

Recycled Sewage Water for Data-Centre Cooling in India

A white paper by the Worksthal AI Research Lab

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Abstract. India's data-centre capacity is forecast to more than triple by 2030, much of it in water-stressed cities that draw on both piped drinking water and over-used groundwater, while most of the sewage the country generates is never treated. This paper sets out why treated sewage is a practical cooling source for Indian data centres, what has already been proven abroad and in Indian industry, how a system would work, the risks to manage, and a three-phase research programme the Worksthal AI Research Lab proposes to run with partners, starting with a Hyderabad case.

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Disclaimer	This paper is for information and discussion. It is not engineering, legal or investment advice. Water-reuse designs must be reviewed by qualified engineers and approved by the relevant authorities before use.

Executive summary

India can cool its next wave of data centres with treated sewage instead of drinking water and groundwater, and the supply already exists: most of the sewage the country generates is not being treated or reused today.

- **The problem.** Data-centre capacity across India's top seven cities is forecast to grow from 1,263 MW (April 2025) to more than 4,500 MW by 2030 ([Colliers via IANS](#)). Many facilities use evaporative cooling, which consumes water continuously, while 600 million Indians already face high to extreme water stress ([NITI Aayog CWMI, via Outlook](#)).
- **The groundwater squeeze.** India already extracts 60.47% of its annually extractable groundwater on average, and 11.1% of assessment units are over-exploited — drawing more than is recharged — including parts of Telangana, Karnataka and Tamil Nadu ([Dynamic Groundwater Resource Assessment 2024, via Vision IAS](#)). Data centres that run on borewells or tankers add to that draw and lower water tables that homes and farms depend on.
- **The resource.** India generated 72,368 million litres per day (MLD) of sewage, but only 20,235 MLD — about 28% — was actually treated ([CPCB, via Down To Earth](#)).
- **The precedent.** Google has cooled its Douglas County, Georgia data centre with recycled wastewater since 2012 ([Data Center Knowledge](#)), and Amazon Web Services says it will expand recycled-water cooling to 120 US data centres ([Aquatech](#)) and plans to cool some of its newest Mumbai and Hyderabad facilities with sewage water ([Amazon India](#)).
- **The policy fit.** Since January 2016, India's Tariff Policy has required thermal power plants within 50 km of a sewage treatment plant to use treated sewage ([Down To Earth](#)). No equivalent rule exists for data centres.
- **The open questions.** Water quality and Legionella control, supply reliability, treatment cost and contract models have not been tested for Indian data centres at scale.

What the Worksthal AI Research Lab proposes: a three-phase programme — a city-level feasibility study, a pilot with one operator and one sewage treatment plant, then an open playbook — and partners to run it with. The first target city is chosen in Phase 1; Hyderabad is a strong candidate (see the case study).

Why do data centres use water?

Servers turn almost all the electricity they use into heat, and evaporating water is one of the cheapest ways to remove it — so the more a site relies on evaporative cooling, the more water it consumes.

How cooling uses water

- **Cooling towers and evaporative coolers** reject heat by evaporating water. Water is lost to evaporation, to drift, and to "blowdown" — water flushed out to stop dissolved minerals building up.
- **Air-cooled chillers** use little or no water on site but draw more electricity ([Trane](#)). Amazon says none of its operational data centres in India use water for cooling because they use air-cooled chillers ([Amazon India](#)).
- **Closed-loop liquid cooling** recirculates the same water. Microsoft says all its new data-centre designs since August 2024 use closed-loop cooling that consumes no water for cooling, with the first sites coming online in late 2027 ([Microsoft](#)).

Every approach trades water against energy. Treated sewage changes that trade: an operator can keep efficient evaporative cooling without drawing on drinking water or groundwater.

How water use is measured

- **Water Usage Effectiveness (WUE)**, defined by The Green Grid in 2011, is annual site water use in litres divided by IT equipment energy in kWh, reported in L/kWh; lower is better ([Trane](#); [The Green Grid](#)).
- **Power Usage Effectiveness (PUE)** is total facility energy divided by IT energy; WUE was designed to be read alongside it ([The Green Grid](#)).
- For scale: Microsoft reported a global average WUE of 0.30 L/kWh in fiscal year 2024, down from 0.49 L/kWh in 2021 ([Microsoft](#)).

Direct and indirect water. WUE counts water used on site. Generating the electricity a data centre uses consumes water too: researcher Shaolei Ren estimates it can be three to ten times the on-site amount ([Aquatech](#)). This paper focuses on on-site cooling water, the share an operator controls directly.

Why indirect water matters in India. Thermal power, a large part of India's electricity supply, is itself a heavy water user. A NITI Aayog study puts an average coal plant at 5–7 m³ of water per MWh generated; India's December 2015 environment notification caps existing plants at 3.5 m³/MWh and plants built after January 2017 at 2.5 m³/MWh with zero waste-water discharge; and a TERI study attributes 87.8% of industrial-sector water consumption to thermal power plants ([Powerline, October 2020](#)). Every unit of electricity a data centre saves also saves water upstream, so reclaimed-water cooling should not come at the cost of a much higher PUE.

Cooling options compared

Option	On-site water	Electricity	Drinking-water or groundwater draw	Source
Air-cooled chillers	Little or none	Higher	None for cooling	Trane ; Amazon India
Evaporative, fresh water or groundwater	High	Lower	High	Trane
Evaporative, treated sewage	High	Lower	Near zero (backup only)	Data Center Knowledge
Closed-loop liquid cooling	Near zero for cooling	Varies by design	None for cooling	Microsoft

Treated sewage keeps the energy advantage of evaporative cooling while removing the drinking-water and groundwater draw.

How much water is at stake? An example

A site's daily cooling water is its IT energy multiplied by its WUE. Two published averages give a range: Microsoft's fleet at 0.30 L/kWh ([Microsoft](#)) and the 0.45–0.48 L/kWh US average that Lawrence Berkeley National Laboratory projects ([LBNL, via Vertiv](#)).

IT load (running 24 hours)	IT energy per day	Water at 0.30 L/kWh	Water at 0.48 L/kWh
10 MW	240,000 kWh	72,000 litres (0.07 MLD)	115,200 litres (0.12 MLD)
50 MW	1,200,000 kWh	360,000 litres (0.36 MLD)	576,000 litres (0.58 MLD)

Even a 50 MW campus would need well under 1 MLD — a small fraction of a single large STP. Sites relying heavily on evaporative cooling in a hot climate can sit well above these fleet averages. The pilot will measure an India-specific figure.

Why does this matter for India now?

India's data-centre capacity is set to more than triple by 2030, and much of it is concentrated in cities that already compete for fresh water — both piped supply and groundwater.

- **Growth.** Colliers puts installed capacity across India's top seven cities at 1,263 MW in April 2025 and forecasts more than 4,500 MW by 2030, backed by \$20–25 billion of investment over five to six years ([Colliers via IANS](#)).
- **Concentration.** Mumbai holds 41% of current capacity, Chennai 23% and Delhi-NCR 14%; Colliers expects Hyderabad to emerge as a major hub ([Colliers via IANS](#)).
- **Water stress.** NITI Aayog's Composite Water Management Index (June 2018) found that 600 million Indians face high to extreme water stress, and projected that national water demand will be twice the available supply by 2030 ([Outlook](#)).

A data centre that draws drinking water or groundwater in a stressed city faces two risks: supply cuts in a drought, and local opposition to a new large water user. A non-potable source that grows with the city — its sewage — addresses both.

Groundwater: the hidden draw. Piped supply is only part of the picture. Groundwater use is harder to see and less regulated:

- **Falling reserves.** Nationally, 11.1% of groundwater assessment units are over-exploited and a further 3.05% critical; over-exploitation is concentrated in the north-west, the west and parts of the south, including Telangana ([Vision IAS, on the 2024 assessment](#)).
- **Borewells at data-centre sites.** Workers at data-centre campuses report deep borewells that they say lower the shallow wells farmers and villagers use for drinking water; operators say they do not draw groundwater ([Deccan Chronicle, May 2026](#)).
- **Bengaluru as a warning.** Devanahalli, a data-centre growth area, extracts groundwater at 169% of its recharge and depends entirely on it; nearby residents report borewells running dry and rely on tankers ([Down To Earth, November 2025](#)).
- **Priority in a shortage.** Maharashtra and Telangana classify data centres as essential services, which could put them ahead of residents' drinking water and sanitation during scarcity ([Deccan Chronicle](#)).
- **Exposure.** A 2025 Planet Tracker analysis found as many as 50 Indian data centres in "extremely high" water-stress regions ([Climate Fact Checks, June 2026](#)).

Treated sewage relieves both pressures at once: it replaces the municipal supply and removes any reason to pump groundwater for cooling.

Hyderabad, profiled below, shows both trends at once: fast data-centre growth and one of India's largest new sewage-treatment programmes.

Case study: Hyderabad

Hyderabad combines a fast-growing data-centre market with one of India's largest sewage-treatment build-outs, which makes it a strong candidate for a first pilot.

Measure	Figure	Source
Sewage generated (urban agglomeration)	About 1,950 MLD	Deccan Chronicle, December 2024
Treatment capacity before the new programme	772 MLD across 25 STPs	Deccan Chronicle
Capacity after six new STPs (527 MLD) opened	1,338 MLD	Siasat, December 2024
Further STPs under construction	10 plants, 453 MLD	Siasat
Programme size	31 STPs, 1,259.5 MLD, Rs 3,866 crore	Deccan Chronicle

- **Demand side.** Colliers expects Hyderabad to emerge as a major data-centre hub ([Colliers via IANS](#)), and AWS plans sewage-water cooling for some of its newest Hyderabad facilities ([Amazon India](#)).
- **Scale fit.** Using the example above, a 50 MW campus would need under 1 MLD — well under 0.1% of the city's 1,338 MLD treatment capacity.
- **Groundwater.** Groundwater in IT hubs such as Gachibowli dropped nearly a metre in three months in early 2026 ([Climate Fact Checks, June 2026](#)), and Telangana's average groundwater level was 7.72 metres below ground in 2024 ([Deccan Chronicle, May 2026](#)). A pilot here would show how much borewell and tanker water reclaimed cooling can replace.
- **Next step.** Map which STPs sit within pipeline distance of the data-centre clusters, and their output quality. Phase 1 will confirm current HMWSSB figures, including whether the December 2025 full-treatment target was met.

Why use treated sewage for cooling?

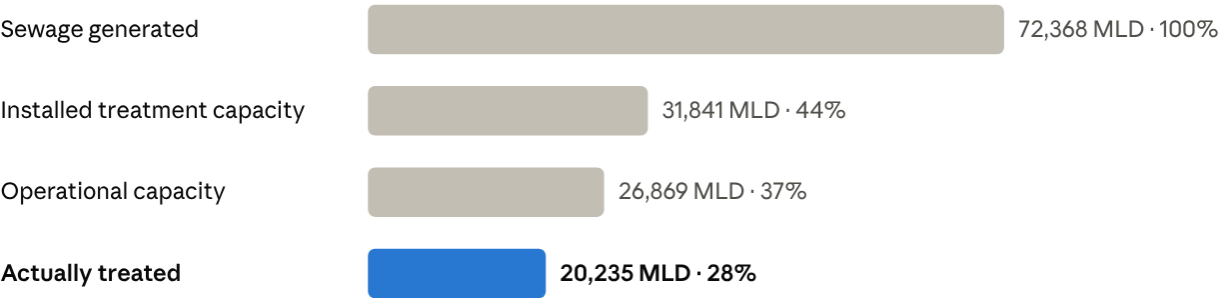
Cooling water does not need to be drinkable, and India produces far more sewage than it treats — so treated sewage is a large, reliable, non-potable source that is mostly unused today.

What it is. Treated wastewater is sewage cleaned at a sewage treatment plant (STP) to remove solids, organic matter and pathogens. For cooling it usually needs a further "tertiary" or polishing step so it does not scale, corrode or foul equipment (see *How would it work?*).

How much there is. Most of India's sewage is never treated, and the treatment capacity that exists is not fully used ([CPCB, via Down To Earth, September 2021](#)).

Only 28% of the sewage India generates is actually treated

Million litres per day (MLD) and share of sewage generated



CPCB data reported by Down To Earth, September 2021 · India, all states

More than 50,000 MLD of sewage a day goes untreated; even the capacity already built is not fully used.

Why it suits data centres.

- **Volume grows with the city.** More people and offices mean more sewage, unlike rivers and reservoirs that shrink in droughts.
- **It is close by.** STPs sit inside the same metros where data centres cluster.
- **It frees drinking water and groundwater.** Every litre of treated sewage used for cooling is a litre of drinking water or groundwater left for homes and farms. Google’s engineers reached the same conclusion in Georgia: the cooling water did not need to be clean enough to drink ([Data Center Knowledge](#)).
- **It can fund better sewage treatment.** A paying industrial buyer for treated water can make tertiary treatment viable for the utility.

Who already cools with reclaimed water?

Reclaimed-water cooling is proven at data-centre scale in the US and at industrial scale in Singapore and India; what India lacks is a data centre doing it.

Who	Where	What they do	Status	Source
Google	Douglas County, Georgia, US	Financed a "sidestream" plant at the local water authority that takes 30% of its treated flow for data-centre cooling; unevaporated water is cleaned on site and returned to the Chattahoochee River	Operating since 2012	Data Center Knowledge
Amazon Web Services	US (Virginia first with direct evaporative cooling)	Expanding recycled-water cooling to 120 data centres, which AWS says will preserve over 530 million gallons of drinking water	Announced June 2025	Aquatech
Amazon Web Services	Mumbai and Hyderabad, India	Plans to recycle sewage water to cool some of its newest data centres; current Indian sites use air-cooled chillers	Planned	Amazon India
PUB (national water agency)	Singapore	NEWater — sewage treated by microfiltration, reverse osmosis and UV — supplied mainly to industry for industrial and air-cooling uses; wafer fabs are the largest users	Since 2002	PUB

Who	Where	What they do	Status	Source
Thermal power plants	India	Tariff Policy since January 2016 requires plants within 50 km of an STP to use treated sewage; 250 MLD of an available 1,179 MLD was in use by December 2018	Mandated, partly implemented	Down To Earth

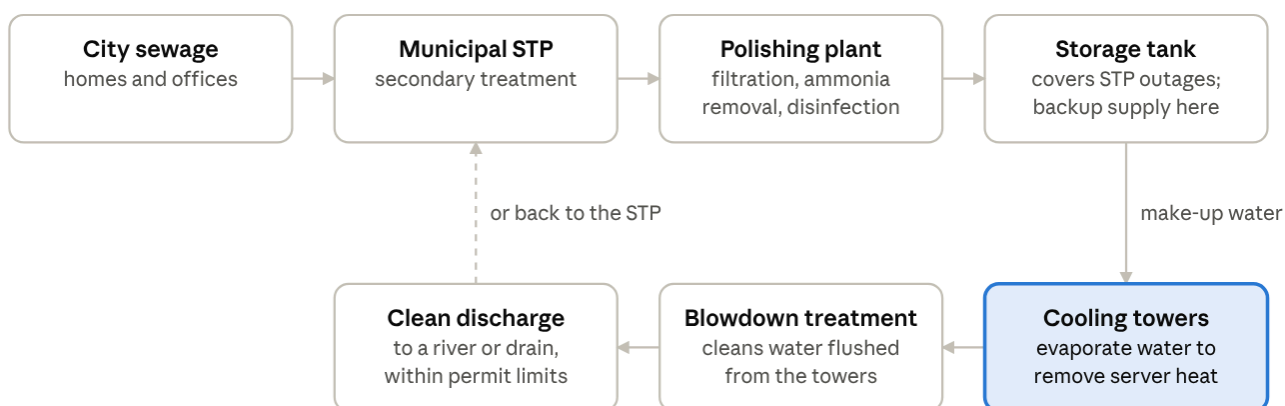
The Indian power-sector experience is the most useful warning: a mandate alone did not deliver reuse, because pipelines, pricing and responsibility for tertiary treatment were unresolved. A data-centre programme should settle those three before it scales (see *What are the challenges?*).

How would it work?

Treated water leaves a municipal STP, is polished to cooling-grade quality, piped to the data centre and used as make-up water for its cooling towers; blowdown is treated and returned rather than wasted.

Treated sewage replaces drinking water and groundwater as cooling make-up water

Proposed water path for a pilot site; volumes are set in the feasibility study



proposed pilot design · 7 stages, 1 optional return loop

The cooling towers are the only point that changes for the data centre: they take make-up water from the storage tank instead of the municipal drinking-water main or on-site borewells.

The treatment train. Secondary-treated sewage from an STP still carries nutrients, dissolved salts, suspended solids and microbes. A polishing plant — at the STP, as Google financed in Georgia ([Data Center Knowledge](#)), or at the data centre — removes what the cooling system cannot tolerate. Singapore's NEWater shows the most thorough version: microfiltration, then reverse osmosis, then UV disinfection ([PUB](#)). Cooling rarely needs water that clean; the right train is the cheapest one that meets the cooling system's limits.

What has to be controlled in the cooling water.

- **Suspended solids and turbidity** — settle in basins and heat exchangers.
- **Hardness, silica and phosphate** — form scale that cuts heat transfer.
- **Ammonia and chlorides** — corrode copper alloys and steel.
- **Nutrients and organics** — feed biofilm.
- **Microbes, including *Legionella*** — a public-health risk in any cooling tower (see *What are the challenges?*).

Numeric targets for each parameter will be agreed in Phase 1 with the treatment partner, the cooling-equipment supplier and the state pollution control board.

Operating safeguards. Continuous monitoring of the incoming water, automatic switch-over to a backup supply if quality or flow drops, and on-site storage sized to ride through an STP outage. The backup source and storage size are set in the pilot design.

What are the challenges?

The technology is proven; the hard parts are water quality, public-health control, supply reliability and who pays for the pipe — the same issues that slowed reuse in India's power sector.

Risk	Why it matters	How to manage it
<i>Legionella</i> and other microbes	Cooling towers release aerosols that can carry bacteria; sediment, biofilm, warm water (25–45°C), water age and low disinfectant residual drive growth (CDC)	A written water management programme; continuous oxidising-disinfectant residual with automated dosing; at least annual cleaning and disinfection; routine <i>Legionella</i> testing; drift eliminators (CDC)
Scaling	Dissolved minerals and phosphate deposit on heat-exchange surfaces and cut efficiency	Polishing treatment, scale inhibitors, controlled cycles of concentration and blowdown

Risk	Why it matters	How to manage it
Corrosion	Ammonia and chlorides attack copper alloys and steel	Ammonia removal in treatment, material selection, corrosion inhibitors and monitoring
Biofouling	Nutrients and organics feed biofilm, which also shelters <i>Legionella</i>	Nutrient removal, biocide programme, filtration
Supply reliability	An STP outage or quality excursion cannot be allowed to stop cooling	On-site storage, a backup source, online quality sensors with automatic switch-over
Pipelines and cost allocation	India's 2016 thermal-plant mandate stalled over pipelines, per-kilolitre pricing disputes and who pays for tertiary treatment; in March 2020 responsibility shifted to the power plants (Down To Earth)	Long-term offtake contracts that fix price, quality, volume and who builds and runs each asset
Permits and standards	India lacks sector-wise quality standards for reused water (TERI, via Eco-Business)	Agree targets with the state pollution control board and utility at the start of the pilot
Public perception	"Sewage" can alarm neighbours and customers	Clear communication that the water is treated, never potable, and replaces drinking water and groundwater the city needs

What does it cost?

Whether treated sewage is cheaper than the alternative depends on distance, treatment level and what the site would otherwise pay for water; the pilot's first job is to price each of these for one real site.

Cost drivers

Cost item	One-off or running	Who typically pays
Polishing (tertiary) treatment plant	One-off, plus running energy and chemicals	Operator, utility, or shared — Google financed the plant in Georgia (Data Center Knowledge)

Cost item	One-off or running	Who typically pays
Pipeline and pumping from the STP	One-off, plus pumping energy	To be agreed; the central issue in India's power-sector experience (Down To Earth)
Treated-water tariff (per kilolitre)	Running	Operator, under a long-term contract
Extra cooling-water treatment and monitoring	Running	Operator
On-site storage and backup supply	One-off	Operator
Blowdown treatment and discharge	Running	Operator

What it is compared against. Municipal potable supply, private tanker water, groundwater, and switching to air-cooled or closed-loop cooling — which saves water but uses more electricity ([Trane](#)).

Value that is not on the water bill: supply security in droughts, a lower risk of local opposition, and a credible water-stewardship claim for customers.

Cost per kilolitre for each option will be collected in Phase 1 from the utility, the STP operator and the partner data centre; this paper does not state cost figures.

What does Indian policy say?

India already encourages industrial reuse of treated sewage, but no rule or incentive yet names data centres, and sector-wise quality standards are still missing.

Policy	Issued by	What it does	Relevance to data centres	Source
Tariff Policy amendment, January 2016	Ministry of Power	Thermal power plants within 50 km of an STP must use treated sewage; costs can be recovered through tariffs. In March 2020 responsibility for pipelines, pumping and tertiary treatment shifted to the plants	The closest precedent for a sector mandate, and a record of what slowed it	Down To Earth
National Framework on Safe Reuse of Treated Water, 2022	National Mission for Clean Ganga, Ministry of Jal Shakti	Guides states in writing reuse policies; sets out agency roles, business models and safety protocols for industrial, agricultural and other non-potable uses	Covers industrial cooling; AWS says its planned sewage-water cooling in Mumbai and Hyderabad aligns with it (Business Today, August 2026)	Water Today; Eco-Business (TERI)

The gap. TERI notes that India lacks sector-wise quality standards and benchmarks for reused water, and calls for incentives such as higher tariffs for non-recycled water, public-private partnerships and water-use credits ([Eco-Business](#)).

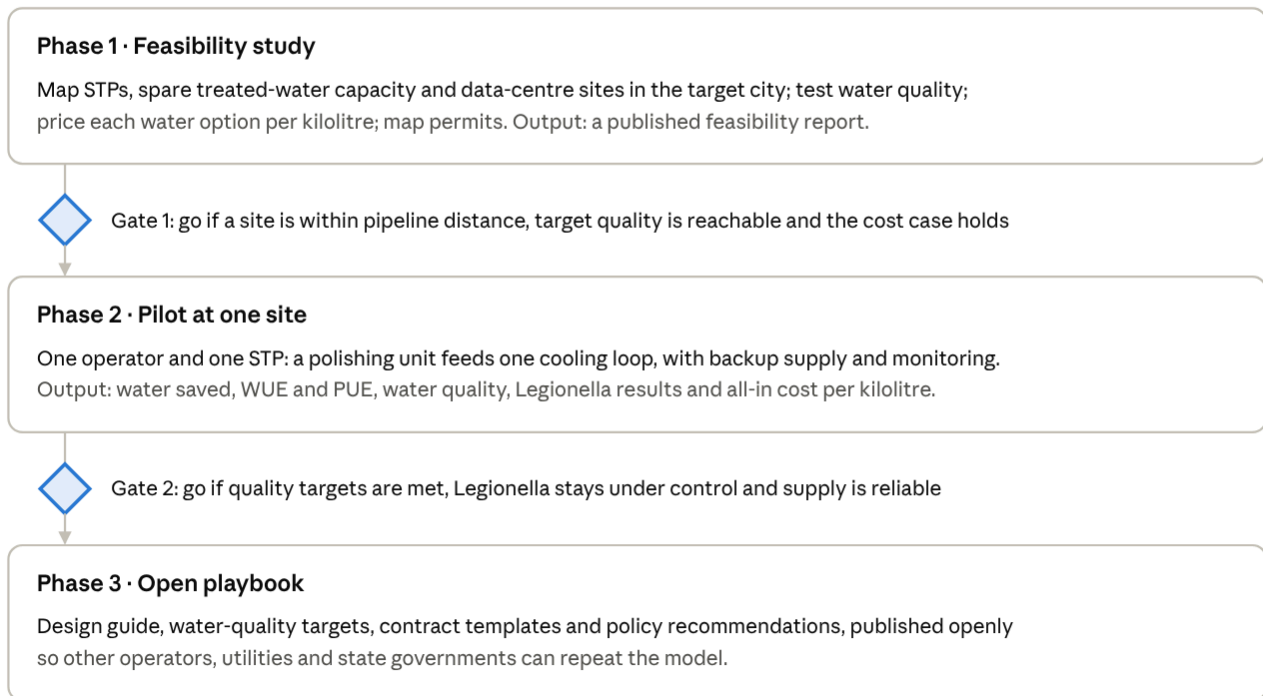
State reuse and data-centre policies for the target state will be reviewed in Phase 1.

What will the Research Lab do?

The Worksthal AI Research Lab proposes three phases — a feasibility study, a pilot at one site, then an open playbook — each ending in a go/no-go gate so partners commit step by step.

Each phase ends in a go/no-go gate, so partners commit step by step

Proposed research programme; timing to be confirmed



proposed programme · 3 phases, 2 gates · timing to be confirmed

A partner can join for Phase 1 alone; nothing is built until Gate 1 shows a viable site.

What the pilot will measure

- Drinking water and groundwater displaced (litres per day and per kWh of IT load)
- Site Water Usage Effectiveness (WUE) and Power Usage Effectiveness (PUE), before and after
- Incoming water quality against the agreed targets, and the number of excursions
- *Legionella* and other microbial test results
- Scaling and corrosion rates on test coupons
- Supply availability: hours on treated water versus backup
- All-in cost per kilolitre against the site's current source

Open data. Results will be published on the [Research Lab publications page](#), with partner approval for anything commercially sensitive.

Who do we want to work with?

The pilot needs four kinds of partner at the table from the start, because the power-sector experience shows reuse stalls when any one of them is missing.

Partner	What we need from them	What they get
Data-centre operators	Cooling requirements, a pilot site or cooling loop, operating data	A tested design and cost model, supply security, and a credible water-stewardship story
Water utilities and STP operators	Treated-water supply, quality data, help with the pipeline route	A paying industrial customer for treated water, and a model to repeat with other buyers
Research institutions	Water-treatment and microbiology expertise, independent testing	Co-authorship of publications and access to field data
Investors and funders	Capital for the polishing plant and pipeline	A first-mover position in water infrastructure for India's data-centre build-out

To talk to us, use the [Research Lab partners page](#) or email shubham@worksthal.com.

Recommendations

Decide on water early: treated sewage is easiest to adopt when it is designed in before a site is built, not retrofitted after.

Data-centre operators

1. Screen every new Indian site for an STP within pipeline distance before choosing a cooling design.
2. Report Water Usage Effectiveness (WUE) alongside PUE, and say how much of the water is potable and how much is groundwater.
3. Where evaporative cooling is chosen, design make-up water treatment for reclaimed water from day one.

Water utilities and STP operators

1. Publish treated-water quality and spare capacity so operators can plan around it.
2. Offer long-term offtake contracts that fix price, quality and volume.

Policymakers

1. Publish sector-wise quality standards for reused water, starting with industrial cooling, as TERI recommends ([Eco-Business](#)).

2. Treat reclaimed-water cooling as a criterion in state data-centre policies and land allotments, and require data centres to disclose groundwater use and hold extraction permits — as Karnataka already requires for every borewell in Bengaluru ([Down To Earth](#)).
3. Learn from the 2016 thermal-plant mandate: settle who builds pipelines and pays for tertiary treatment before mandating use ([Down To Earth](#)).

Glossary

Term	Meaning
Blowdown	Water deliberately drained from a cooling tower to stop dissolved minerals concentrating
Cycles of concentration	How many times dissolved solids are concentrated in tower water compared with the make-up water
Drift	Small droplets carried out of a cooling tower with the exhaust air; drift eliminators reduce it
Evaporative cooling	Removing heat by evaporating water, as in cooling towers
<i>Legionella</i>	Bacteria that can grow in cooling towers and cause Legionnaires' disease when inhaled in aerosols
Make-up water	Water added to a cooling system to replace what is evaporated, drifted or blown down
Over-exploited (groundwater)	An area that extracts more groundwater each year than is naturally recharged, so the water table keeps falling
MLD	Million litres per day
Polishing / tertiary treatment	Treatment after a standard STP to reach the quality a specific use needs
PUE	Power Usage Effectiveness: total facility energy divided by IT equipment energy
Reverse osmosis (RO)	Pushing water through a membrane that removes dissolved salts and most contaminants
Site water vs indirect water	Site water is used on the data-centre premises; indirect water is consumed generating the electricity it buys

Term	Meaning
STP	Sewage treatment plant
Treated wastewater	Sewage cleaned at an STP to remove solids, organic matter and pathogens
WUE	Water Usage Effectiveness: annual site water use (litres) divided by IT equipment energy (kWh)

Methodology and limitations

This paper is a desk review of public sources, not a report of Worksthal field results.

- **Method.** Figures come from government data (CPCB, Ministry of Power, NMCG, the national groundwater assessment), company disclosures (Google, Amazon, Microsoft), industry research (Colliers, LBNL) and public-health guidance (CDC), each opened and linked in Sources.
- **Data age.** National sewage figures date from 2021 and NITI Aayog's water-stress figure from 2018; newer releases may differ.
- **Secondary reporting.** Several government figures are cited through news reports of the original documents; where a primary document is listed, it is named in Sources beside the report used.
- **Scope.** On-site cooling water. Water used to generate electricity is discussed only for context; detailed water-quality engineering design and cost modelling are left to the research programme.
- **Example figures.** The sizing example uses published fleet averages, not measured Indian data.

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