PrepAlpine

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GS Paper II: Current Affairs

1. Transforming a Waste-Ridden Urban India: A Circular Economy Approach

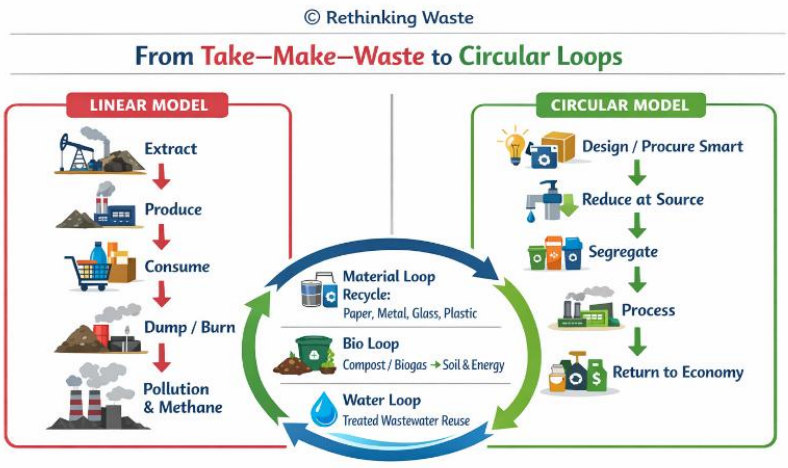
a. Introduction

Urbanisation in India is advancing rapidly and irreversibly. Cities are engines of economic growth, innovation and opportunity, yet they are also emerging as major centres of waste generation, pollution and greenhouse gas emissions. Poorly managed urban waste has resulted in overflowing landfills, air pollution from open burning, contamination of water bodies and recurring public health crises. Methane emissions from waste dumps further aggravate climate change.

Urban waste is therefore no longer a matter of cleanliness or municipal aesthetics alone. It has evolved into a core issue of public health, environmental sustainability, climate governance and urban resilience. Addressing this challenge requires a structural transformation in how cities produce, consume and manage resources.

b. Scale of the Urban Waste Problem in India

The magnitude of India's urban waste challenge is vast and accelerating.



i. Rising Waste Generation

- Rapid urban population growth, rising incomes and changing consumption patterns are driving unprecedented waste generation.
- By 2030, Indian cities are projected to generate nearly 165 million tonnes of municipal waste annually.
- By 2050, with the urban population approaching 800 million, waste generation may exceed 400 million tonnes per year.

ii. Environmental and Climate Consequences

- Unscientific disposal contaminates groundwater and surface water.
- Accumulation of waste contributes to disease outbreaks and productivity losses.
- Landfills are a major source of methane, a greenhouse gas far more potent than carbon dioxide in the short term.

Without systemic reform, urban waste will deepen India's climate vulnerability and undermine sustainable urban growth.

c. Rethinking Waste: From a Linear to a Circular Model

At the core of India's urban waste crisis lies the dominance of a linear economic model.

i. Limitations of the Linear Model

- Resources are extracted, consumed and discarded.
- Waste is treated as an inevitable by-product to be dumped or burned.
- Valuable materials and energy are permanently lost.

ii. Circular Economy as an Alternative

The circular economy offers a fundamentally different paradigm.

- Waste generation is reduced at source.
- Materials are reused, recycled and reintegrated into production cycles.
- Energy and nutrients are recovered from waste streams.

In this framework, waste is viewed as a resource rather than a liability, making circularity the organising principle of sustainable urban waste management.

d. Major Streams of Urban Waste and Their Challenges

i. Organic or Wet Waste

Organic waste constitutes more than half of municipal solid waste in Indian cities.

Nature and Risks

- Includes kitchen waste, food leftovers and garden waste.
- When landfilled, it decomposes anaerobically and emits methane.

Circular Opportunities

- Household, community and city-level composting can convert waste into organic manure.
- Bio-methanation plants can generate biogas, upgraded to compressed biogas for clean energy use.

These solutions reduce landfill pressure, cut emissions and create local nutrient and energy cycles.

ii. Dry Waste and Plastics

Dry waste includes plastics, paper, metals and glass.

Core Challenges

- Poor segregation at source reduces recyclability.
- Low public awareness and inconsistent compliance.
- Heavy reliance on informal waste workers.

Plastics are particularly problematic due to their non-biodegradable nature and accumulation in ecosystems.

Policy and Market Gaps

- Extended Producer Responsibility aims to shift accountability to manufacturers.
- Implementation remains uneven across states and cities.
- Recycled products often face quality and market acceptance issues.

iii. Construction and Demolition Waste

Rapid urban construction has led to a surge in construction and demolition waste.

Current Problems

- Illegal dumping on roadsides, drains and vacant land.
- Contribution to urban flooding, pollution and visual degradation.

Untapped Potential

- Construction waste can be recycled into aggregates for roads, pavements and buildings.
- Recycling reduces pressure on natural resources such as sand and stone.

Weak enforcement and limited recycling capacity have prevented systematic utilisation.

iv. Wastewater and Faecal Sludge

Wastewater management is central to circular urban systems.

Wastewater Reuse

- Treated wastewater can be reused for agriculture, horticulture and industry.
- Reduces pressure on scarce freshwater resources.

Faecal Sludge Management

- Critical for sanitation and public health, especially where sewerage coverage is limited.
- Integration into urban planning strengthens water security and environmental outcomes.

e. Governance and Institutional Constraints

The shift towards circular urban waste management is hindered by governance failures.

i. Institutional Fragmentation

- Urban Local Bodies, State governments, private operators and citizens operate in silos.
- Weak coordination undermines integrated planning.

ii. Financial and Capacity Constraints

- Limited municipal finances restrict infrastructure investment.
- Inadequate monitoring, testing and quality assurance systems for recycled products.

iii. Inconsistent Public Participation

- Segregation and compliance depend heavily on citizen behaviour.
- Awareness and enforcement remain uneven.

As a result, collection, processing and reuse fail to form a closed-loop system.

f. Role of Government Initiatives

India has begun repositioning waste management as a strategic urban priority.

Key Programmes

- **Swachh Bharat Mission (Urban) 2.0** – Vision of garbage-free cities.
- **AMRUT** – Focus on wastewater and urban infrastructure.
- **Mission LiFE** – Promotion of sustainable consumption behaviour.
- **Cities Coalition for Circularity** – Knowledge-sharing and best practices.

These initiatives reflect a shift towards linking cleanliness, sustainability and climate action with urban governance.

g. Way Forward: Making Circular Cities Work

A circular transition requires coordinated action across policy, infrastructure and society.

i. Strengthening Regulation and Planning

- Strict enforcement of segregation, construction waste rules and producer responsibility.
- Integration of waste accountability into building codes and urban planning norms.

ii. Scaling Infrastructure

- Investment in composting, bio-methanation, recycling and wastewater treatment facilities.
- Upgrading quality standards for recycled products to build market confidence.

iii. Financial and Institutional Support

- Enhanced financial support to Urban Local Bodies.
- Incentives for private sector participation and innovation.

iv. Citizen Engagement

- Behavioural change through awareness, incentives and penalties.
- Active public participation as a prerequisite for circularity.

Conclusion

India's cities must decisively move away from a waste-intensive linear model towards a circular economy. Effective waste management is central to cleaner cities, improved public health, climate mitigation, water security and sustainable urban growth.

A circular approach ensures that cities do not become centres of pollution and ecological stress, but engines of resource efficiency and sustainable development. For India's urban future, circular waste management is not an optional reform—it is an indispensable foundation for resilient and liveable cities.

GS Paper II: Current Affairs

2. Land Acquisition and Infrastructure Development in India

a. Introduction

Every major infrastructure project begins with land. Highways, railways, power corridors, irrigation networks and urban expansion all depend on timely access to land. Without it, financial approvals, engineering designs and technological preparedness remain ineffective.

At the same time, land in India is far more than a physical asset. It is a source of livelihood, social identity and cultural continuity, and is embedded within ecological systems such as forests, wetlands and wildlife habitats. Because of this multidimensional character, land acquisition emerges as one of the most sensitive aspects of development, located at the intersection of economic growth, democratic rights and environmental sustainability.

b. Why Land Acquisition Emerges as a Bottleneck

i. Competing Developmental Claims

Infrastructure projects are justified in the name of public interest and long-term national development. However, land acquisition imposes immediate and concentrated costs on specific groups.

Distributional Asymmetry

- Benefits of infrastructure are diffused across society and over time.
- Costs—displacement, livelihood loss and social disruption—are borne locally and immediately.

In a democratic system, resistance to acquisition is therefore not merely obstructionist. It often reflects genuine concerns about compensation adequacy, rehabilitation and future security.

ii. Legal and Procedural Complexity

Land acquisition is not a single administrative act, but a multi-stage legal process.

Sequential Procedures

- Identification and demarcation of land.
- Assessment of market value and compensation.
- Rehabilitation and resettlement planning.
- Public consultation and consent requirements.
- Environmental and forest clearances, where applicable.

Since many of these steps are sequential rather than parallel, delays at any stage accumulate rapidly, especially in large, multi-district projects.

iii. Federal Structure and Coordination Gaps

India's constitutional division of powers adds another layer of complexity.

Division of Authority

- Infrastructure planning and funding are often led by the Union government.
- Land is a State subject, and acquisition is executed by State governments and district administrations.

Coordination Challenges

- Misalignment of priorities between Centre and States.
- Administrative capacity constraints at the district level.
- Unclear accountability leading to mutual blame.

Weak inter-governmental coordination frequently translates into duplication of effort and prolonged delays.

iv. Environmental and Forest Constraints

A significant proportion of infrastructure projects pass through ecologically sensitive areas.

Nature of Environmental Scrutiny

- Forests, wetlands and wildlife corridors require statutory protection.
- Environmental and forest laws mandate detailed impact assessments.

Planning Deficit

- Environmental constraints are often identified late in the project cycle.
- This leads to redesigns, prolonged clearances and cost escalation.

The challenge lies not in environmental regulation itself, but in poor anticipatory planning.

c. The Right of Way Problem

Even after formal acquisition, projects frequently face difficulties in securing unhindered access to land.

i. Sources of Right of Way Disruptions

- Encroachments and unresolved compensation disputes.
- Continued local resistance and litigation.

ii. Impact on Linear Projects

- Particularly acute in highways, railways and transmission lines.
- Even a short unresolved stretch can halt work across the entire corridor.

Thus, legal acquisition does not automatically translate into physical possession or usability.

d. Consequences of Land Acquisition Delays

Delays in land acquisition have cascading economic and governance implications.

i. Economic Costs

- Time overruns lead to cost escalation due to inflation and idle capital.
- Public funds remain locked in incomplete assets, reducing economic returns.

ii. Governance and Credibility Costs

- Erosion of public trust in State capacity.
- Weakening of investor confidence.
- Delayed delivery of essential public services.

Land acquisition thus becomes a determinant of both economic efficiency and governance credibility.

e. Institutional Responses and Coordination Mechanisms

Many delays arise from coordination failures rather than legal barriers.

i. Focus on Administrative Solutions

- Real-time monitoring of project progress.
- Early identification of land and clearance bottlenecks.
- Structured coordination between Centre, States and implementing agencies.

ii. Accountability and Oversight

- Senior-level administrative reviews.
- Clear assignment of responsibility across departments.

Such mechanisms demonstrate that improved governance capacity can significantly reduce delays even without major legislative change.

f. Why Diluting Land Laws Is Not a Sustainable Solution

Land acquisition laws are often portrayed as the primary obstacle to infrastructure growth.

i. Purpose of Legal Safeguards

- Protection of property rights and livelihoods.
- Prevention of arbitrary displacement.
- Safeguarding environmental sustainability.

ii. Risks of Dilution

- Increased social conflict and litigation.
- Loss of democratic legitimacy.
- Long-term resistance that ultimately slows projects.

In a democratic society, participatory but slower development is more sustainable than rapid but exclusionary growth.

g. Improving Land Acquisition without Undermining Rights

A balanced approach lies in strengthening governance rather than bypassing safeguards.

i. Better Planning and Technology Use

- Early identification of land, social and environmental constraints.
- Digital land records and geospatial mapping for accuracy and transparency.

ii. Strengthened Centre–State Coordination

- Dedicated coordination platforms.
- Clear timelines and responsibility matrices.

iii. Fair and Transparent Processes

- Time-bound but just procedures.
- Transparent compensation mechanisms.
- Effective rehabilitation and resettlement support.

iv. Continuous Public Engagement

- Early dialogue with affected communities.
- Addressing grievances before they escalate.
- Building trust through transparency.

Conclusion

Land acquisition remains a structural challenge in India's infrastructure development because it lies at the crossroads of development, democracy and sustainability. The solution does not lie in weakening legal protections, but in strengthening planning, coordination and administrative capacity.

India's infrastructure ambitions can be realised only when development is pursued with consent, consultation and credibility. A governance approach that respects rights while enabling timely

execution is essential for building infrastructure that is both economically efficient and socially legitimate.

GS Paper III: Environment

3. India's Energy Transition: Why Renewables Alone Are Not Enough

a. Introduction

Energy transition is often understood as a shift from fossil fuel–based electricity generation to cleaner sources such as solar and wind. India has made substantial progress on this front. Renewable energy capacity has expanded rapidly, and solar and wind power are now among the cheapest sources of new electricity generation in the country.

However, energy transition is not limited to how electricity is produced. It also involves how power is transmitted, distributed, priced, consumed and financially sustained. In India, the most binding constraints lie not at the generation stage, but in what happens after electricity is produced. The core challenge is the ability of the power system to absorb variable renewable energy, manage demand efficiently and remain financially viable.

b. Why Expanding Renewable Capacity Is Not Enough

Despite rapid growth in renewable capacity, several systemic problems persist.

Persistent System-Level Inefficiencies

- Renewable power is frequently curtailed because the grid cannot absorb it at certain times.
- Peak-time electricity remains expensive despite surplus renewable generation during off-peak hours.
- Power cuts and reliability issues continue in several regions.
- Electricity distribution companies remain financially stressed.

These outcomes indicate that India's challenge is not a shortage of renewable generation, but weaknesses in the institutional, financial and market architecture of the power system.

c. Distribution Companies as the Central Bottleneck

Electricity distribution companies (discoms) form the critical link between generators and consumers.

i. Structural Role of Discoms

- Purchase electricity from generators.
- Supply power to households, agriculture and industry.
- Maintain last-mile infrastructure and grid reliability.

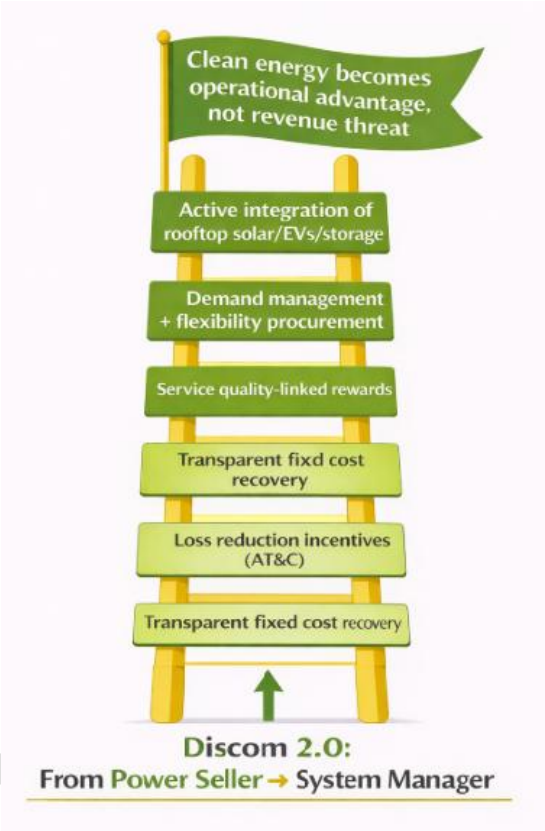
ii. Structural Financial Weaknesses

- High technical and commercial losses.
- Tariffs that often fail to recover full costs.
- Large fixed costs for networks and contracted capacity.

To remain viable, discoms rely heavily on commercial and industrial consumers, who pay higher tariffs. These revenues cross-subsidise households and agricultural users. This fragile structure has direct consequences for the energy transition.

d. Why Clean Energy Measures Can Strain Discom Finances

Certain climate-friendly interventions unintentionally weaken discom revenues.



i. Energy Efficiency

- Reduces electricity consumption.
- Fixed network costs remain unchanged.
- Revenue declines faster than costs.

ii. Rooftop Solar

- Consumers generate power during the day.
- Continue to rely on the grid at night.
- Discoms must maintain backup capacity without full compensation.

iii. Open Access and Captive Power

- High-paying industrial consumers exit or partially bypass the grid.
- Cross-subsidy base erodes.
- Financial stress on discoms intensifies.

As a result, discoms often view decentralised renewables and efficiency measures as financial threats, even though they are essential for a sustainable energy system.

e. The Centrality of Tariff Reform

Tariff reform is a cornerstone of effective energy transition.

i. Time-of-Day Tariffs

- Higher prices during peak demand periods.
- Lower prices when electricity is abundant, such as midday solar hours.

India has already mandated time-of-day tariffs, recognising their role in aligning consumption with supply.

ii. Limits of Pricing Alone

- Most households lack awareness of peak periods.
- Limited understanding of appliance-level electricity use.
- Continuous manual load management is unrealistic.

Pricing signals without supporting systems place an impractical burden on consumers.

f. Role of Smart Technologies and Demand Response

Demand response enables consumers to adjust electricity use automatically in response to system conditions.

i. Smart Demand-Side Tools

- Smart thermostats optimise cooling loads.
- Smart chargers schedule electric vehicle charging during off-peak hours.
- Smart plugs manage appliance usage without manual intervention.

ii. System-Level Benefits

- Reduction in peak demand.
- Improved grid stability.
- Lower overall system costs.

Well-designed demand response provides flexibility at lower cost than large-scale energy storage, especially for short-duration peaks.

g. Reforming Wholesale Electricity Markets

i. Market-Based Economic Dispatch

India's dispatch system is dominated by long-term contracts rather than real-time cost efficiency.

Existing Problems

- Expensive power is sometimes used while cheaper renewables are curtailed.
- Dispatch decisions are not always cost-optimal.

Benefits of Market-Based Dispatch

- Lowest-cost electricity is dispatched first.
- Improved renewable utilisation.
- Reduced overall system costs without new capacity addition.

ii. Integrating Captive Power into Markets

A significant share of industrial demand is met through captive power plants.

Current Limitation

- Operate outside organised electricity markets.

Potential Gains

- Increased competition.
- Greater system flexibility.
- Improved renewable absorption.

h. Addressing the Geographic Mismatch

Renewable energy generation is concentrated in a few states, while demand is highest in urban and industrial centres.

i. Structural Challenge

- Transmission infrastructure exists but is underutilised.
- Market fragmentation limits nationwide optimisation.

ii. Need for a National Electricity Market

- Seamless flow of electricity across states.
- Efficient utilisation of clean power regardless of location.

Physical connectivity alone is insufficient without market integration.

i. Redefining the Role of Distribution Companies

For energy transition to succeed, discoms must evolve institutionally.

From Power Sellers to System Managers

- Focus on reliability, flexibility and grid efficiency.
- Active management of peak demand and variability.

Required Reforms

- Transparent recovery of fixed network costs.
- Incentives linked to service quality and loss reduction.
- Rewards for demand management and flexibility provision.

When incentives are aligned, clean energy becomes an operational advantage rather than a financial threat.

Conclusion

India's energy transition cannot be achieved by expanding renewable capacity alone. The deeper transformation lies in reforming electricity distribution, redesigning tariffs, deploying smart technologies and creating efficient wholesale markets. Clean energy success depends as much on institutions, incentives and governance as on solar panels and wind turbines.

Only when distribution companies are financially viable, markets are efficient and consumers are supported by intelligent systems will India fully realise the promise of its renewable energy potential.

Reader's Note — About This Current Affairs Compilation

Dear Aspirant,

This document is part of the PrepAlpine Current Affairs Series — designed to bring clarity, structure, and precision to your daily UPSC learning.

While every effort has been made to balance depth with brevity, please keep the following in mind:

1. Orientation & Purpose

This compilation is curated primarily from the UPSC Mains perspective — with emphasis on conceptual clarity, analytical depth, and interlinkages across GS papers.

However, the PrepAlpine team is simultaneously developing a dedicated Prelims-focused Current Affairs Series, designed for:

- factual coverage
- data recall
- Prelims-style MCQs
- objective pattern analysis

This Prelims Edition will be released separately as a standalone publication.

2. Content Length

Some sections may feel shorter or longer depending on topic relevance and news density.
To fit your personal preference, you may freely resize or summarize sections using any LLM tool (ChatGPT, Gemini, Claude, etc.) at your convenience.

3. Format Flexibility

The formatting combines:

- paragraphs
- lists
- tables
- visual cues

—all optimised for retention.

If you prefer a specific style (lists → paras, paras → tables, etc.), feel free to convert using any free LLM.

4. Monthly Current Affairs Release

The complete Monthly Current Affairs Module will be released soon, optimized to a compact 100–150 pages — comprehensive yet concise, exam-ready, and revision-efficient.

5. Join the PrepAlpine Discord Community

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What You'll Experience

- **Peer-to-Peer Discussions**
  Subject-wise channels for GS papers, Ethics, Economics, Polity, Geography, Environment, and Optional subjects.

- **Focused Study Circles**
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  Collaborative micro-notes, doubt resolutions, PYQ-linked discussions, and peer-reviewed clarity.

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  Weekly "Open Mic" sharing sessions where learners discuss strategies, mistakes, breakthroughs, and lessons from their UPSC journey.

- **An Evolving Learning Culture**
  A serious, supportive, and intelligent peer environment — no noise, no clutter. Learning grows here through interaction, reflection, and structured peer collaboration.

"From Isolation to Interaction — Learn the UPSC Way, the Smart Way."

6. Suggest Topics for Coverage

If you feel any important theme is missing or under-covered, simply post it in the "Suggestions" channel on our Discord server.

Our content team regularly reviews inputs and includes relevant suggestions in upcoming Monthly Current Affairs Modules.

Beyond daily updates, the PrepAlpine Discord functions as a complete UPSC learning ecosystem — offering free peer mentorship, structured discussions, practice threads, AI-powered micro-learning tools, and a community of serious aspirants working together.

Together, these resources embody the PrepAlpine vision:

Better Content. Smarter Mentorship. Intelligent Preparation.