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PrepAlpine

Email: info@PrepAlpine.com

Website: PrepAlpine.com

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GS Paper III: Environment

1. Mega Data Centres: Digital Infrastructure vs Resource Sustainability

a. Introduction

Proposed hyperscale and AI data-centre projects in Visakhapatnam and Thane are facing citizen protests over their large electricity and water requirements, ecological impacts and inadequate public consultation. The controversy highlights the physical-resource costs underlying India's rapidly expanding digital economy.

MEGA DATA CENTRE: RESOURCE-ENVIRONMENT-SOCIETY TRADE-OFF



b. Why are Mega Data Centres Resource-Intensive?

Data centres house thousands of servers that operate continuously and generate substantial heat. Their operation therefore creates a three-fold infrastructure demand:

Computing → High Electricity Consumption → Heat Generation → Cooling → Water/Energy Demand

AI-oriented facilities intensify this challenge because high-performance computing requires significantly greater power density and cooling capacity.

The proposed Thane project, for example, reportedly requires around 422 MW of electricity, besides extensive backup-generation capacity.

c. Why are communities opposing projects?

- **Water stress:** Cooling can require significant quantities of water. Locating large facilities in cities already experiencing shortages creates competition between digital infrastructure and essential urban consumption.
- **Energy burden:** Continuous electricity requirements can place additional pressure on grids already facing peak-demand constraints. Large diesel-generator backup capacity can also create local air and noise pollution.
- **Ecological concerns:** In Visakhapatnam, activists have raised concerns regarding projects near environmentally sensitive areas, including the Kambalakonda Eco-Forest, Rambilli Wildlife Sanctuary and Mudasarlova reservoir.
- **Transparency and data gaps:** Conflicting estimates regarding expected water consumption and inadequate baseline information on air, noise and water impacts can undermine public confidence.
- **Limited local economic spillovers:** Data centres involve enormous capital investment but, after construction, are relatively low-employment infrastructure compared with conventional manufacturing. Communities therefore question whether local economic gains adequately compensate for resource and environmental costs.
- **Weak participatory planning:** Opposition has also emerged from inadequate consultation with residents before land, water and infrastructure commitments are made.

d. Analysis/ Observation

The controversy reveals an important paradox of digitalisation:

“Cloud” infrastructure is digital in function but intensely physical in footprint.

India needs large-scale data centres for AI development, cloud computing, data localisation, digital sovereignty and cybersecurity. Domestic capacity can reduce dependence on overseas digital infrastructure and attract high-value technology investment.

However, indiscriminate expansion can create new water-energy-land trade-offs. A data centre may be commercially viable while imposing environmental and infrastructure costs on the surrounding city.

The core governance question is therefore not whether India should build data centres, but where and under what resource conditions they should be built.

A uniform approach is unsuitable because the environmental cost varies substantially with local water availability, grid composition, climate, cooling technology and ecological sensitivity.

e. Way Forward

- Develop data-centre zoning based on carrying capacity, avoiding water-stressed residential areas and ecologically sensitive zones.
- Require transparent disclosure of Water Usage Effectiveness (WUE) and Power Usage Effectiveness (PUE) along with projected resource requirements.
- Encourage closed-loop cooling, air/liquid cooling and treated wastewater use rather than dependence on potable freshwater.
- Link new capacity increasingly with renewable energy and grid-strengthening investments.
- Undertake cumulative environmental assessments for large data-centre clusters rather than evaluating projects only in isolation.
- Institutionalise public consultation and transparent resource-use commitments before project approvals.

Conclusion

Mega data centres demonstrate that the digital economy is not resource-neutral. India’s ambition to become an AI and cloud-computing hub must therefore evolve from simply attracting investment

towards resource-sensitive digital industrialisation—balancing digital sovereignty with water, energy and ecological security.

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

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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.

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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.

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- paragraphs
- lists
- tables
- visual cues

—all optimised for retention.

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