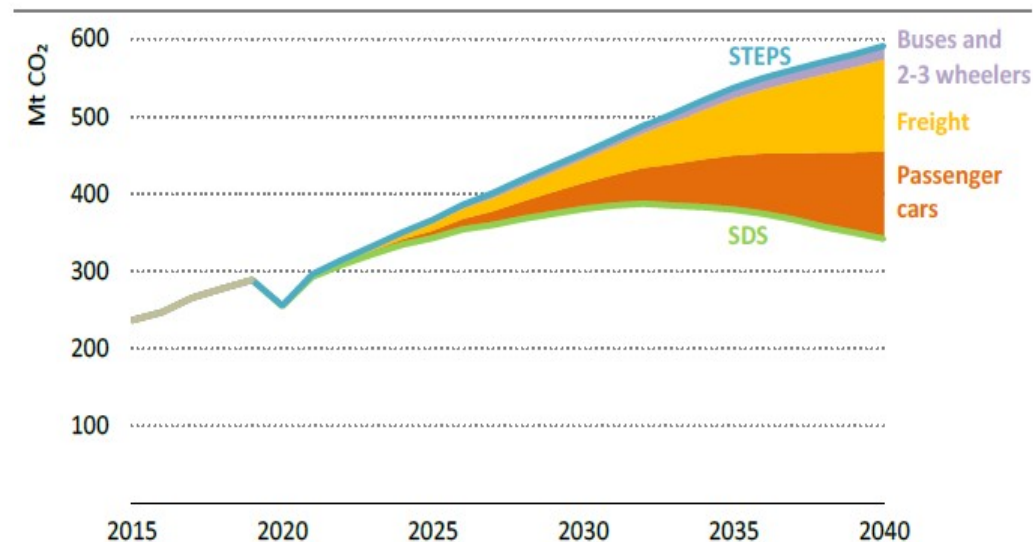
- Road transport related air pollutant emissions in the Stated Policies Scenario & Road transport related CO₂ emissions, 2019-2040



Source: IEA 2021, Air Quality and Climate Policy Integration in India

CO2 reduction opportunities in climate challenged world

- IEA: India - the biggest opportunity to reduce CO2 emissions from passenger cars and freight transport



Indian freight transport demand is going to increase five fold between 3 trillion to 16 trillion tonne km (t-km).

Note: Scenarios are Stated Policies Scenario (STEPS) and Sustainable Development Scenario (SDS)

Source: IEA 2021 India energy outlook

Post pandemic recovery: Carbon intensive

UNEP Emissions gap report 2021:

Transport sector CO₂ emissions bouncing back; Warned against carbon intensive recovery.

Most regions have spent miniscule on clean transport.

Of USD250 billion spending globally on economic recovery, spending on traditional transport is 9.9% which is three times that of only 3.3% spending on clean transport.

Changing pattern of car locked world

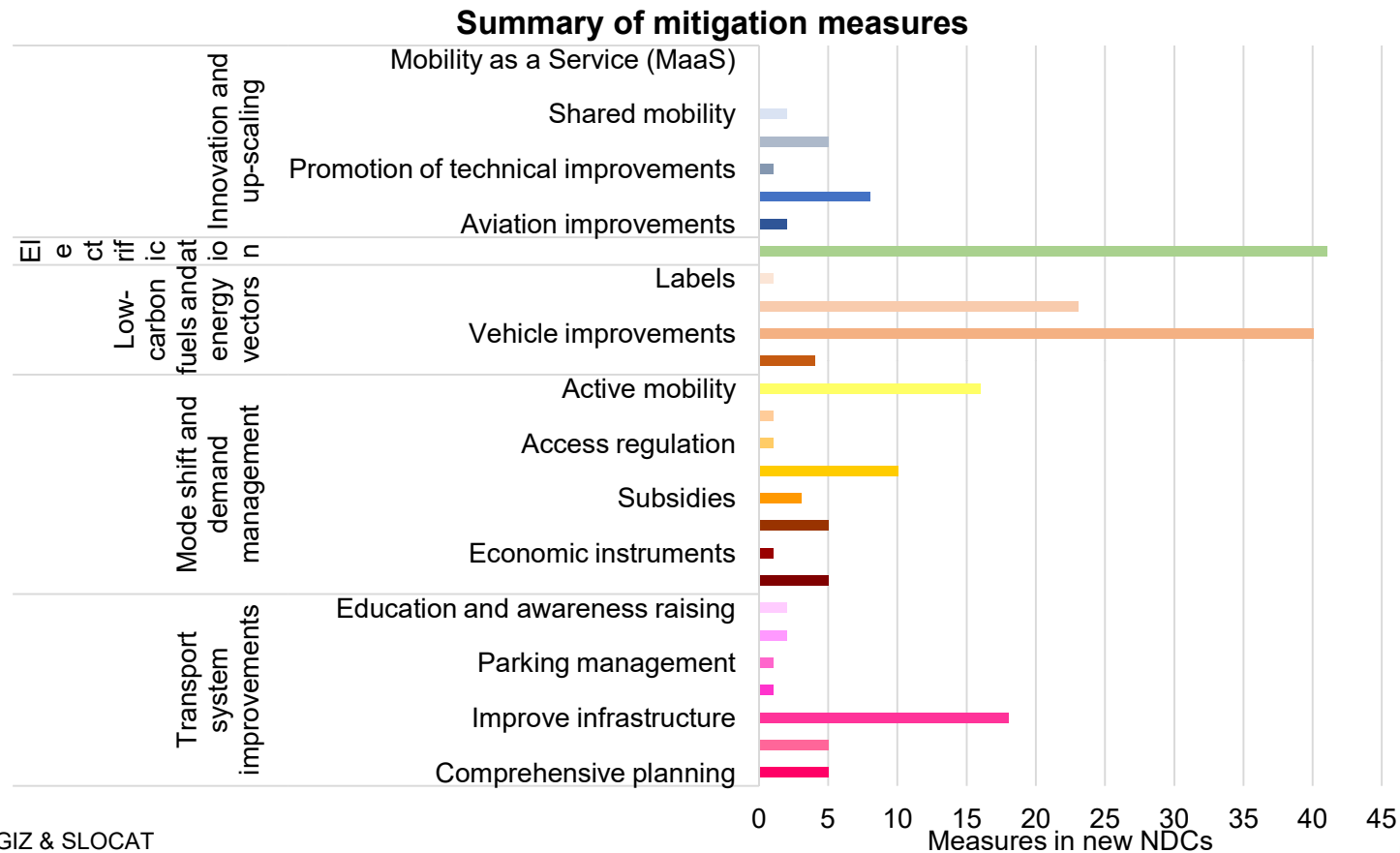
- **Currently, highest** total transport sector energy consumption in **North America and Canada** (0.19-0.23 Boe per 1000 UD), (IEA)
- **High in Europe** (0.12-0.15 Boe)
Rich countries: Strong correlation between GDP and motorization.
Car ownership more than 700-800 per 1000 inhabitants (US, Australia)
UK, Japan and Switzerland among others -- more than 500-600.
- **Low in India** (0.06-0.09 Boe) (IEA)

This trend to change

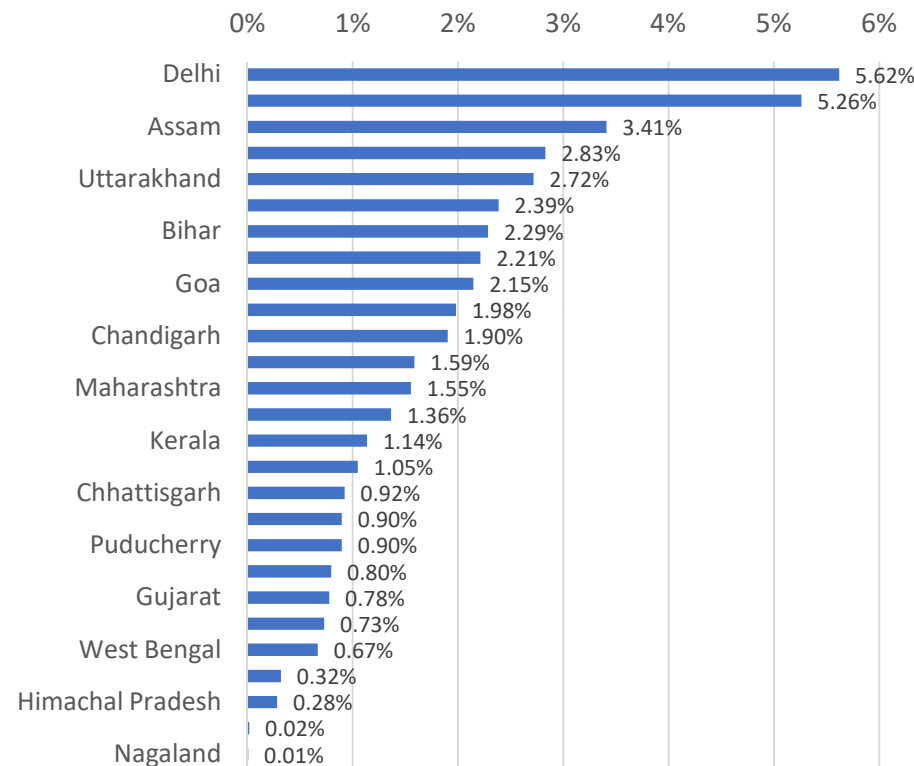
IEA's Energy Outlook 2019: In OECD energy used for passenger travel to decline until 2030s due to slower economic and population growth and greater impact of energy efficiency improvement in vehicles.

IPCC: Light duty vehicle travel per capita high – but to peak around 2035 in developed world

Global action towards electrification and fuel economy



Zero emissions transition in India – non-starter still... Electric vehicles - less than 2% market share; Most are e-rickshaws



State wise EV market shares in India (Vahan database, CY 2021)

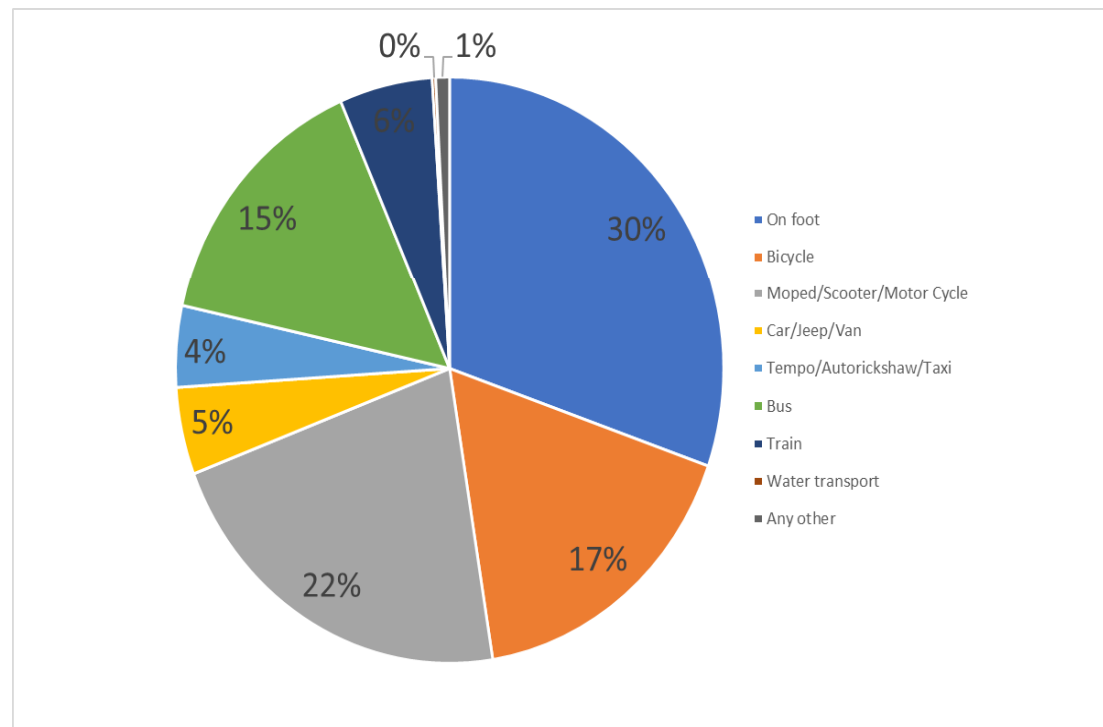
**Global Declaration on
100% transition to zero
emissions by 2030-2040**

**Global - ZEV Transition
Council**

Global - ZEV Alliance

**India has signed on to
the Declaration on 100%
transition to zero
emissions by 2030-2040**

Opportunity for change in India: Majority still walk, cycle and use public transport But these modes are under huge stress

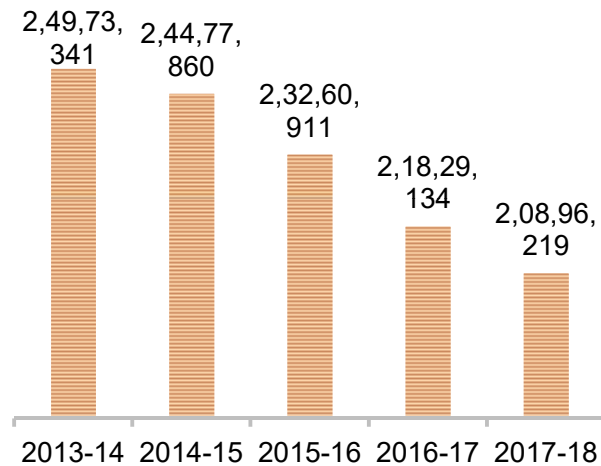


Source:
Jindia Census
2011

Bus transport in crisis

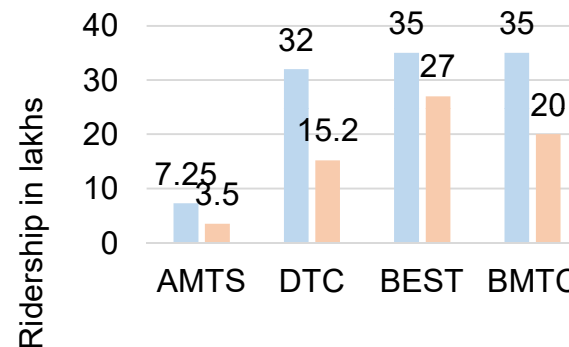
City bus services

Declining bus ridership



Between 2013-2018, 18 cities have lost combined ridership of 40.8 lakhs.

Pandemic impact on ridership and revenue



■ Ridership before covid (Dec 19 - Feb 20)

Urban India

Operational buses 35-40K
Needed 115-120K

Gap – **75-80K***



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

Source: Data collected from different sources by CSE

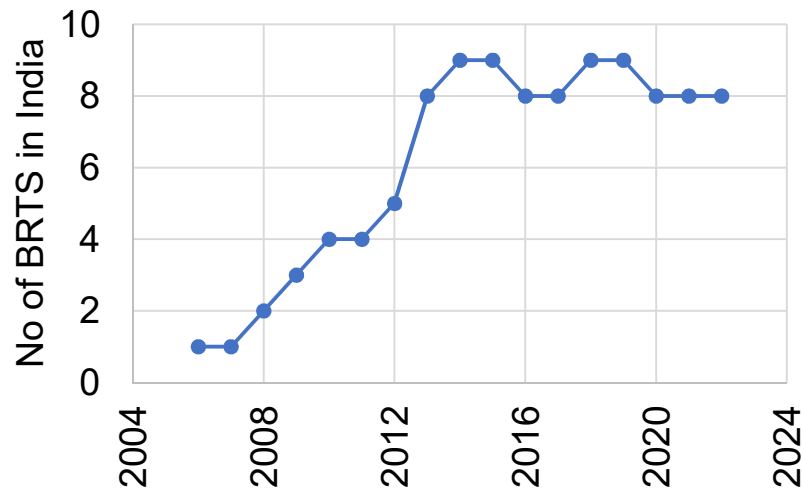
*Calculated considering the cities above 2 lakh population

Mass transit - inadequate

Operational BRT - 8

Total operational length: 412 km

(Ahmedabad and Surat combinedly have more than 50% of total network length).



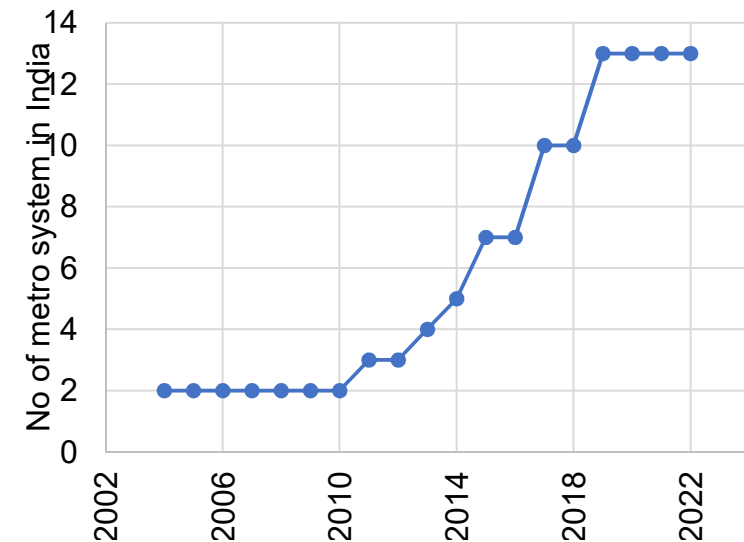
Only Ahmedabad and Surat has integrated (physical and IT) their BRT system with city bus services.

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



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Source: Map prepared by CSE

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 – walking, cycling and public transport users, very small
- 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



**Change mindset:
Global cities are moving away from car
centric infrastructure
Let South Asia not repeat the mistake**



Cities that have destroyed roadways



**San Francisco
Milwaukee
New York
Portland
Toronto
Seoul**



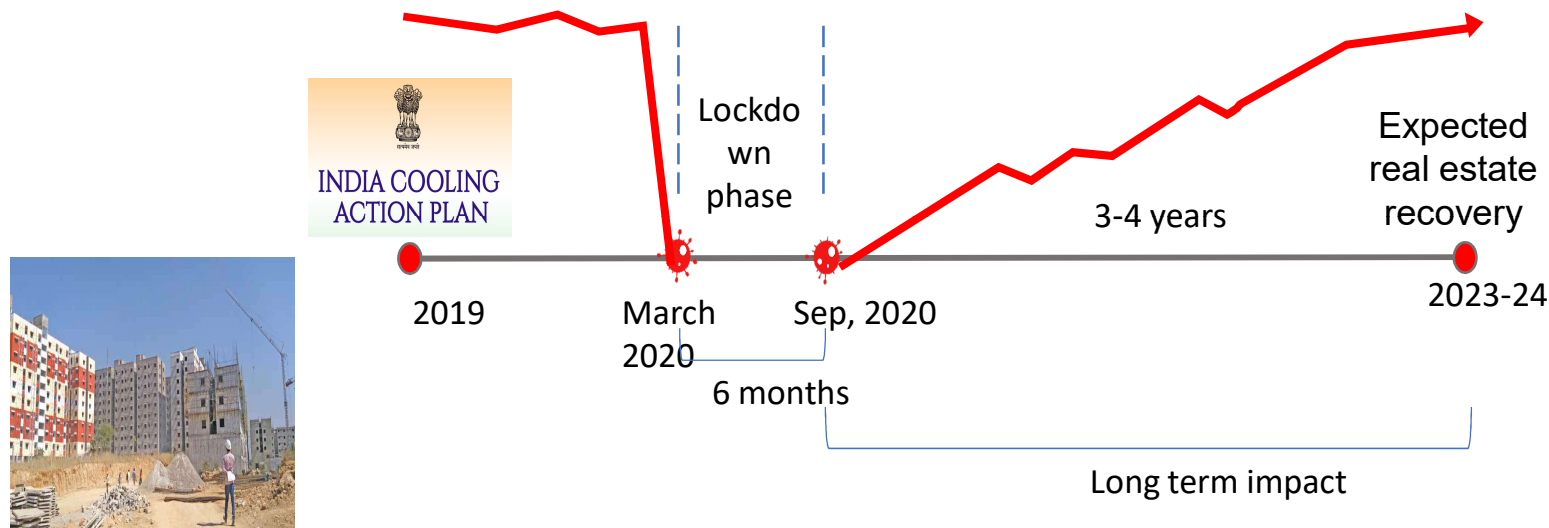
Reducing energy and carbon intensity of built structure....



What is IPCC report saying about impact of climate change on built structure?

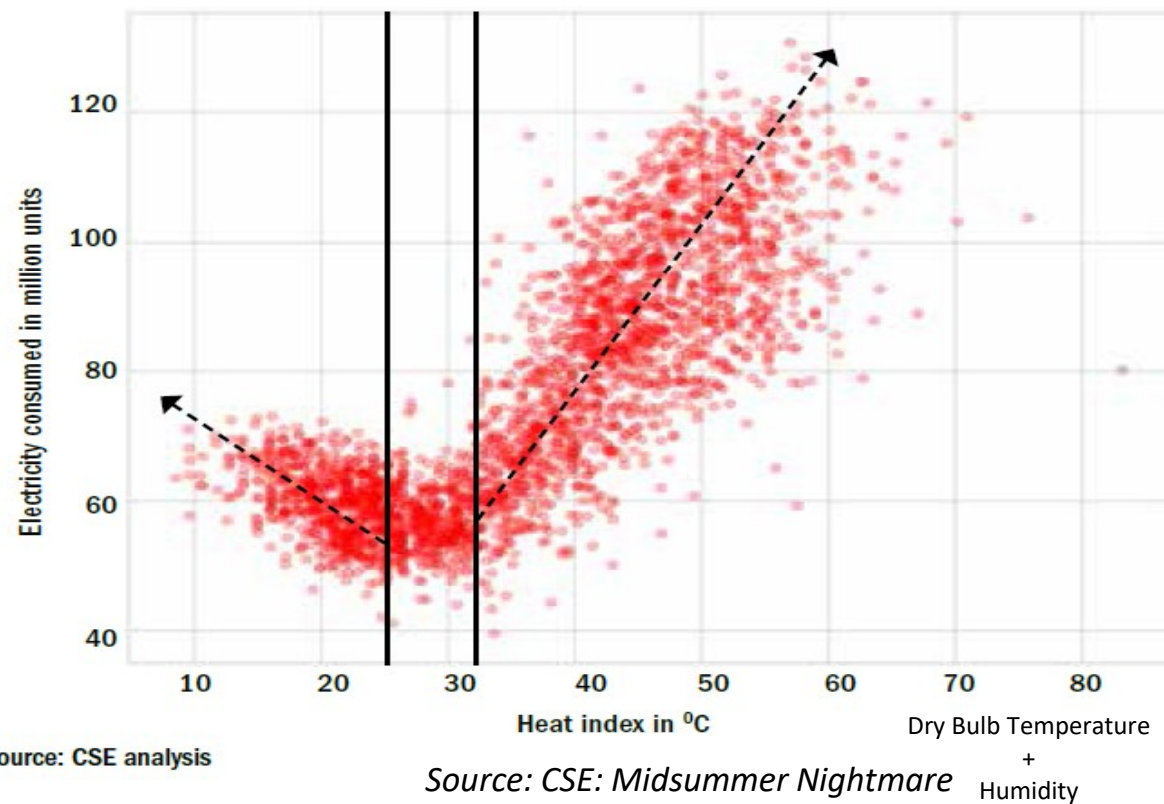
- **Asian countries experiencing a hotter summer climate**, resulting in increase of energy demand for cooling at a rapid rate -- esp peak demand during heat waves
- **Vulnerability and lower adaptive capacity** for young/old/sick people/indigenous people, those in low quality housing and lower socio-economic status.
- **Meeting increasing demand for indoor space cooling with equitable access, requires new approaches to providing cooling** – (energy efficiency and building code standards, passive architecture to improve thermal comfort, rebates on efficient equipment, equipment efficiencies, refrigerants with lower global warming potential.)

India: How can post pandemic recovery be linked with thermal comfort and resource efficiency



- **India's residential sector is adding at least 178 million sqm of residential floor area every year.** About 1–1.2 million dwelling units to be added in next few years
- **Link incentive with performance -- resource efficiency and thermal comfort**

Electricity consumption- proxy for thermal discomfort



**2019 CSE study –
Midsummer
Nightmare:**

Delhi: -- Electricity consumption in summer starts to rise exponentially only after the daily heat index temperature crosses the 31-32°C mark.

-- Once the 25-32°C heat index is breached, impact of mechanical cooling (ACs) shows up noticeably

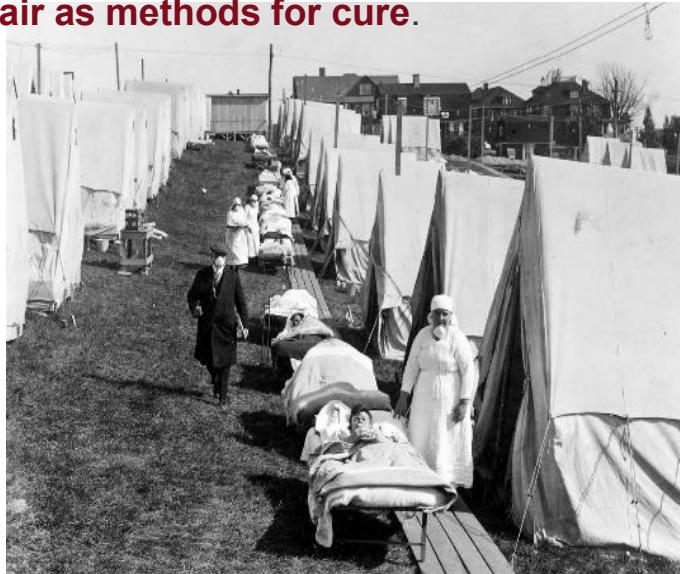
Pandemic rethink on building design

Coronavirus and the Sun: a Lesson from the 1918 Influenza Pandemic

Richard Hobday Mar 10, 2020 · 6 min read

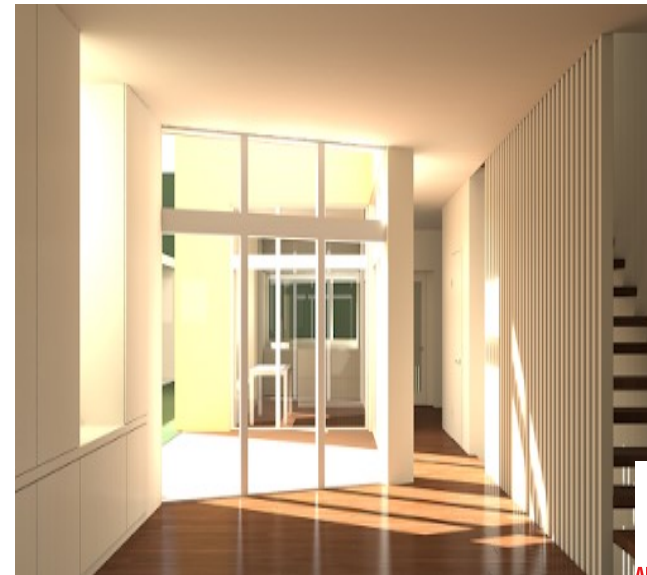
Fresh air, sunlight and improvised face masks seemed to work a century ago; and they might help us now.

Spanish flu: Sun bathing and fresh air as methods for cure.



COVID times: Need ventilation, sunlight and open spaces for healthy living to avoid 'petri dish' buildings

Thermally uncomfortable buildings with poor ventilation, inadequate shading and high heat loads are more vulnerable to contagion

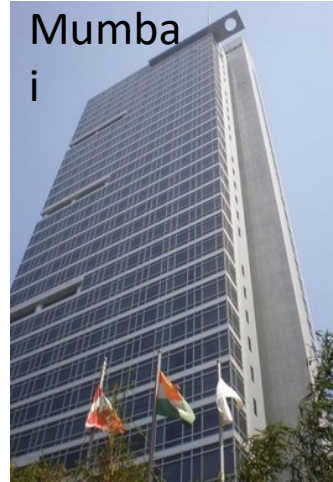


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Chandigarh



Mumbai



Kolkata



Gurgaon



Noida



Chennai



Bangalore



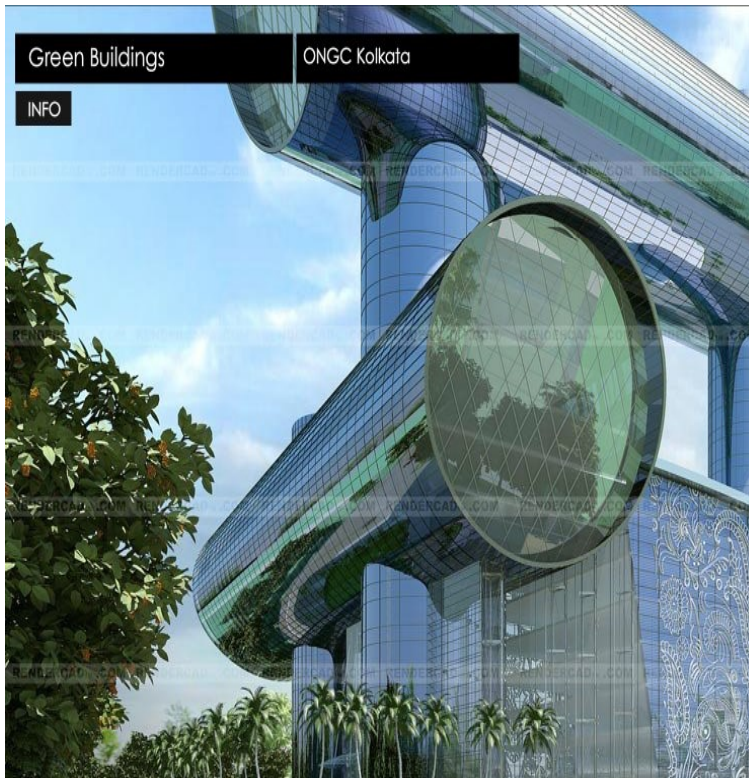
Heat trapping building increasing demand for active cooling and energy inefficiencies



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Connect architecture with local climate and architectural wisdom

New Town Kolkata: Glass building in hot and humid climate



But local architecture -- courtyard houses
Focus on solar access and ventilation



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Alternative walling technologies: Ease and speed of construction



Shearwall using Tunnel formwork

But -----

Uninformed material transition promotes thermally uncomfortable and energy inefficient buildings

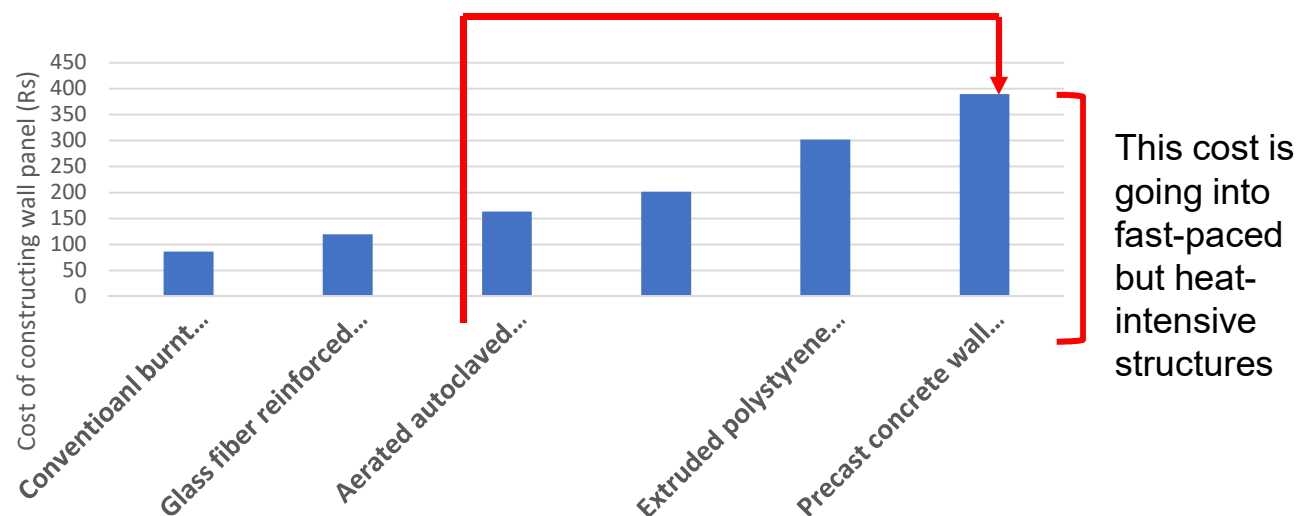
(Eg U-value of monolithic concrete wall is 60% higher than that of regular burnt clay brick wall)



Pre-cast concrete structures
Hyderabad, Telangana

Uninformed material transition may promote thermally inefficient buildings

U-value of monolithic concrete wall is 60 per cent higher than that of regular burnt clay brick wall



Capped construction costs push fast-paced technologies to save on time, labour costs and linked loan interest etc

Source: Compiled from several CPWD Schedule of Rates 2018-19

Reality check – Buildings underperform

Telangana: CSE Assessment of mass housing: *How thermal comfort of affordable housing is affected by layout, orientation, walling, clustering, day lighting and ventilation?*

Heat gain drop by about 40% in the same building design when the material is changed from concrete blocks to fly ash bricks. **Prioritise better performing materials**

Appropriate building orientation can substantially lower heat gain

Combined impact of design and walling material can increase annual thermal comfort hours – by nearly 330 hours

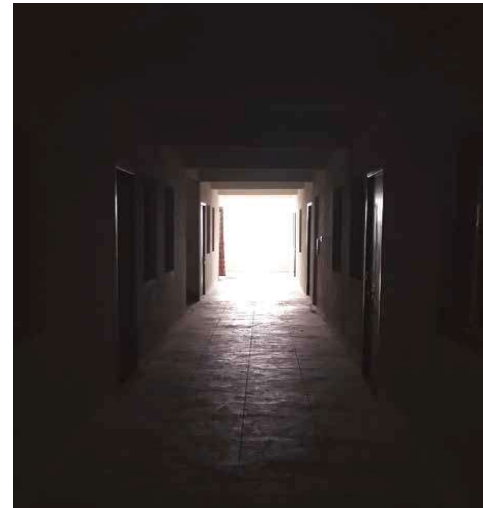
Building clustering and distance between buildings require attention in the layout plan to improve access to sun and increase daylit area.



Link incentives for affordable housing under PMAY with thermal comfort requirements

Central Government incentives

- “Infrastructure status” to affordable housing
- Central public enterprises to give priority to use of land for affordable housing
- GST reduced to 1% (from 8%)
- PMAY requires states to provide additional FAR) and FSI, or TDR and relaxed density rules for slum redevelopment and low-cost housing
- **Without performance requirements buildings underperform**



Drawing lessons from our local architectural wisdom



Need more creative use of building orientation, passive architecture to improve thermal comfort and reduce the air conditioned hours.

Need appropriate orientation of façade, and building material



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**Need equity in space: Pandemic
exposed the invisible masses
Migrants and distress living
Led to rental scheme**



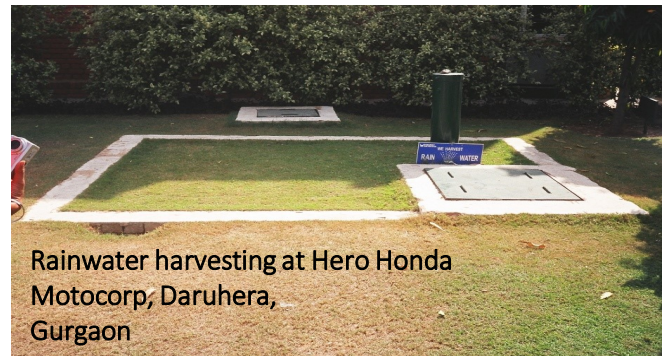
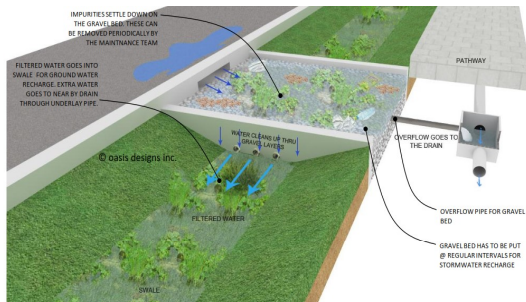
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**Self built housing – most important source
of housing
Needs support to be safe, energy efficient
and thermally comfortable**



Provide technical and professional help and support to the poorer households on design, material, and service planning ...

Need resource efficient and sufficient built structures Need circularity and decentralized services to close the loop of waste and waste water



Onsite composting
RK Mission
Vivekananda
Centenary College



Onsite vermi
composting

**Stronger community ownership at neighbourhood scale : democratise
and demonstrate change**

Waste is resource: Recycled construction material



Reimagine cities and reinvent inclusive cities

- **Need new urban agenda for clean air and climate neutral goals**
- **City/state climate action plans** to decarbonise urban energy system, shift budgets to public and active transport and new zero-emissions mobility; green construction, resource efficiency measures
- **Urban adaptation plan** for ecosystem restoration to reduce climate risks
- **Need urban form based code to implement compact, connected, and accessible cities**
- **Fiscal reform** to mobilise resources and create new revenue streams to build sustainable and resilient urban infrastructure
- **Need inclusive urban transition** – include urban poor and informal settlements in urban planning for distributive justice
- **Ensure resource efficiency and circularity**
- **Need participatory urban planning and budgeting;**
- **Adopt measurable impact monitoring systems**

