

Material-Intensive and Globally Entangled Nature of India's Development Ambitions



DOI: <https://doi.org/10.24943/MGENIDA11.2025>

Authors

Manish Dubey, Amir Bazaz, Nidhi Srivastava
Indian Institute for Human Settlements

Research Support

Meghna CN, Nitish Kumar Parihar, Parinetha Banandur, Sharon Maria Sajan, Shraddha Jaipal,
Sirigowri Guruprasad, Indian Institute for Human Settlements

Design & Layout

Vidhya Venkatesan, Prachi Prabhu | Reviewed by Padma Venkataraman
IIHS Communications and Design

Dravya, the Centre for Materials and Sustainable Development at IIHS, gratefully acknowledges the support of Rio Tinto. The views and opinions expressed herein are solely those of the Centre and its contributing authors, and do not reflect the views, opinions, policies or positions of Rio Tinto.

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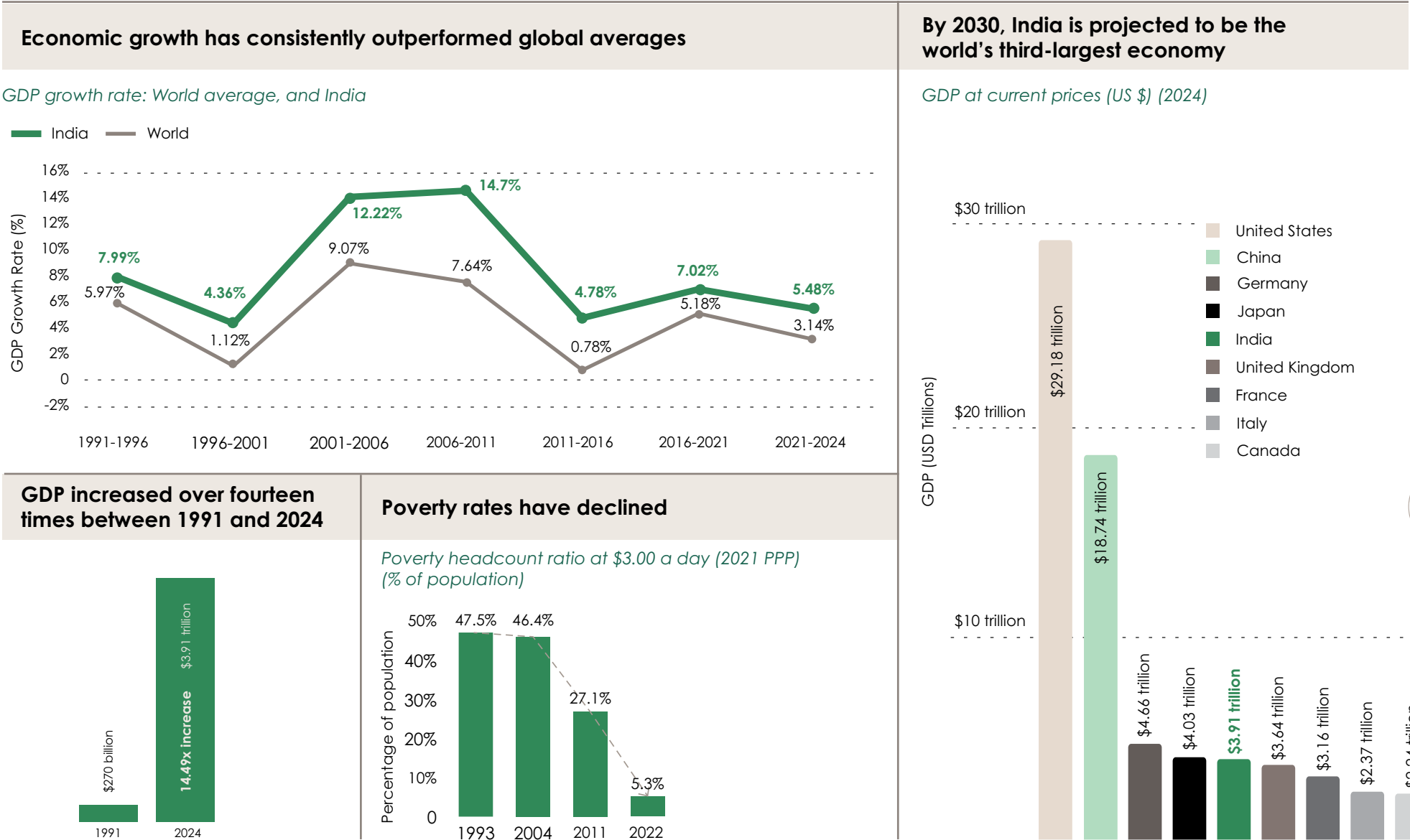
CHAPTER 1

India – Transformation and ambition

India's post –1991 transformation has been nothing short of dramatic. Fuelled by bold infrastructure expansion, rapid urbanisation, and a sweeping digital revolution, its GDP has soared, poverty rates have plummeted, and the nation now commands real global economic clout. Looking ahead to 2047 and the aspiration for developed nation status, India faces the urgent challenge of bridging regional divides, generating sustainable employment, and managing growing climate risks. Meeting these goals will require a focus on inclusion, productivity, and resilient, sustainable development.



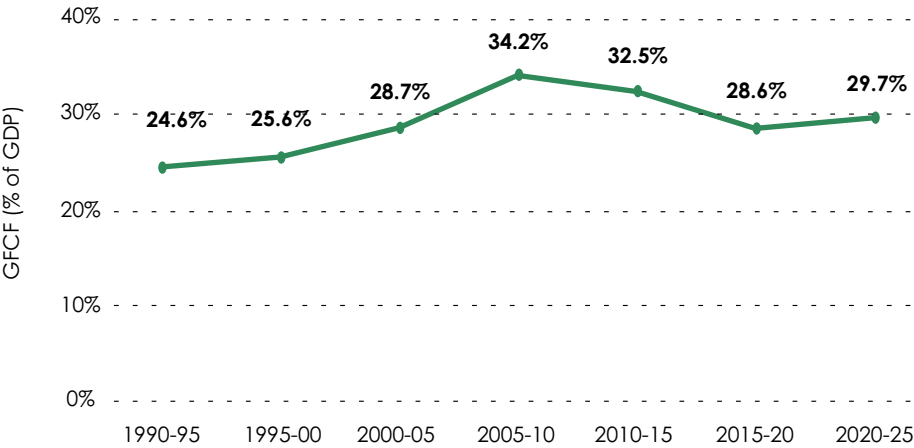
In just over three decades, since 1991, India has staged a dramatic ascent, rising from economic uncertainty to a position of global economic clout.



India's post-1991 transformation has been anchored in a vast infrastructure expansion and the remaking of its urban map.

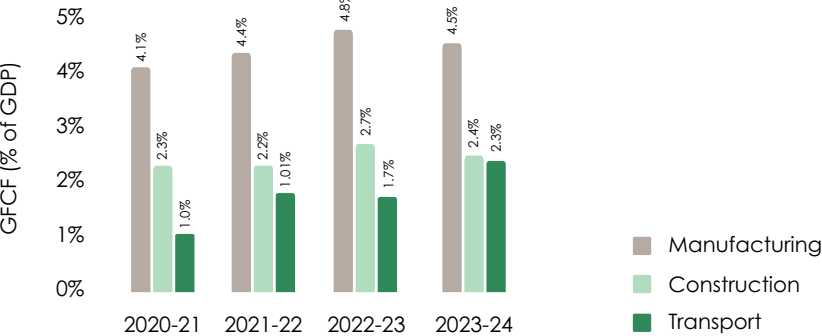
Capital formation has hovered around 30% over 2020-25

Gross Fixed Capital Formation (GFCF) relative to GDP (1990-2025)



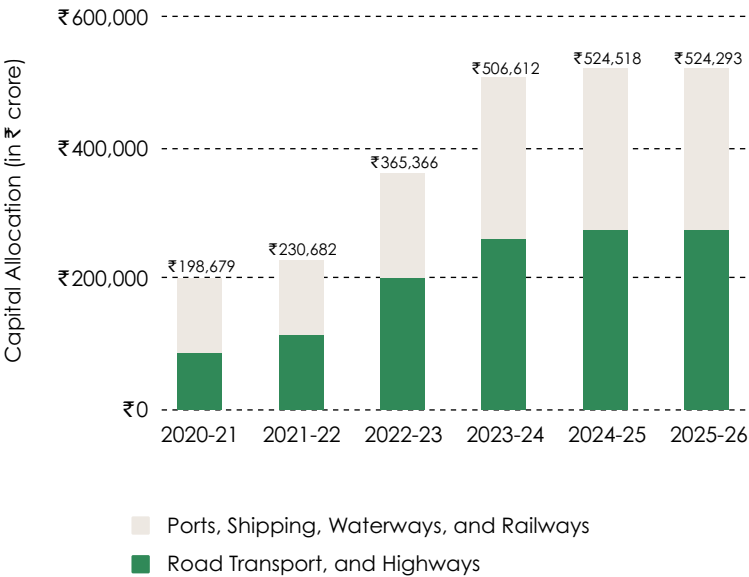
Manufacturing, construction, and transport dominate capital creation

GFCF (industry-wise) as % of GDP



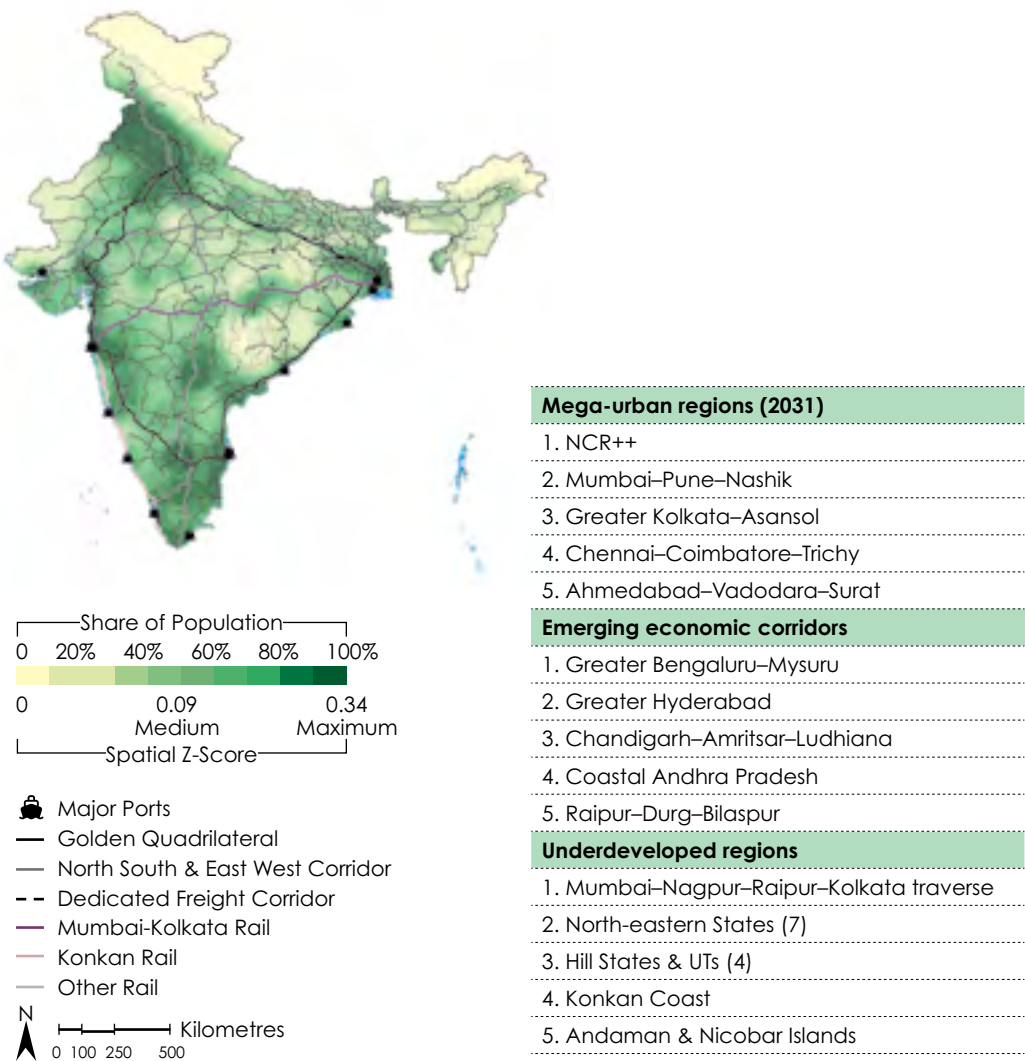
Amidst a major infrastructure push, Government of India capex has risen 2.6x since 2020-21

Expenditure on Central sector schemes by select Ministries



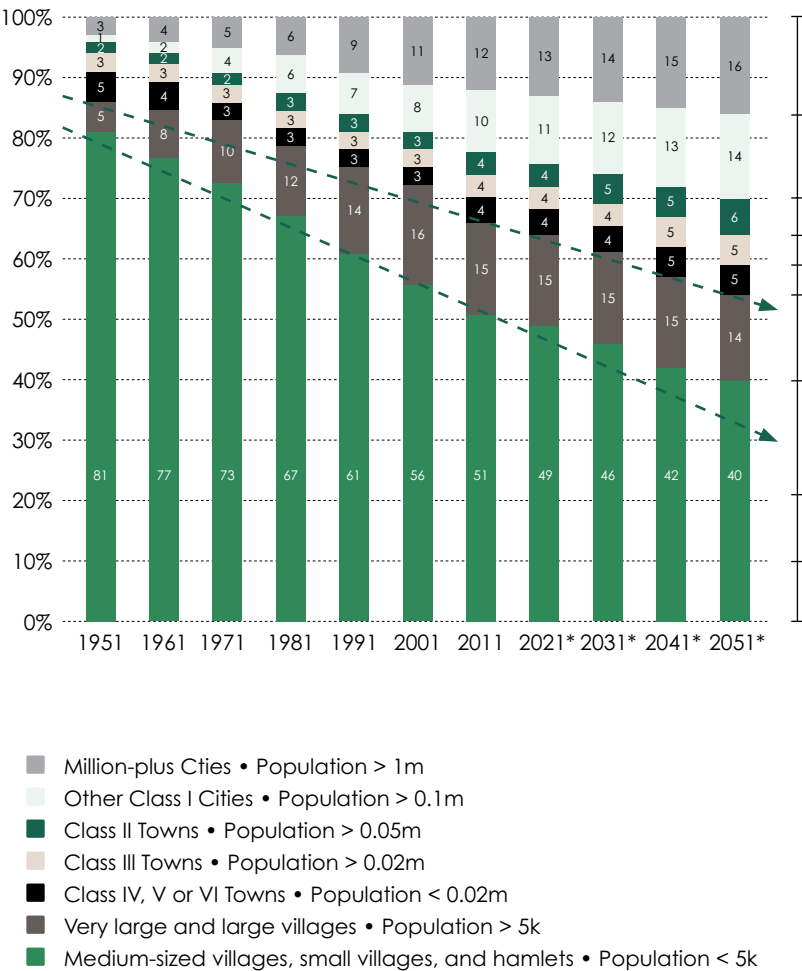
Emerging mega-urban regions and economic corridors are fashioning economic geography

Economic concentration: regions, clusters & corridors (2017)



By 2031, India's urban population could touch 600 million and the process of urbanisation is bound to intensify

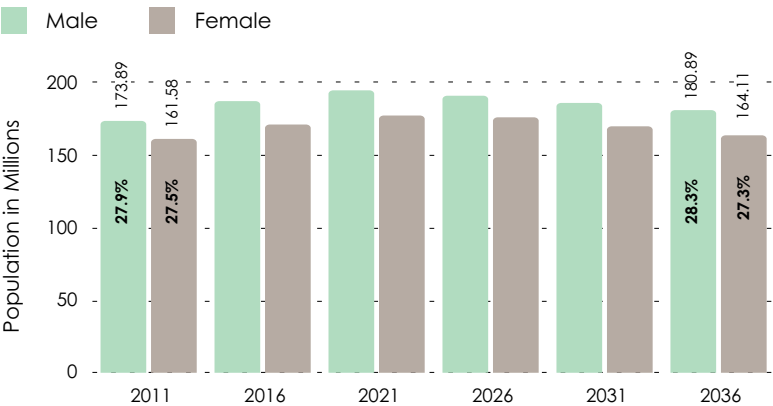
Distribution of population by settlement size classes (1951 – 2051*)



India's post-1991 upswing and unmatched demographic heft have set the stage for bold ambition.

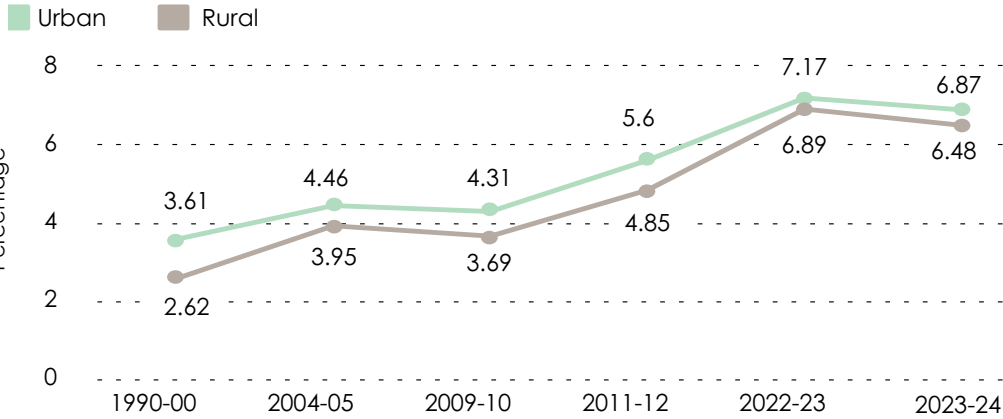
India's youth (15–29) population consistently remains substantial

Population of youth (15-29) from 2011 - 2036



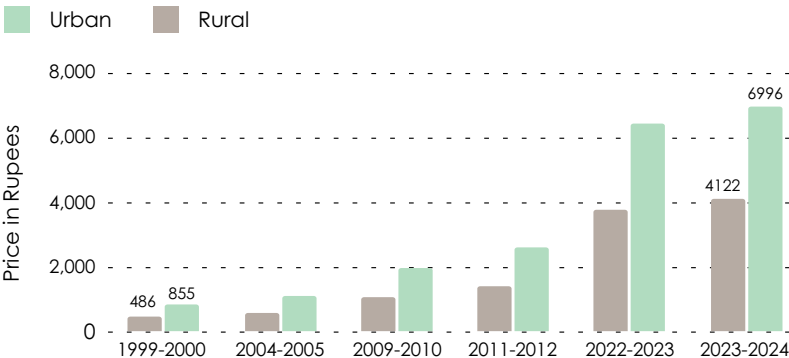
Durable goods are finding more takers

Trend of durable goods in percentage composition of MPCE from 1990s



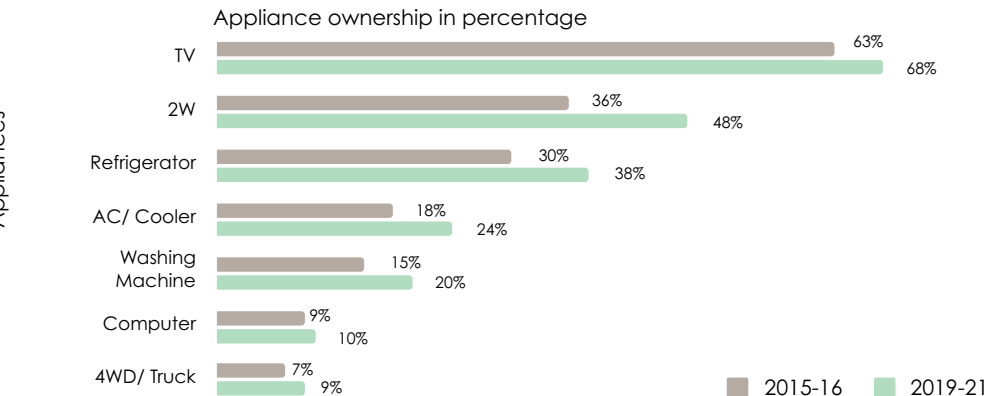
Household consumption has risen over 8x post-2000

Trend in share (nominal value in Rs) of non-durable goods in average Monthly Per Capita Expenditure (MPCE)



Changing aspirations and rising incomes are fueling appliance ownership

Appliance ownership from National Family Health Survey- 5



India stands at a juncture where aspiration and promise collide with deep-rooted structural challenges.

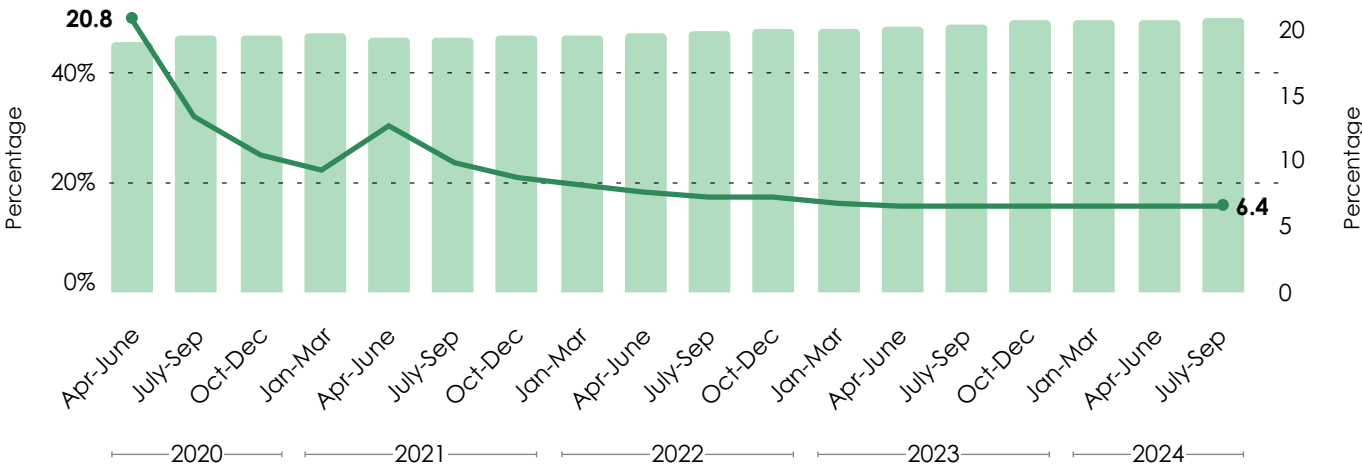
Despite notable progress, there are employment challenges across all regions and States

Declining quarterly urban unemployment

UR (RHS) LFPR

Unemployment Rate (UR):
UR is defined as the number of persons/ person-days unemployed per 1000 persons/ person-days in the labour force (which includes both the employed and unemployed).

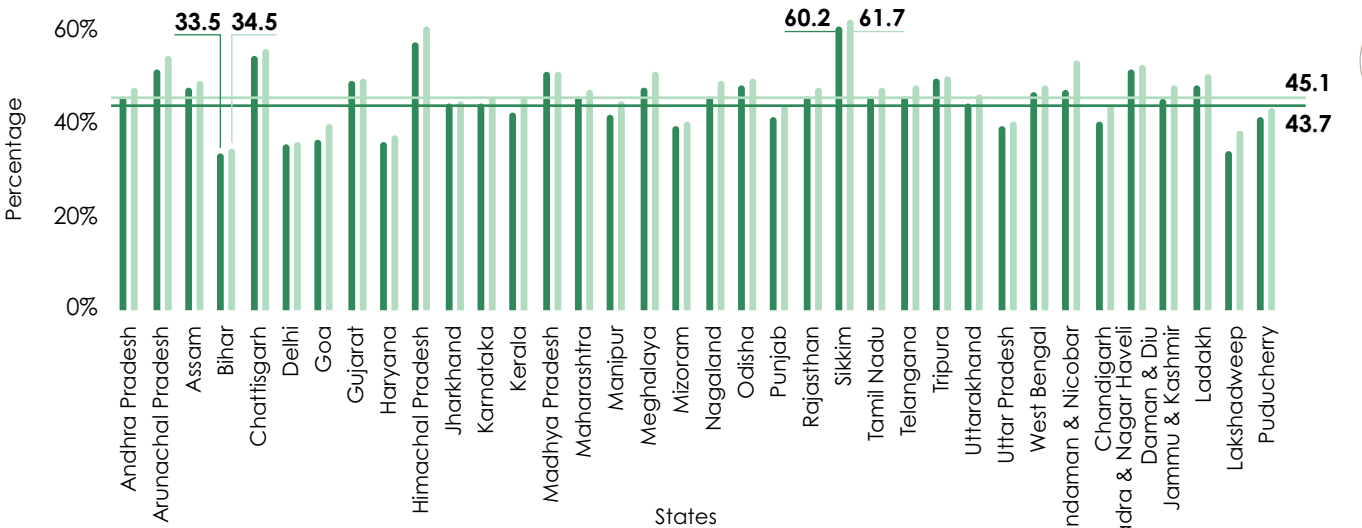
Labour force participation rate (LFPR):
LFPR is defined as the number of persons/ person-days in the labour force per 1000 persons/ person- days.



Worker Population Ratio and Labour Force Participation Rate across States

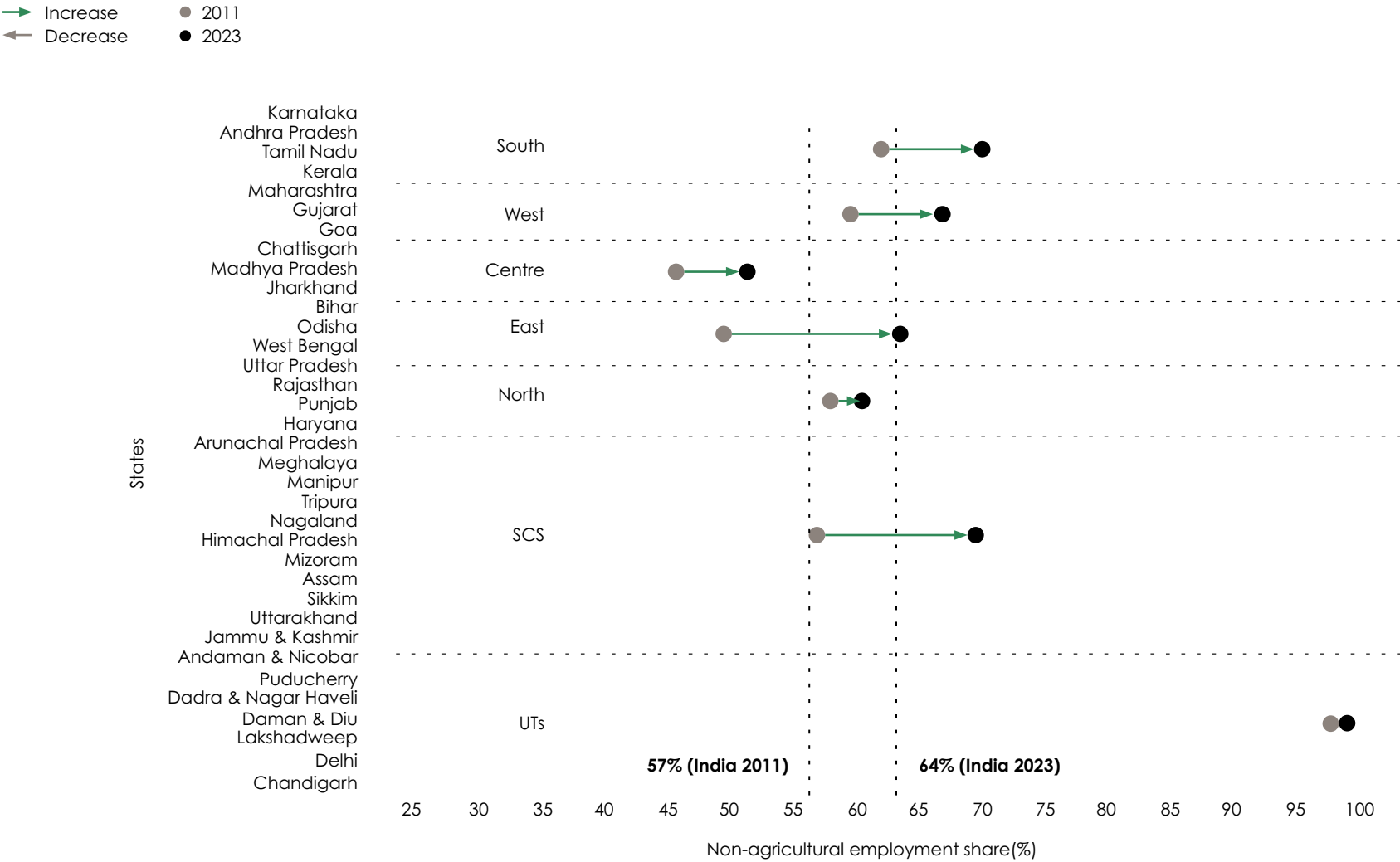
WPR (2023-2024) LFPR (2023-2024)
WPR All India Average LFPR All India Average

Worker Population Ratio (WPR):
WPR is defined as the number of persons/ person-days employed per 1000 persons/ person-days.



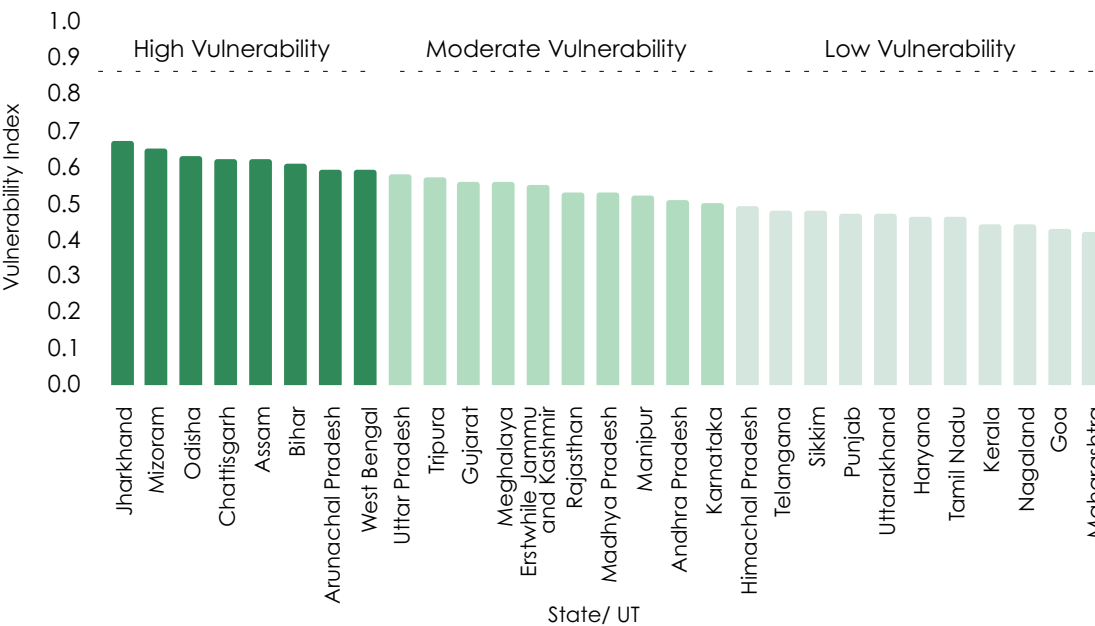
Transformation in employment across regions is visible: oriented towards secondary and services sector

Change in male non-agricultural employment share by State: 2011 to 2023



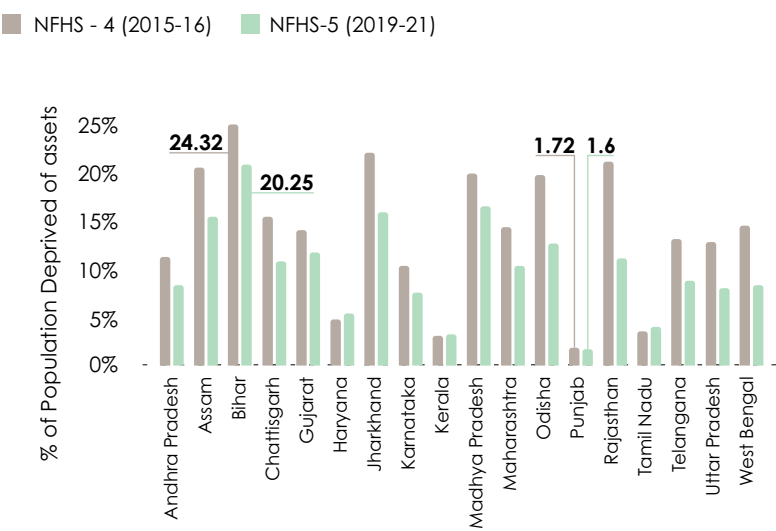
There are marked inter-State differences in climate vulnerability

Vulnerability indices of Indian States, their categorisation, and corresponding ranks



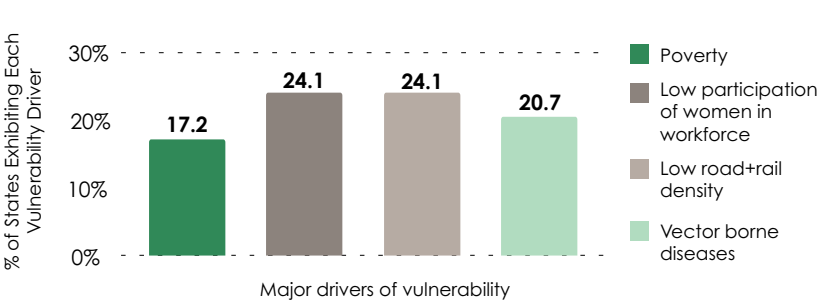
Although asset deprivation has declined, regional disparities in multidimensional progress persist

Percentage of population deprived of assets



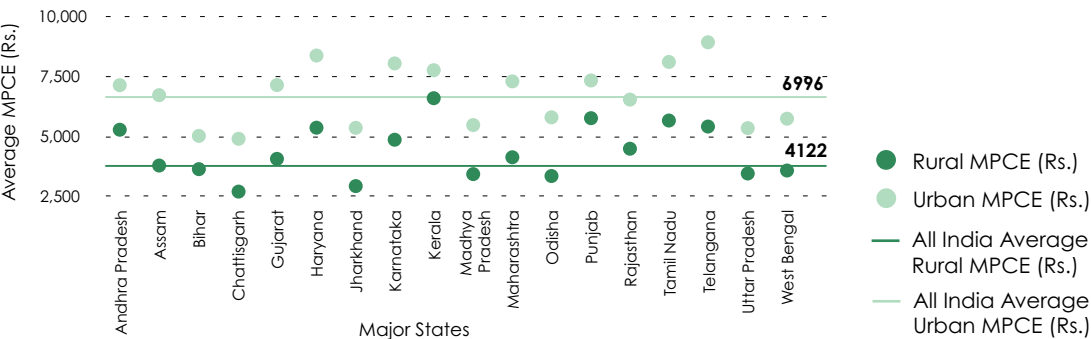
Strategic attention to poverty, workforce participation, infrastructure, and health is imperative for mitigating climate vulnerability

Major drivers of vulnerability for all States



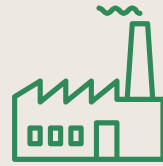
Challenges persist across both consumption and investment dynamics

Average MPCE (Rs.) of major States and their relative position with All-India in 2023-24



The way forward lies in prioritising inclusion, productivity gains, committing to sustainability, resilient development, and sagaciously managing India's urban growth engine.

Coordinated action to **boost**



manufacturing



innovation



entrepreneurship

Accelerate and fortify **investment in**



housing & real estate



energy



transport

Leverage urban promise, without losing sight of rural advancement and integration

CHAPTER 2

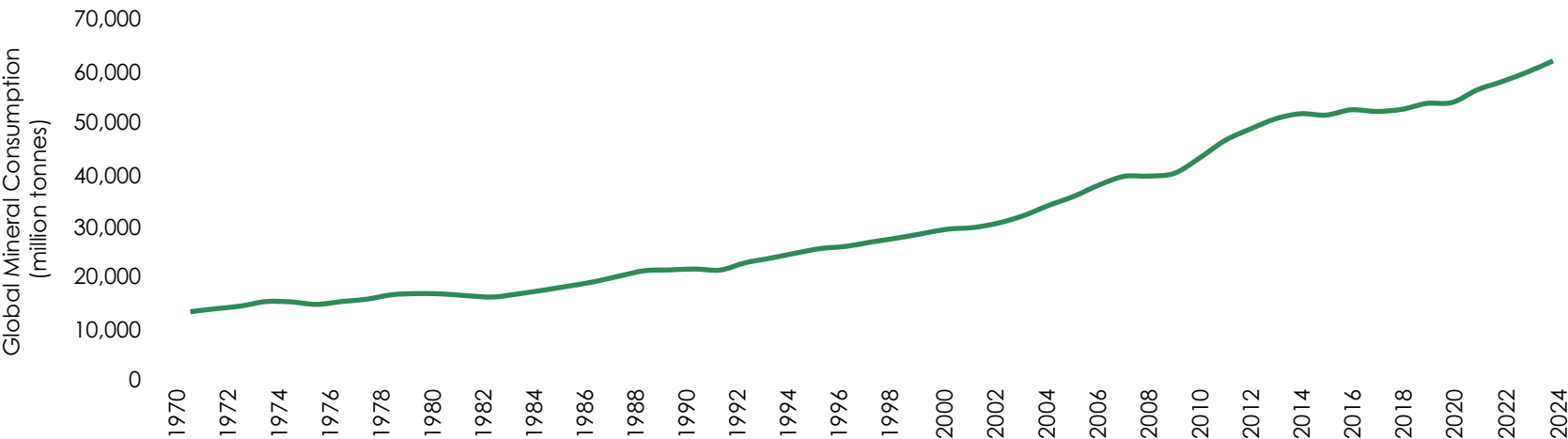
Materials – India's essential enabler

India's economic and social ambition depends on reliable and affordable access to materials. The country's material demand is growing rapidly, and is expected to continue increasing in the coming years, driven by sectoral and regional dynamics. However, this surge faces challenges from import dependence, volatile global markets, and limited domestic resources. Without strategic resolve and planning, rising material use could threaten India's long-term goals for prosperity, climate resilience, and inclusion.

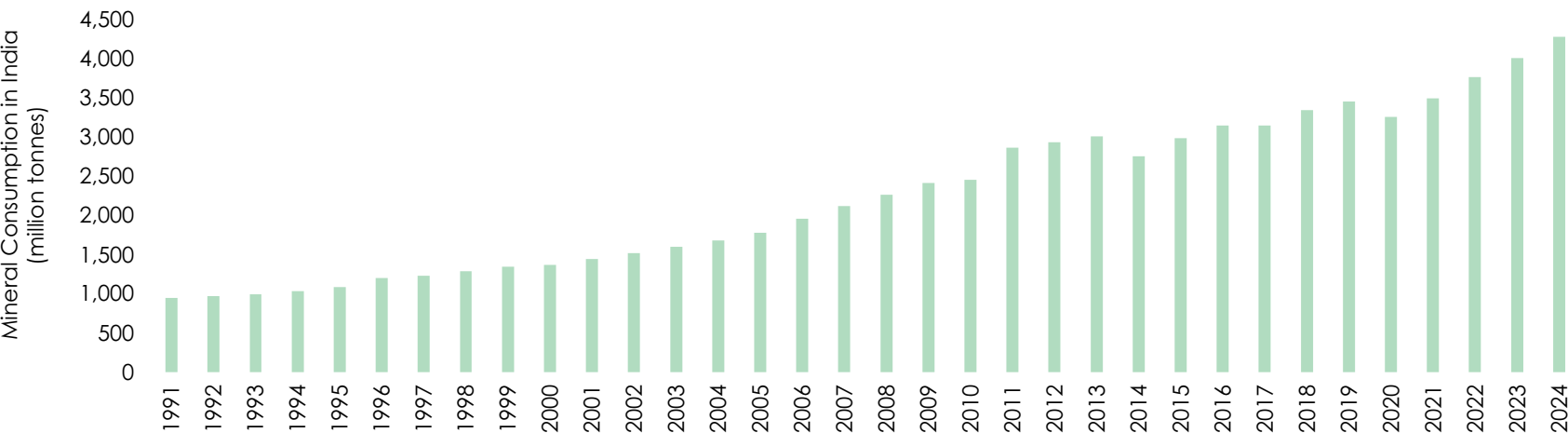


India's economic and social ambition rests on reliable, affordable material access.

Waves of material access have quietly fuelled every developmental leap in human history



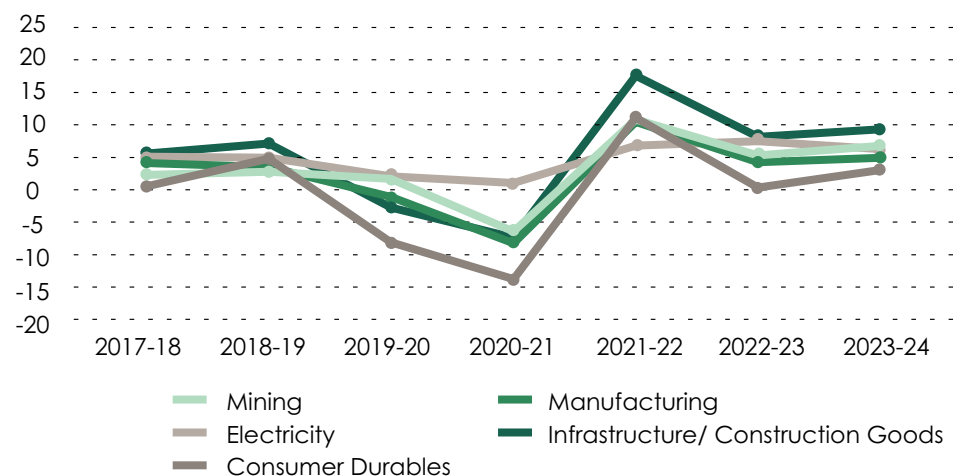
India's growth has a clear material signature – and every future growth milestone will be underpinned on vast, timely, and affordable material flows



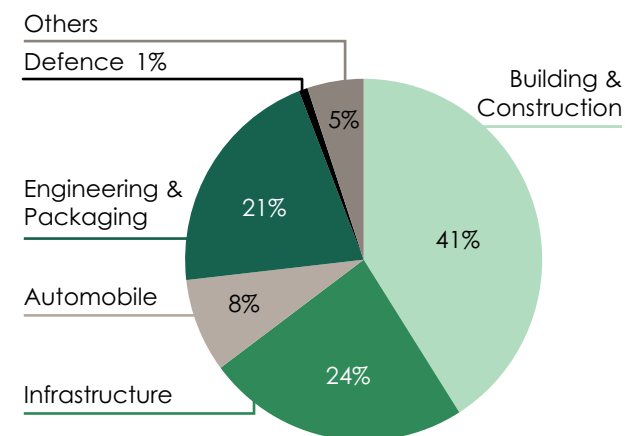
India's material demand has shifted in scale and composition, a process set to escalate in the coming years.

India's surge in infrastructure, real estate, and transport has a firm material imprint

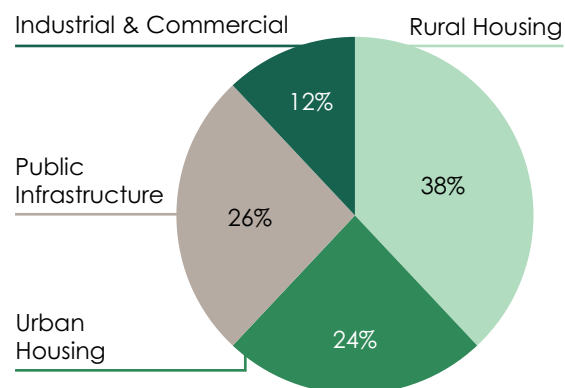
Annual indices of industrial production (base year 2011-12)



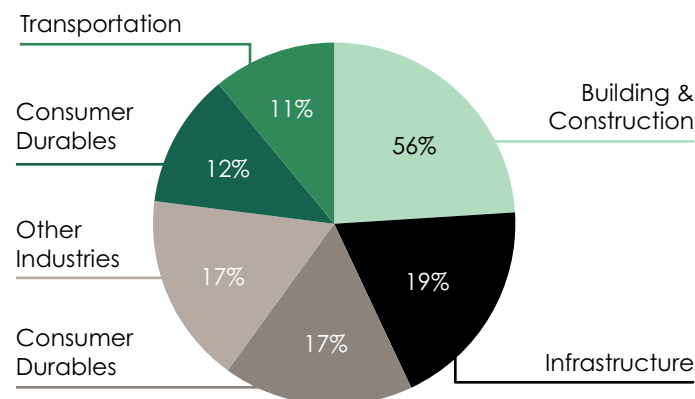
Sector-wise steel consumption



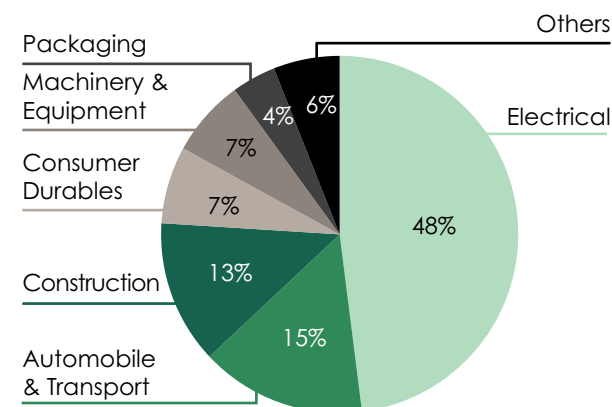
Sector-wise cement consumption



Sector-wise copper consumption

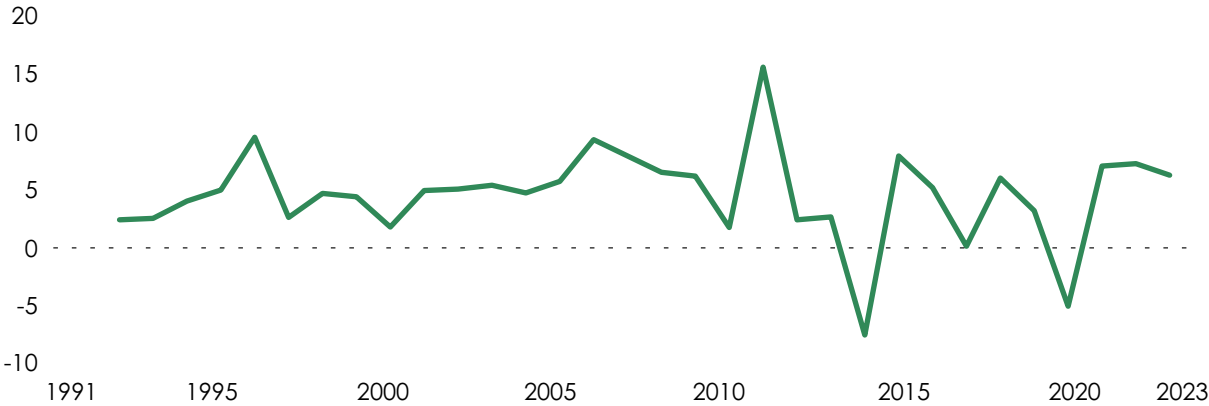


Sector-wise primary aluminium consumption



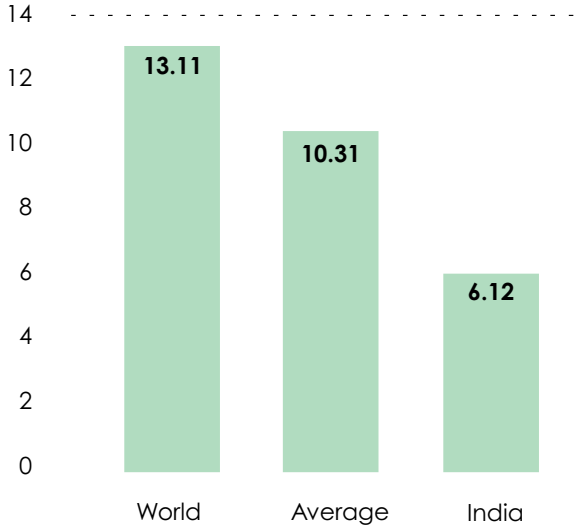
India's material consumption was 4.28 billion tonnes in 2024, accounting for 7% of global consumption

YoY growth in material (minerals and non-metallic minerals) consumption



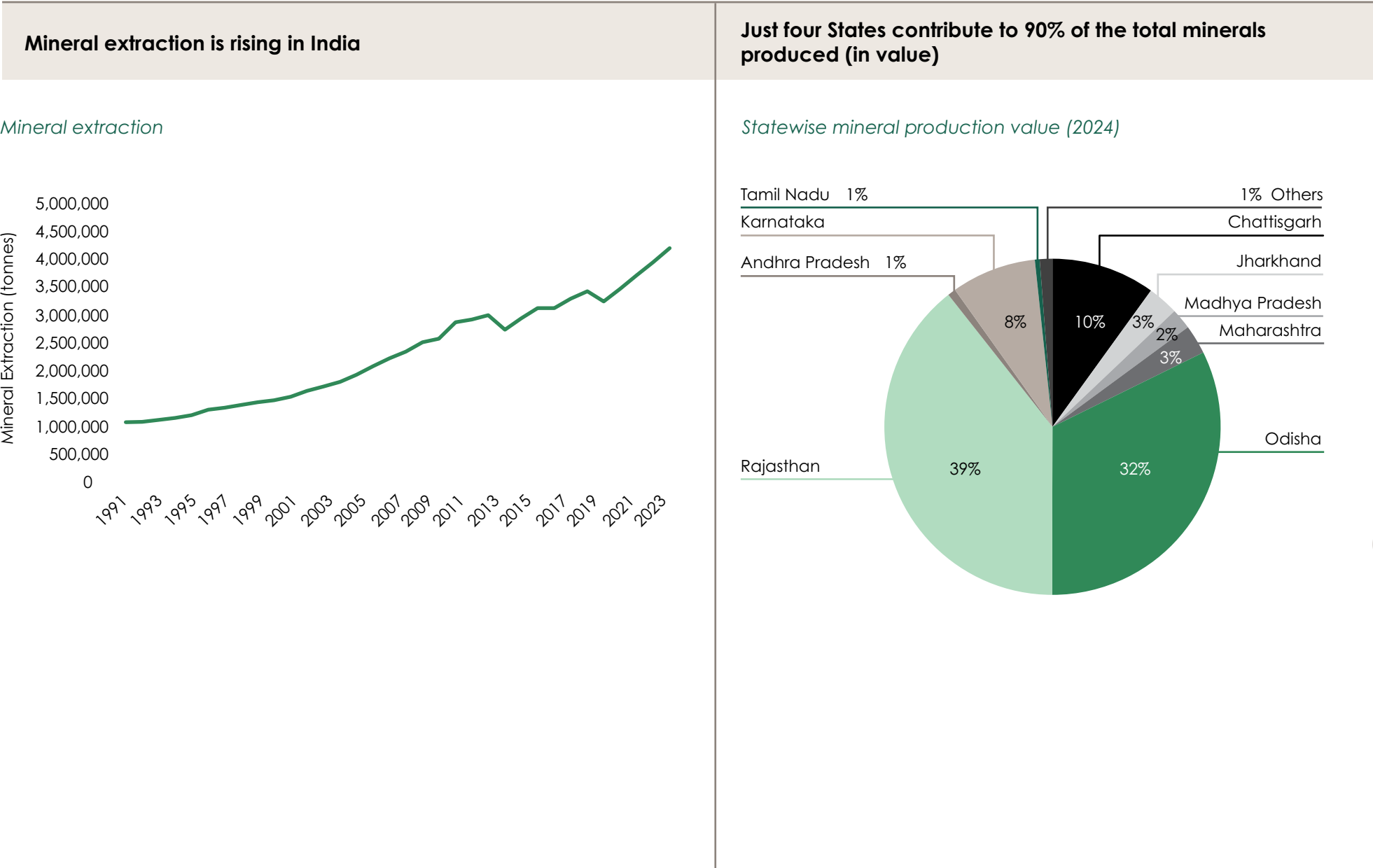
Per capita material consumption,* while growing, is still lower than the global average

Material consumption per capita (tonnes)



*Metals, non-metallic minerals, biomass, and fossil energy carriers

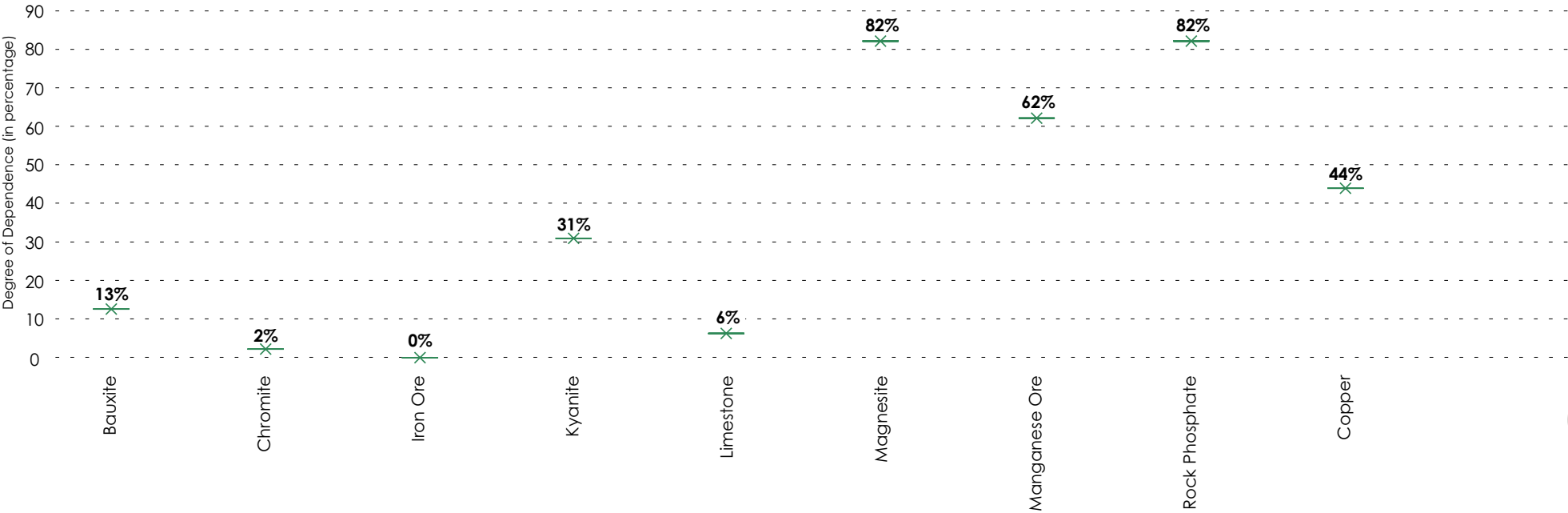
Material use is being shaped not just by sector but also by geography.



India's material supply faces mounting pressure from import dependence, volatile global markets, and intense strain on domestic land and water resources.

India is heavily dependent on import for several minerals. Further, India is 100% import dependent on several minerals such as Lithium, Cobalt, and Nickel

India's import dependence for minerals in 2022-23

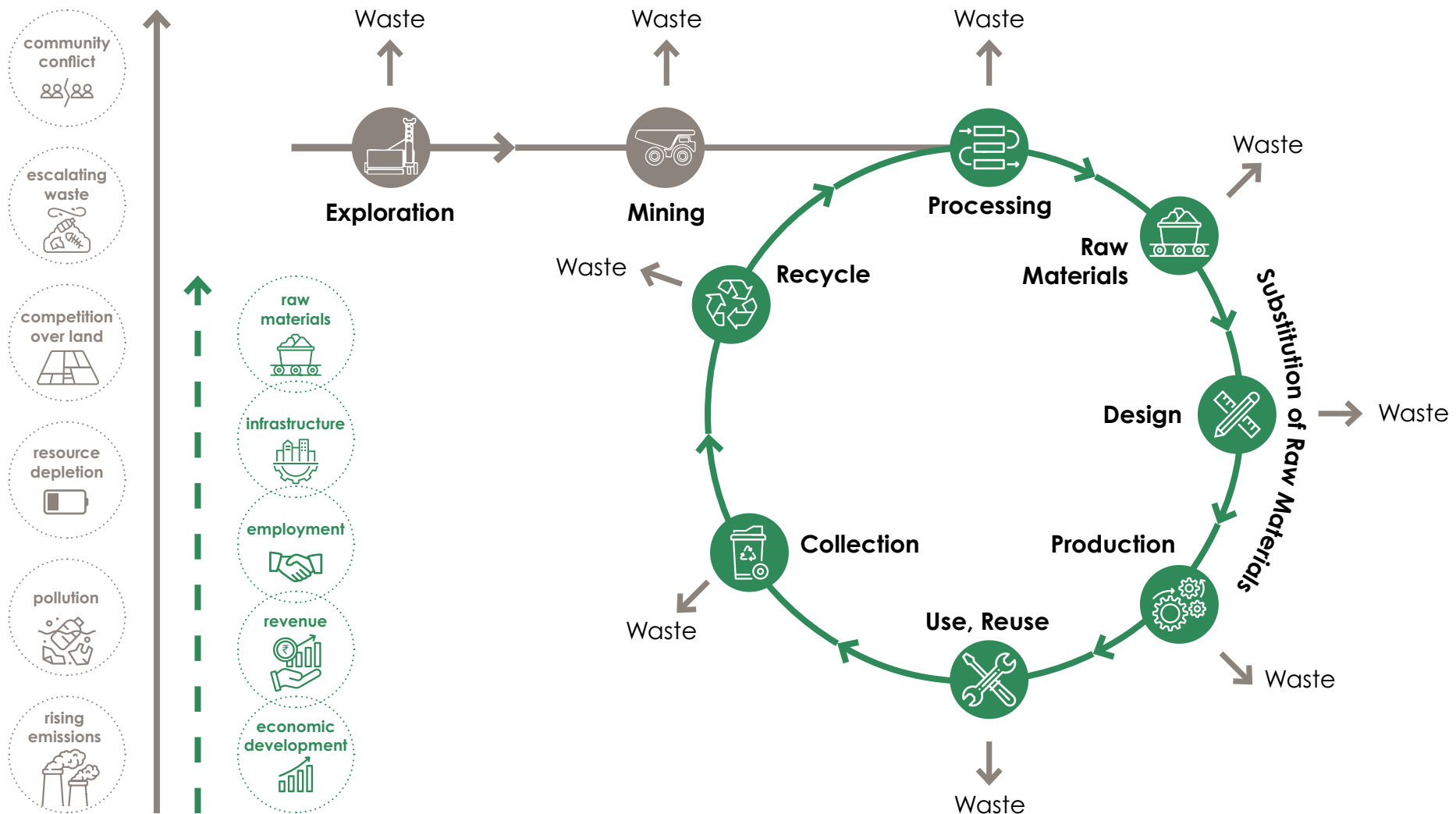


Materials face major import exposure, even as recycling rates and capacity lag



Rising material demand brings steep environmental and social consequences.

Rising emissions, pollution, resource depletion, escalating waste, competition over land, and community conflicts threaten to outpace the gains of rapid growth, unless efficiency, circularity, and proactive engagement become central to how India uses material resources

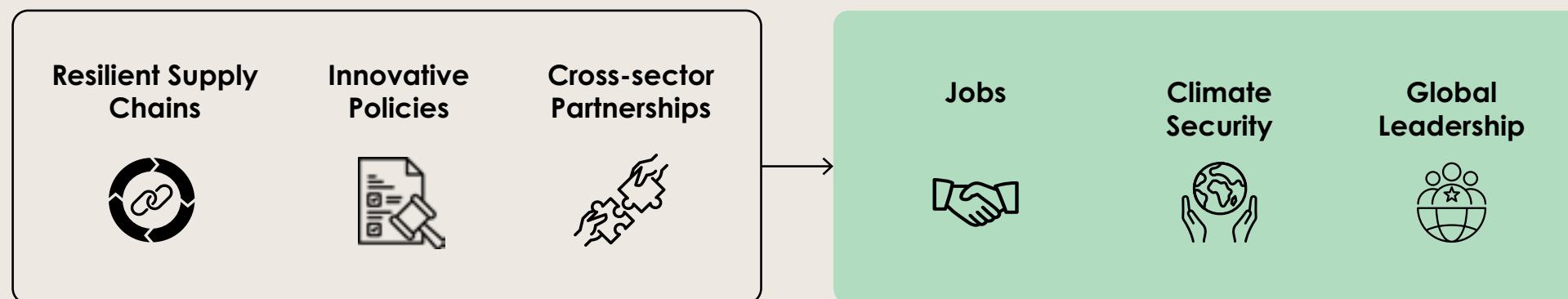


Business-as-usual scenarios could see India's material demand rising substantially by 2050.

There will be a **threefold increase** in **steel** demand, **six to sevenfold increase** in **copper** demand and, **sixfold increase** in **aluminium** demand

If India does not build smarter, more coordinated systems for material supply, use, and recovery, it risks **bottlenecks, rising costs, and stalled progress**

The next century demands



CHAPTER 3

India's material crossroads – Trade-offs, tensions, and the new turn

India's rapid growth has created a collision between infrastructure ambition and legacy material systems. The core trade-offs are between growth, environmental security, and equity. Tensions arise from import dependence, stranding assets in mining regions, and diverse regional demands. Success demands facing these trade-offs via adaptive, people-centric, and coordinated strategies. India's material moment is a test of our collective capacity.



India's transformation has brought extraordinary progress, but is also producing a collision of pressure points.

Ambitious infrastructure, urban expansion, and new sectoral dynamism have outpaced legacy systems for extraction, logistics, and recycling, exposing the country to market volatility, resource depletion, and inadequately managed waste and pollution.

Expansion of Key Infrastructure in India over the Last Decade, and Target for 2030			
Indicator	2013	2023	2030 Target
Length of National Highways (Kms)	97,991	1,46,145	-2,00,000
Modernisation of Railways: Operational Vande Bharat Trains		100+	800
Length of Operational Metro (Kms)	248	945	1595
% of Cargo Transshipment handled by Indian Ports		25%	>75%
Power Generation (Gigawatt)	243	442	1100
Renewable Power (Gigawatt)	30	175	500
Tele Density (% of Population)	75.23	85.69	NA
Electric Vehicle Charging Stations (Units)	-	12,146	3.9 mn
Total Built-up Supply Estimates for 2030 in top 8 Cities in India (Residential Real Estate)	-	-	6,198 mn Sft
Total Built-up Supply Estimates for 2030 in top 8 Cities in India (Office Market)	-	-	1,306 mn Sft

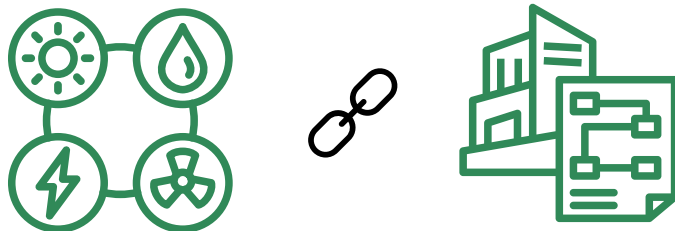
Source: Cushman & Wakefield, & Confederation of Indian Industry. (2024); Knight Frank (India) Pvt. Ltd. (2024)

The core trade-off ahead is between the drive for rapid, inclusive growth, and the imperative for environmental security, social equity, and resilience.

Building housing, infrastructure, and industry at scale demands enormous quantities of steel, cement, and minerals, many of which are imported or under threat.



The shift to green energy, EVs, and new technologies demands an entirely new material mix, sophisticated supply chains, and bold industrial policy.



Sectoral and regional tensions deepen the challenge.



Mining and industrial growth provide jobs and State revenues, particularly in coal – and mineral-dependent regions, but also risk disenfranchising communities, stranding assets, and widening inequality if transitions aren't just and well-managed.



Uncertainty about market prices, technology shifts, and climate finance complicates long-term planning.

Fragmented regulation and incomplete data make it hard to coordinate across:



government



industry

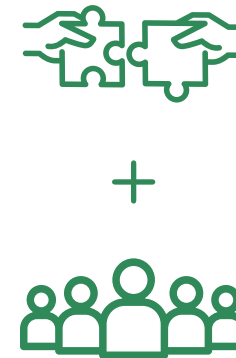


communities

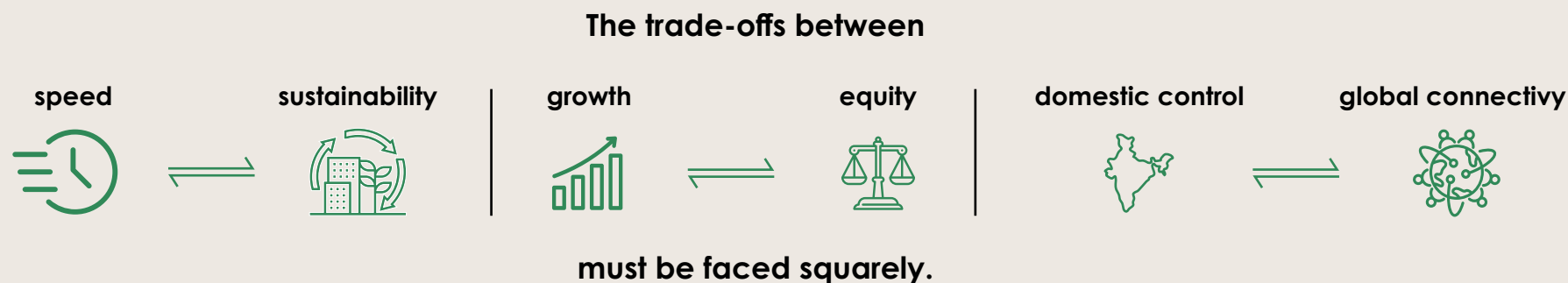
Navigating the material turn will require balancing national ambitions with regional realities.



Investing in strategic partnerships, and fostering adaptive, people-centric approaches to material management will be crucial.



India's material moment is a test of collective capacity.



Success will rest on the ability to turn pressure points and tensions into sources of resilience, leveraging technology, cross-sector innovation, financing, and social engagement for a development path that is robust, equitable, and future-ready.



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