



Is India Running Out of Water – An Analysis of Water Bankruptcy, AI Data Centers, and Big Finance

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Abstract – The issue of freshwater and India has passed a threshold that is beyond seasonal thinking and crises. In January 2025, the United Nations officially launched the notion of global water bankruptcy, a term which differentiates between the permanent structural decay and the solvable upheavals of the crisis. This difference has terrific practical implications to India. With the nation drawing over 60 percent of its replenishable groundwater per year and individual states using over 150 percent of natural recharge, the rate at which this system is being depleted is extremely rapid. The underground is settling in Delhi. All assessments have identified Bengaluru, Chennai, Hyderabad and Delhi as potential Day Zero cities. It is against this background that India has invested about 43 billion dollars in the development of AI data centers which demand a significant amount of water in thermal cooling, with a direct and unacknowledged competition between digital infrastructure development and basic human needs. At the same time, the increasing internationalization of water, which in 2020 saw the introduction of water futures in the Chicago Mercantile Exchange, has injected speculative capitals into the sphere that traditionally belonged to the logic of public utilities. This paper looks at how these forces converge and how the equity aspects of water scarcity can be analyzed and how individuals, organizations and policymakers can go beyond managing crises to structural reform before the deficit is irreversible.

Keywords: Water bankruptcy, groundwater depletion, India water crisis, AI data centers, water financialization, water governance, Day Zero, shadow pricing.

1. INTRODUCTION

1.1 The Fountain That Went Dark

Visitors to Kempegowda International Airport in Bengaluru, India in the summer of 2024, were not greeted by the well-known waterfall, which is the traditional entrance to the technology hub of India, but rather by a dry building as the city lacked sufficient water to allocate water to decoration. In the terminal, the tankers were charging people between 4,000 and 5,000 rupees per load. Water was being rationed. And the city that provides software to Fortune 500 corporates, the city where Google, Microsoft, and Amazon conduct their Indian operations, could not keep a fountain.

Such picture should attract more attention than it had in the policy circles. It is not a metaphor. It is a data point. Decades has India been treating its water issue as a seasonal one. Summers are difficult. Monsoons arrive. The tanks fill up. The borewells recover. The tankers disappear. and the same cycle repeats itself with little improvement the next year, still a bad one though. It is this frame which has created the water policy, funded the water infrastructure and regulated water use over the last three or so generations. It is a frame no longer specific to physical reality. This was stated by the United Nations in January 2025. The term of global water bankruptcy first appeared in the official multilateral language, and it was not the oratory. The shift in

language was calculated to indicate that the crisis frame, the old frame, was no longer valid. A crisis is recoverable. Bankruptcy is a quite a different thing.

India's Water Bankruptcy: From Symbolic Loss to Systemic Solutions

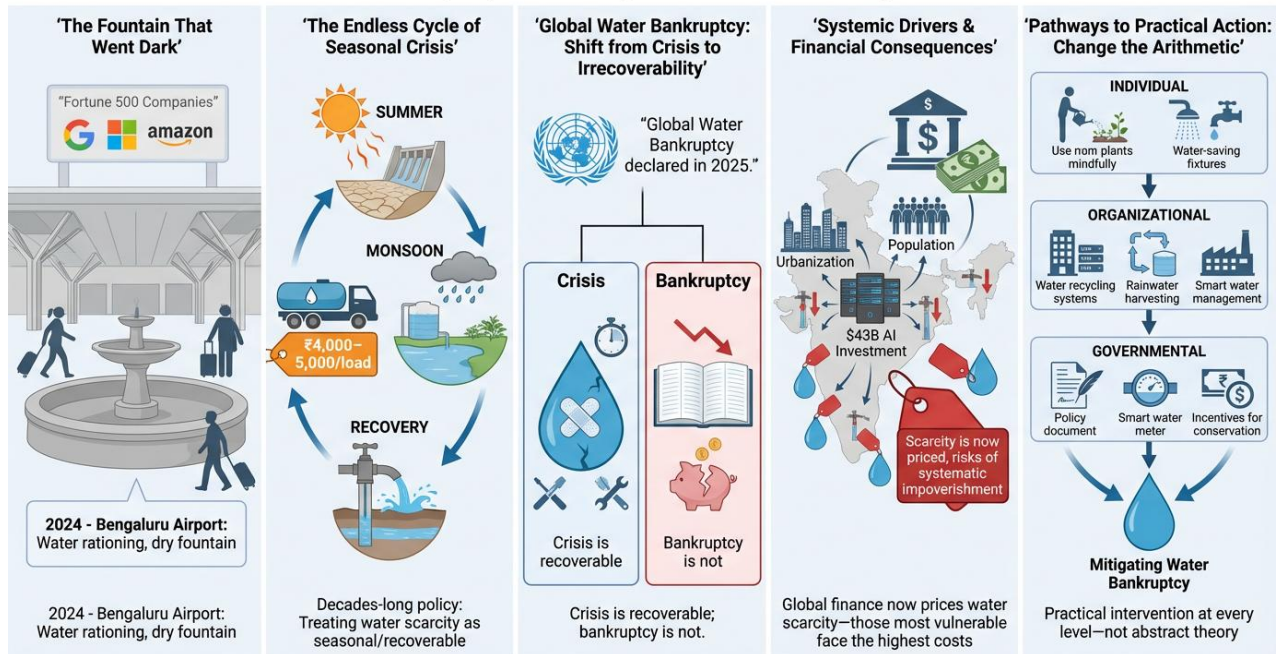


Fig -1: India's Water Bankruptcy

The paper follows the lineage of what water bankruptcy entails in India, in particular, what is driving India into it, how it fits with its 43 billion dollar AI infrastructure aspirations, and how the world financial system has already started to price scarcity in a systematic way that would systematically impoverish those most susceptible to it. Most importantly, the paper looks at what can be done, not in theory, not in the abstract discourse of sustainable development models but in practice, at the organizational, governmental and individual level, where there is still time to change the arithmetic.

2. OBJECTIVES

The main objectives of this study are as follows. First, to analyze the conceptual and practical consequences of using the term water crisis in lieu of water bankruptcy when analyzing the problem of groundwater depletion in India. Second, to record the size of the freshwater deficit in India based on the data provided by the Central Ground Water Board, NITI Aayog, and foreign research institutions. Third, to examine the water dependency inherent in the Indian developing AI data centre infrastructure and the gap in governance that lets it go untested. Fourth, to discuss the financialization of water scarcity by commodity markets and packaged water industry, including the implications related to equity. Fifth, in order to establish actionable modalities of individuals, corporates, and governors to shift gears to structural water reform to reactive crisis management. All of these goals are intended to offer a holistic description of the various forces coming together on the Indian water system, and provide grounded and workable recommendations that reflect the urgency of the situation, as well as its complexity.

3. CURRENT TRENDS

India has a number of converging trends that represent the state of water in the country by 2025. The extraction of groundwater has increased in pace in the agricultural states and the evaluations of the Central Ground Water Board indicate that more and more assessment units are now in the over-exploited or critical category than in the safe category in the last ten years. The stress of urban water has become greater and more geographically focused with metropolitan regions experiencing recorded deficits in water supplies over non-monsoon months in Bengaluru, Chennai, Hyderabad, and some parts of Delhi.

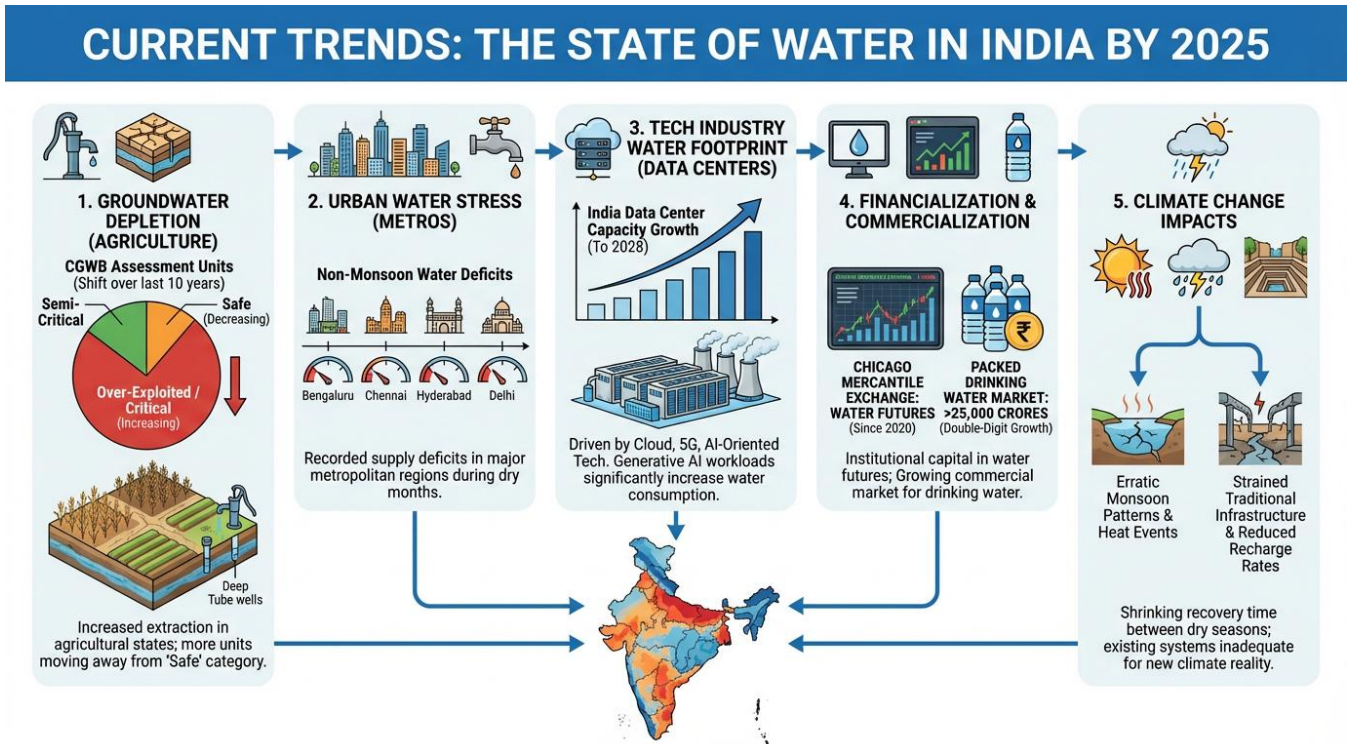


Fig -2: Current Trends The State of Water in India by 2025

The water footprint of the technology industry is increasing accordingly. The capacity of data centers in India is estimated to grow at a remarkable rate until 2028 due to the need in cloud computing, the implementation of 5G infrastructure, and the direct impetus in the government of India to entice the investment in technology that is AI-oriented. The numbers of water consumed by large-scale data centers around the world have increased dramatically as the number of generative AI workloads, which are far more compute-intensive than their more traditional counterparts, have become a larger portion of overall processing demand.

Institutional capital has been drawn to water futures trading at the Chicago Mercantile Exchange which was introduced on the exchange in 2020. The market of packed drinking water in India alone with a value of over 25000 crores and increasing at steady and consistent rate of doubling digits speaks volumes of gradual commercialization of the resource which up till now was largely under control as a public utility. The changing climate such as the growing uncertainty around monsoon patterns and an increasing number of hot events is shrinking the recovery time between dry seasons and placing a strain on recharge rates that traditional infrastructure was not built to manage.

4. WHY THE WORD "BANKRUPTCY" CHANGES EVERYTHING

There is no semantic difference between a crisis and a bankruptcy. It is active, and it dictates the type of response that a situation requires.

FROM CRISIS TO BANKRUPTCY: A STRUCTURAL SHIFT IN WATER MANAGEMENT (INDIA & GLOBAL CONTEXT)

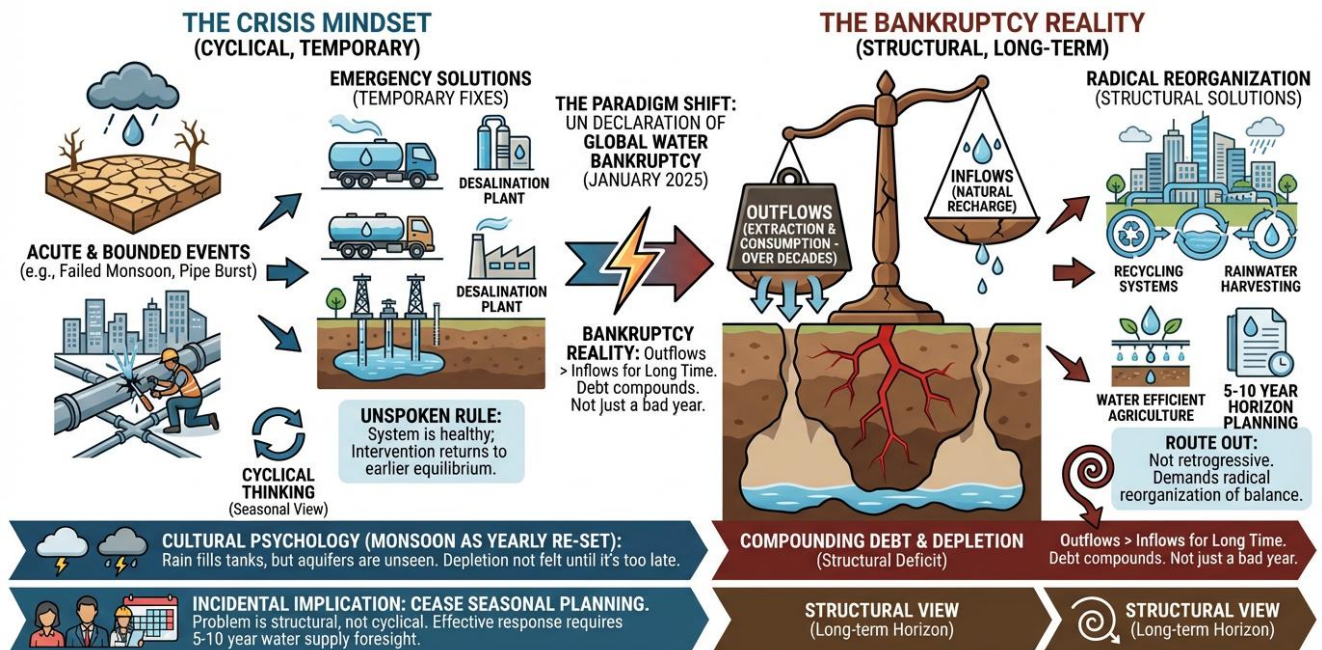


Fig -3: From Crisis to Bankruptcy A Structural Shift in Water Management

A crisis is acute and bounded. It has a start point, a time of tension and if handled properly, an end. A drought year is a crisis. A failed monsoon is a crisis. Bursting of a pipe within a city network is a crisis. All these may be resolved in terms of emergency solutions increased distribution, more extraction, improved maintenance. The unspoken rule of crisis management is that whatever has led to the crisis is basically a healthy system and that an intervention may be made to bring the current system back to an earlier point of equilibrium. Bankruptcy is based on other reasoning altogether. It is not the case when a person or an organization is declared bankrupt because they had a bad year. It is due to the fact that during a long time, the outflows were always more than inflows and the debt that it has created surpasses the level at which the normal operations can settle it. The route out of bankruptcy is not a retrogressive behavior. It demands reorganizing, a radical reorganization of the balance between the income and the expenditure.

The situation in the groundwater in India fits the description of bankruptcy much better than the crisis one. The extraction rates have over decades surpassed the natural recharge rates. The shortage has not been confined to a poor year or a water dry area. It is both geographically extensive and temporal. The extraction of each year is being done in part out of the same reserve that was already depleted by other past years. The debt is compounding. By making the introduction of the idea of global water bankruptcy in January 2025 official, the United Nations was indicating that this distinction is policy-relevant. The outcome of crisis thinking is crisis reactions additional borewells, additional tankers, additional desalination facilities. It is not the

wrongness of these interventions but, when used in bankruptcy state, it is inadequate and counterproductive. There is no solution in drilling more to tap into sinking aquifers. It is a quicker sale of the left over asset.

It is this change that has not been easy to absorb due to the cultural psychology of the Indian monsoon. The monsoon, literally and symbolically, is a kind of yearly re-set. Rain fills tanks, replenishes rivers and picks the face of scarcity. The aquifers however are not visible. Their depletion is not felt as a first-hand experience until a borewell goes dry, a city has to ration, or the ground starts collapsing. These symptoms manifest, and at this stage, the deficit is already structural. The incidental implication to any reader, be it an individual homeowner, a manager in corporate operations, or a city planner, is to cease to structure water questions on a seasonal basis. Monsoon recovery water risk planning is planning in a condition that is increasingly less dependable each year. A business continuity plan that fails to outline the specifics of water supply in a 5-10 year horizon is an incomplete business continuity plan. The first step towards all effective responses that follow is recognition of the fact that the problem is structural and not cyclical.

5. INDIA'S NUMBERS ARE NOT AMBIGUOUS

Numbers cut through narrative and the numbers of the groundwater in India are not cozy.

INDIA'S GROUNDWATER BANKRUPTCY: THE CRISIS IN NUMBERS

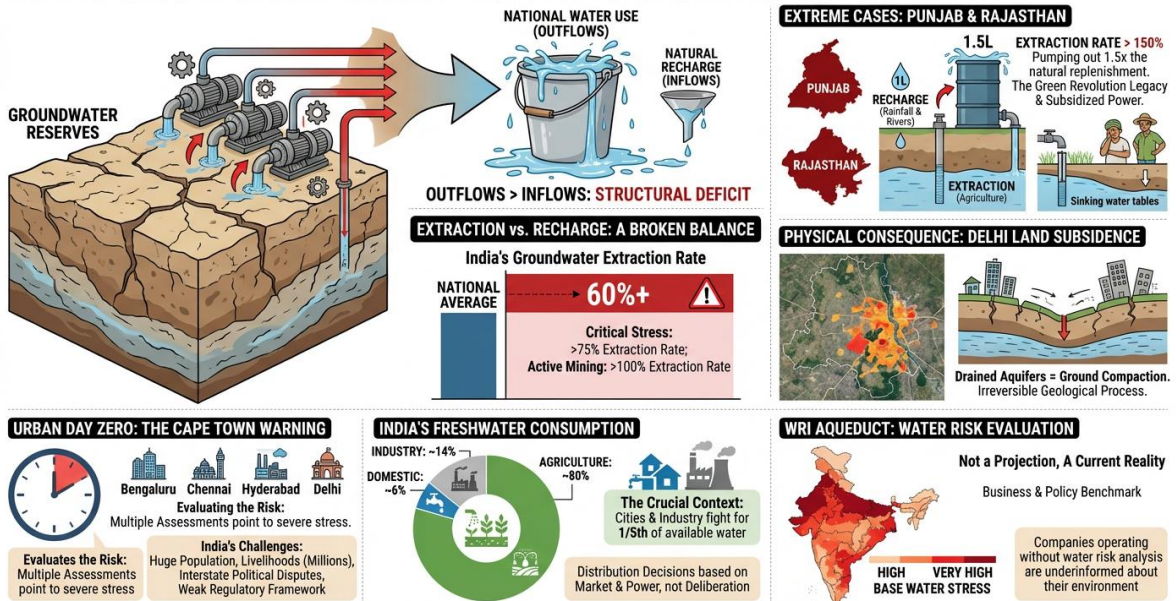


Fig -4: India's Groundwater Bankruptcy The Crisis in Numbers

According to data released by Central Ground Water Board, India is drilling over 60 percent of its available ground water each year. In contextualizing this, it is widely assumed by water security scholars that extraction rates exceeding 75 percent of recharge are indicative of critical stress, and rates exceeding 100 percent are indicative of active ground water mining activities. The whole of India is on the verge of the crisis, and in its most fertile farming provinces, already passed the boundary of mining.

The most extreme ones are Punjab and Rajasthan. The two states are using a groundwater that is above 150 percent of the natural annual recharge rate. This implies that with each liter of rainfall penetration and rivers seepage that the earth will naturally replenish, these states are sucking out one and a half liter. This situation



in mathematics does not work out. It worsens. It causes the water table to lower, the wells are forced to go deeper, the prices of extraction grow, and the amount of available water are progressively diminishing. The situation in Punjab is particularly agonizing considering the fact that it is the heart of food security in India. The 1960s and 1970s Green Revolution had changed the state into the granary of the nation, though, it did so by subsidizing the extraction of the water which was never included in a sustainable budget. Agricultural pumps could be subsidized with electricity thus creating economic incentive in farmers to drill deeper with the declining water tables, as the electricity effectively cost nothing. The incentive was structured in the most ideal way to generate precisely the result that is being witnessed.

Delhi provides another type of evidence. Measurement of land subsidence in selected areas of the capital has been recorded by satellite-based information and surface surveys as a physical effect of drained aquifers. Once the ground water is extracted out of porous structures that form the underground, the pressure that was keeping together the rock and sediment that were laid at the top deteriorates. The floor is squeezed down and in. This is not metaphorical. It is a geological process that is recorded, quantifiable, and irreversible in certain instances, since compacted sediment does not necessarily get the ability of containing water regardless of whether they are recharged again or not.

The Day Zero framework, which reached prominence in Cape Town in 2018, has been used in Bengaluru, Chennai, Hyderabad, and Delhi to evaluate it in numerous assessments over the last several years. The close call experienced by Cape Town was educative, but not as a success tale. The city was only a few weeks away to an absolute halt in the supply of piped water. Any behavioral and policy alteration which prevented this result was made possible only after operation under very severe pressure, and demanded a degree of collective discipline which is hard to maintain other than by existential urgency as an inducement. The case of India is even more complicated by several thousandfold factors: the number of people, farming age-related demographic needs that constitute hundreds of millions of livelihoods, cross-state water contentions with a long political background, and the government framework that is not yet suited to make binding judgment on the extent of extraction.

Most of the freshwater consumption in India is agricultural (approximately 80 percent). This is the crucial background of all figures in this talk. By the cities rationing water they are tapping a system in which four-fifths of the water is required by the farms. The distribution decisions, as to whether to feed the people, to pass on to urban use, or to industry, are not being made in well-managed deliberation areas. They are being prepared on a non-authoritative basis, by market, political, and brute physical factors, who digs deepest. The tool created by the World Resources Institute called Aqueduct that stresses water at a very fine geographic scale indicates that huge areas of most economically productive regions in India are running with a high to very high base water stress. It is not something that has to be projected in the future. It is a contemporary evaluation of the proportion of current demand and renewable supply. Companies located anywhere within this geography who have not benchmarked their water risk against these evaluations are doing business with a partial understanding of the environment they are dealing with.

6. THE AI PARADOX, COOLING SERVERS IN A THIRSTY COUNTRY

One of the most significant and under-researched crossroads between economic aspiration and corporeal limitation in the current history of development in India is the promise of the nation to create AI data center infrastructure at scale. The scale of investments is estimated to be 43 billion dollars as the Indian government entities, development by the individual developers, and large international technology corporations such as

Google, Microsoft, and Amazon Web Services are all committed to the investments. The vision is simple, the aim is to make India a global infrastructure in AI, to reap the benefits of the digital economy and decrease the reliance on the data centres in Singapore, the United States and Europe.

THE AI PARADOX: COOLING SERVERS IN A THIRSTY COUNTRY

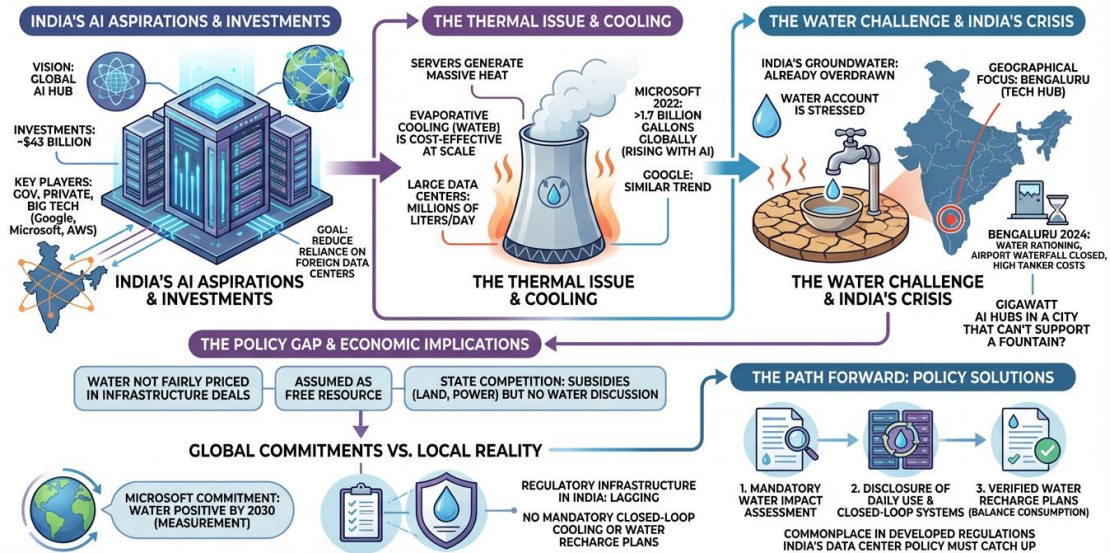


Fig -5: The AI Paradox Cooling Servers in a Thirsty Country

The thermal issue is not so much addressed. Each server farm is nothing more than a heat generator. Computational workloads cause heat to be generated by the processors and they require heat removal which is achieved by either cooling the facility or degrading and failing hardware. At small scales, this may be done by the means of air conditioning. Evaporative cooling with the use of water is the most cost-effective cooling technique at gigawatt scale. Millions of liters of water are used up in large data centers in a day. The sustainability reports published by Microsoft revealed that the company used more than 1.7 billion gallons of water in 2022 in its data centers around the world, with the number rising significantly in 2023 as generative AI activity occurred. The same can be said about the water consumption trend in Google.

The push of AI infrastructure in India is thus inseparable with a question of water consumption and what is being questioned is being questioned within a nation where the water account is already overdrawn. The topicality of this issue is geographical. The main candidate of most of the technology infrastructure in India is Bengaluru, which already has an ecosystem of software firms, engineering talent and global connectivity. It is also a city that in 2024 was rationing water and closing its airport waterfall, as well as charging thousands of rupees each tanker delivery. The concept of constructing gigawatt-scale AI hubs in a city that cannot support a decorative fountain needs to raise serious doubts of the water impact analysis these approvals are based on. This is an indication that such questions are not being raised loudly.

The main point is not whether or not data centers should be located in India. Market forces and geopolitical reasoning already have decided that. The point is whether water has been fairly priced in the infrastructure deal. In a scenario where state governments are competing to host data centers by either providing subsidized land, preferential power rates, and expedited environmental clearance, water is not a point of



discussion on the table. It is assumed as a background resource, which is implicitly freely available at virtually no cost, and not a restricted input that must be metered, charged and planned.

Microsoft has committed itself to corporate water positivity by 2030, i.e., it will measure its operations in terms of water in its operations, globally. It is an initial commitment worth having when it is operationalized in a rigorous way and precisely this type of standard ought to be a regulatory floor on the data centre approvals in India and not an aspirational target. There have been some operators in water-stressed geographies shifting to closed-loop cooling, air cooling of lower-density workloads, and geographic distribution of facilities, to take advantage of cooler climates. The regulatory infrastructure of India regarding its data center infrastructure is yet to make the instruments that will force them to consider these methods to be a condition to the operation permits. The practical policy question is to the policymakers simply stated who writes water into the contract. All data center authorization in a water stressed area must involve a water impact assessment, disclosure of anticipated daily use, and a demonstration that closed-loop cooling systems will be installed or a water recharge plan that has been verified which balances the consumption by will recharge of local watersheds. They are not some far-off needs. They are commonplace in the developed environmental regulations. The policy of the data center in India must be caught up.

7. WALL STREET GOT HERE BEFORE THE UN DID

This move, which was less covered in India than it deserved, was the introduction of water future contracts in the Chicago Mercantile Exchange in December 2020. The contracts, which are pegged on the Nasdaq Veles California Water Index, enable institutional investors to assume financial stances on the trend of water prices in the Californian spot market in water rights. It was the first historical time when water was finally considered as a commodity and the same financial structure as crude oil, soybean and natural gas it was given. The timing is instructive. In January 2025, the term water bankruptcy was formally used by the UN. Financial markets started trading water scarcity as a variable five years back. This is not surprising. It requires markets to price the future scarcity that is anticipated with the presence of adequate information, and the information of the dwindling water resources on earth, the rate of loss of aquifers and water stress due to climate changes has been accessible for at least over a decade in one form or another. Those who developed the water futures contract were not trying to make a prediction. They were reacting to an already fully documented trend.

It is better to unpack carefully the concept of water financialization in such countries as India since the ramifications are not homogenous and analysis is not that easy. On the structural effects, two are likely to occur when a resource becomes a tradeable financial tool. First, the cost of access to such a resource increases more rapidly than in the case of the management of public utility, as financial logic adds speculative premiums to the allocation process and market-based allocation mechanisms that do not prioritize the social factor. Second, the distribution of the resource changes to whoever is able to pay the highest irrespective of their need. This is an efficiency argument in a working market of private goods. It is an equity disaster to a resource that is not only a necessity to life, but also becoming scarce. This is at an early, but evidently, stage in the packaged drinking water market in India. The market is now worth over 25,000 crores and it is a market which is constantly increasing over the years. Such an increase is not preference-based. It is motivated by the inability of dependable water supply by the populace. As city taps fail, people turn to bottled water. Once a sufficient number of households change, a commercial ecosystem will coalesce to cater to that need: brands, distribution channels, retail prices, and venture capital. When such an

ecosystem is in place, it has a structural reason to ensure that public water supply is never reliable, since reliable taps will decrease the demand of the product.

WALL STREET VS. UN: THE FINANCIALIZATION OF WATER

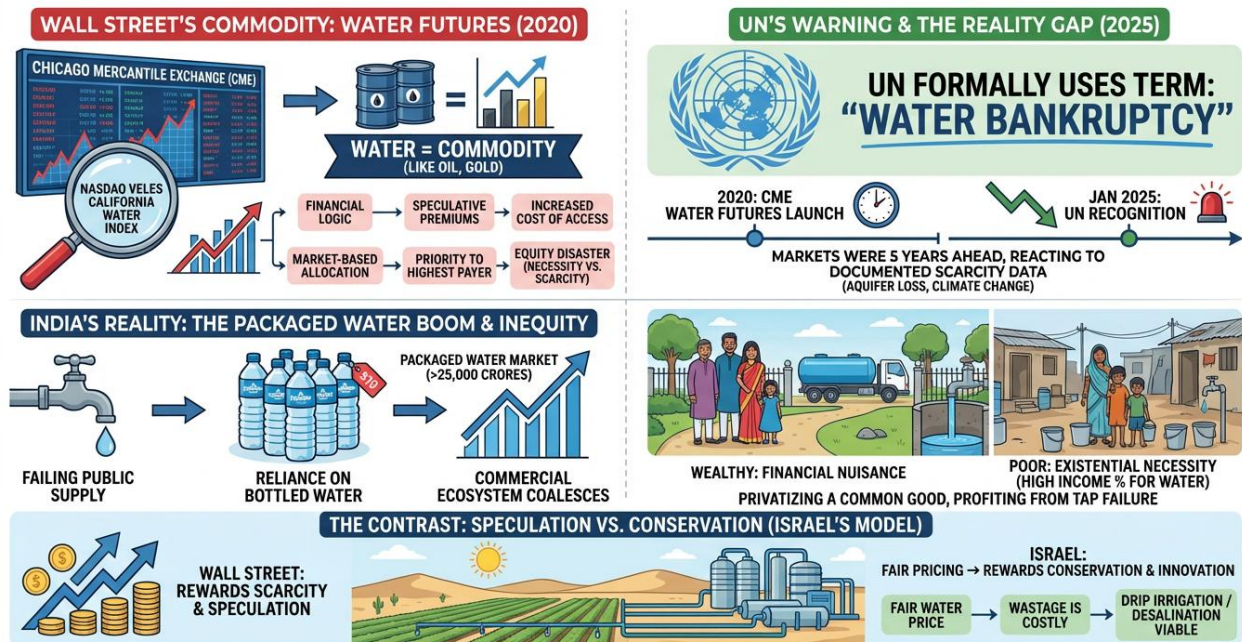


Fig -6: Wall Street Vs UN The Financialization of Water

Those people who will have to pay the highest price of this transition are not hard to determine. A family living in a gated neighborhood in Hyderabad or Pune can cope with the issue of water stress as a financial nuisance an increased cost per month on bottled water, a personal tanker service, a deeper well. A family in an informal settlement in the same urban area, which relied on an already insufficient municipal supply, has the same scarcity as a survival necessity. It is not the family that pays 15 percent out of its income on packaged water holding futures contracts. It is privatizing the access to what used to be a common good, and no political system is in place to question the set-up.

The water pricing model in Israel is more constructive. The nation is actually a desert, drier than most of the water-strained parts in India, but has been able to become a global water efficiency leader because it associated water with a fair price at an early age. It was not moral urges that made drip irrigation economically correct in Israel, but the fact that there existed a real price of water, which made wastage costly. Desalination was investable due to the presence of what was priced in the equation, chronic scarcity. The key distinction between the model of the Israeli market and the Wall Street water futures is the orientation of incentive. The pricing set up of Israel is a reward system that appreciates conservation and innovation. The speculation of commodities rewards scarcity.

8. THE PEOPLE WHO ARE NOT AT THE TABLE

There is no structural resource issue where the costs are distributed evenly, and the water bankruptcy in India is no exception. The people who have the least capacity to bear the costs are bearing the brunt of these

costs, and the benefits of emerging water markets are going to those who already have capital. The sharpest inequity is in the agricultural aspect. Smallholder farmers in India are the major consumers of groundwater and at the same time the most immediate sufferers when supplies of groundwater run dry. The paradox is structural. Farmers who have the financial resources to drill deeper wells, to install more powerful pumps, and to tap more efficient irrigation technology are able to maintain production with falling water tables. First access is lost by smallholders, whose borewells penetrate only to the upper levels of the aquifer. The productivity gains of the Green Revolution were real and substantial, but the infrastructure it developed, especially in Punjab, Haryana and parts of Maharashtra, created a system where individual farmers had all the economic incentives to take as much as possible, as soon as possible, without any mechanism to internalize the cost of common overexploitation.

THE PEOPLE WHO ARE NOT AT THE TABLE: INDIA'S WATER INEQUITY & THE GOVERNANCE GAP

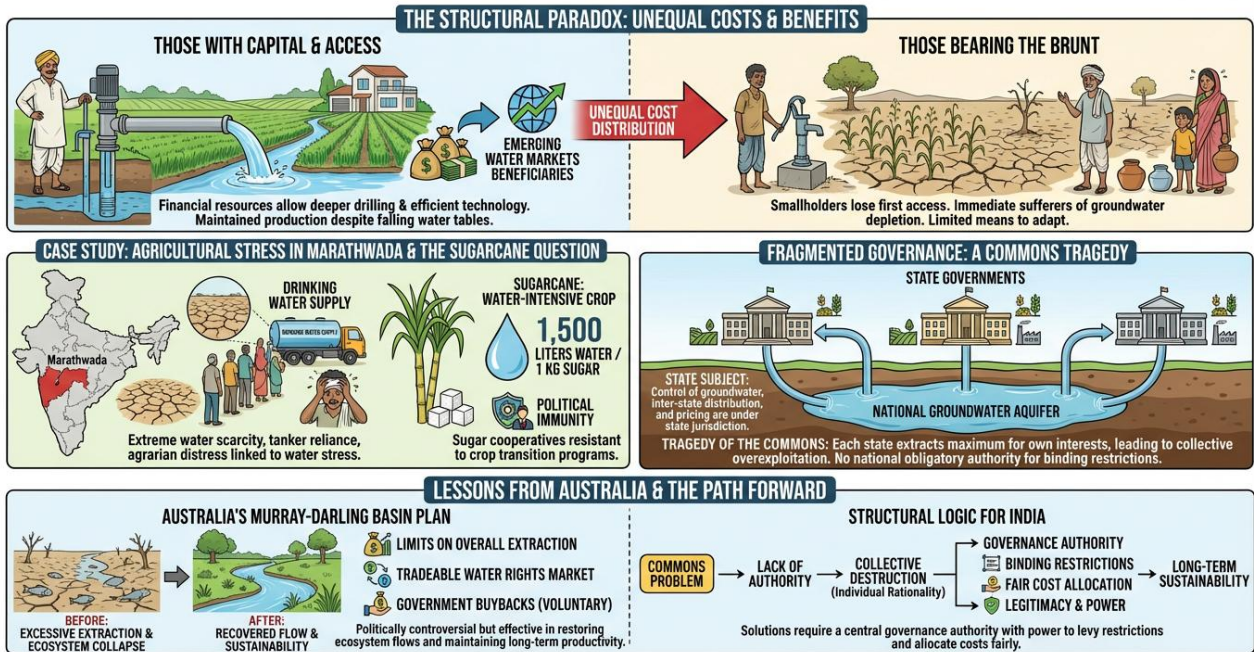


Fig -7: India's Water Inequity & The Governance Gap

One of the most reported case studies of agricultural water stress at its most extreme occurs in the Marathwada of Maharashtra. The area has passed through several years of extreme lack of water, where farmers lack the opportunity to irrigate their lands, where villages rely on water tankers to drink clean drinking water, and where a correlation has been documented between water stress in agriculture and agrarian distress among farmers. This is compounded by the sugarcane question. Maharashtra grows much of the sugar production in India, and sugarcane is one of the most water-intensive commercially-cultured crops, with a water demand of about 1,500 liters of water per kilogram. The sugar cooperative system has proved to be politically immune to the type of crop transition programs which would obviously make sense in terms of water budgeting.

The water governance architecture in India is not structured in such a way as to respond to these equity aspects. The Indian constitution categorizes water as a state subject and therefore, control of groundwater,



inter-state water distribution and pricing of agricultural water are all within the jurisdiction of the state. No national body has an obligatory authority to define extraction limits, recharge requirements or to organize among states that are linked by aquifers. This leads to a commons tragedy at the continental level: each state government has a strong political reason to extract as much as possible to benefit its own agricultural and industrial interests, and no state government has a reason to restrict itself in isolation when its neighbors are not.

Australia faced a form of this issue in the Murray–Darling Basin, where excessive amounts of river water used by several states had destroyed the ecosystem and caused the flow downstream to fall to environmentally important levels. The eventual solution that came out was the Murray Darling Basin Plan which included a limit on the overall water extraction in the basin, a market in tradeable water rights, and a government buyback program that paid out farmers who forgave their allocations to the government on a voluntary basis. It was a politically controversial year. It demanded a long-standing federal effort to counteract resistance on a state level. It caused real suffering to certain communities. And it worked. The overall extraction decreased, ecosystem flows have largely recovered and long-term productivity of the basin was maintained. The political situation in India does not easily allow a direct copying of the Australian model, yet the logic of the structure works. Commons problem solutions involve an authority of governance endowed with the legitimacy and power to levy binding restrictions on extraction, as well as to allocate the costs of adherence fairly. Lack of that power means that individual rationality will result in collective destruction.

9. WHAT LIQUIDATION ACTUALLY LOOKS LIKE

In finance, liquidation is the sale of assets by a company in order to settle its debts, typically at the end of bankruptcy proceedings that has found the company to be unable to reorganize into a viable going concern. The debt is paid off by the consumption of the asset base, and after the assets disappear, so too does the entity. What India is performing on its ground water is doing so in this reasoning with chilling accuracy. The water at the bottom of Punjab under the farms, under the tech parks of Bengaluru, under the growing suburbs of Delhi, is an asset. It is a result of the gradual seeping of rainfall and river water into permeable rock and sediment over a geological time-scale. Whenever it is actually depleted, it is non-renewable on human time scales. And it is being used up to finance economic activities, some of which are productive and in the national interest, some of which yield returns to go abroad, and some of which would not be subsidized by the country were it aware of the true cost.

The case of the data center is especially sober-minded. India is depleting groundwater which is not hers to cool servers which are not hers to drive models generated by companies with headquarters in the United States and make profits which are taxed in Ireland or Singapore. This does not qualify as an argument against foreign investment. It is a plea in favor of proper accounting. Unless the water cost of a hyperscale data center operation in Hyderabad is part of your lease contract, on your operating permit, or of any non-binding environmental commitment, the individuals whose wells will run dry first, or who are usually the smallholders and urban informal settlements near, are literally giving a free ride to the operation. The larger trend is the same. An implicit water subsidy charged against the aquifer is agricultural subsidies that make it economically rational in chronically water-stressed Maharashtra to grow water-intensive sugarcane. Export-based textile production in Gujarat utilizes intensive water resources and generates products where the value is reflected in the export income and the cost of water usage is not expressed in the price of the product. The recharge zones, flat and permeable lands on which rainfall penetrates into the ground, are being

systematically covered with concrete and asphalt to build peri-urban real estate development in all the tier-one and tier-two cities of India, as the demands on these aquifers increase.

WHAT LIQUIDATION ACTUALLY LOOKS LIKE: India's Groundwater Depletion

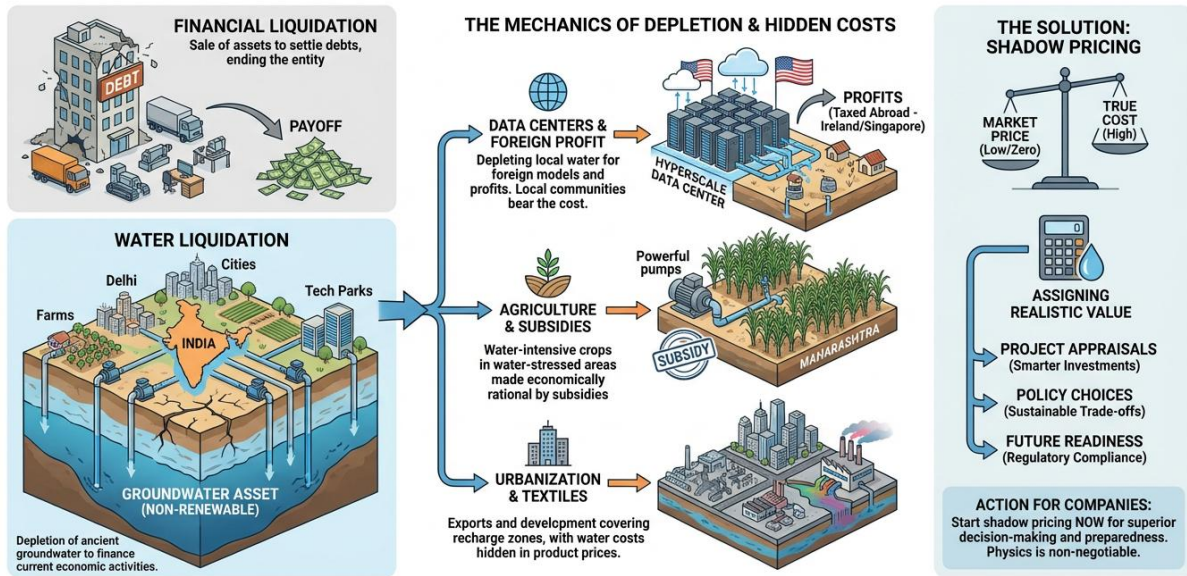


Fig -8: India's Groundwater Depletion

Shadow pricing is the most viable analytical tool to start changing this. Shadow pricing is the process of assigning a realistic economic value to a resource when such a value is not reflected in existing market prices and applying it to project appraisals and policy choices. Assuming that water to a data center in a water-stressed district were shadow-priced at its actual replacement costs, including the replacement costs of the recharge infrastructure necessary to compensate usage, much of the current project economics would be considerably less appealing. More to the point, the relative valuation of water-intensive initiatives and water-saving ones would be based on trade-offs, not a false plenty. The companies in India should start shadow pricing of water in their own project economics now before the regulation process compels the company to do so. Those initial companies to develop this discipline will possess superior quality decision making on site selection, process design and supply chains management. They will also be more prepared to the regulatory environment that will come, as the physics of groundwater depletion is non-negotiable.

10. WHAT CAN ACTUALLY BE DONE

The diagnosis section of this article is not an easy read. This prescriptive part must be sincere and not a hopeful part, since solutions to the problems do not come easy. They need the political will, long-term investment and readiness to incur the short time costs to avert the long term disaster. Yet there they are, and they are not enigmas. The truthful beginning point of individuals and households is recognizing scale. In India, households contribute between 5 and 8 percent of freshwater. Asking people to take shorter showers is not a bad idea, but 5% of demand will not be a solution when 80% of agricultural consumption and increased industrial consumption is causing the problem. The stronger personality is civic. Imposing the requirement

that municipal governments should release piecemeal, more frequent water audit statistics. Backing candidates with substantive water policy platforms and not having water as a side issue. Participation in watershed monitoring programs by citizens, some of which have generated actual data on aquifer health in areas lacking government monitoring.

WHAT CAN ACTUALLY BE DONE: SOLUTIONS TO INDIA'S WATER CRISIS

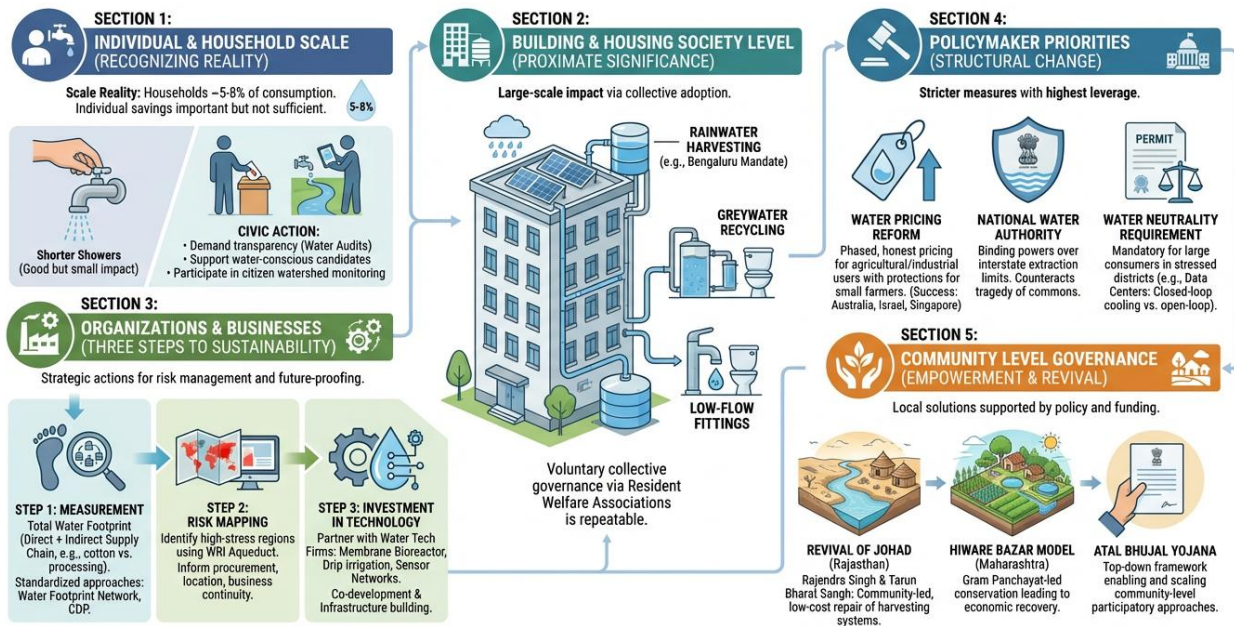


Fig -8: Solutions to India's Water Crisis

Action is more proximately significant at the building and housing society level. Large-scale harvesting of rainwater, greywater recycling and low-flow fittings are all ways of lowering the pressure on municipal supply and borewells. Since 2009, a rainwater harvesting requirement in large structures has existed in Bengaluru, and the experience of those buildings where it has been installed indicates that water demand is indeed being cut in a quantifiable way. What voluntary collective governance can do is evidenced by resident welfare associations that are self-imposing these standards, regardless of whether the municipal enforcement met them, and the example is repeatable.

There are three steps that can be undertaken right now, one by one, by organizations and businesses. Measurement is the first step. The picture of the total water footprint, including the water that is entrenched in the supply chains that most Indian companies rely on, is lacking. A garment maker in Tirupur can determine how much water it directly consumes in its dyeing and processing processes, but the water required to cultivate the cotton grown in Vidarbha is an indirect footprint, and is likely to be significantly greater. Until the complete footprint is understood, it cannot be dealt with. Standardized approaches to water footprint measurement such as those developed by the Water Footprint Network or the CDP Water Security framework are the basis on which all other measurements rely.

Risk mapping is the second step. Both the WRI Aqueduct platform (version 1.2 added the groundwater stress data at granular geographic scale) and enable organizations to determine which of their operations and suppliers fall within high or even extremely high water stress regions. This mapping activity directly supports



procurement, location of new facilities, diversification of supply chain, and business continuity planning. Those companies which have not yet completed this mapping are taking investment decisions and have not included a material slice of risk information.

The third is investment in technology. A new industry of water technology firms in India is focusing on issues such as cost-effective membrane bioreactor systems as a solution to wastewater recycling, drip irrigation systems designed to scale to smallholder farms, and sensor networks to monitor groundwater levels in real-time. These corporations require corporate partners and corporate customers to expand. By investing in, or even co-developing the water technology with these startups, the corporations are not only managing its own risk of operation, but also developing the infrastructure that the larger issue of concern needs. To a policymaker, the list of priorities is stricter and the reasoning is also straightforward. The one intervention with the greatest leverage is water pricing reform, to industrial and agricultural users. Subsidized water sends a price feedback that water is truly free, and as long as that price feedback is present, the behavior adjusted to be consistent with unlimited amounts will remain so. It is difficult and expensive politically to phase in honest pricing and the explicit protections needed to help small and marginal farmers to meet the costs they cannot absorb, which require time to create carefully. It has also succeeded in Australia, and in Israel and in Singapore, where pricing of water was seen as a policy tool and not a political cost.

The form of government that the common people in India need is a national water authority with real binding powers over the extraction of groundwater across state boundaries. The current disjointed system, where individual state governments make uncoordinated extraction choices with no national coordinating or enforcement mechanism, is actually creating just the tragedy of commons theory would predict. The political desire by the government to establish such a body and arm it has not existed on the federal level, yet the evidence base upon which either is needed is now too large to be turned a blind eye to. The water neutrality requirement should become a matter-of-course when it comes to issuing water operating permits in water-stressed districts to data centers and other large water consumers. One type of cooling technology is closed-loop cooling. It is also costlier than open-loop evaporative cooling, the reason why operators use water when possible. When closed-loop systems or similar recharge requirements become a regulatory baseline, not a voluntary corporate social responsibility measure, the economics shift the economics and will encourage more appropriate technology choices at the design phase.

Water governance at the community level should be given policy attention, and funding. A revival of johad in Rajasthan, implemented with an annual budget of just 50,000 by its founder over decades, Rajendra Singh and the Tarun Bharat Sangh, had shown that it is within the reach of local communities, with legal acknowledgment and a small financial outlay, to repair ruined water harvesting systems and reverse the disappearance of groundwater resources in a measurably large way. The model improvement of gram panchayat-led conservation of a formerly water stressed village in Maharashtra, Hiware Bazar, to one of the most water-contained villages in the state and the resultant economic indicators, such as increasing per capita income, followed the water recovery. These are not fortuitous achievements. They are recorded, repeatable results that indicate the direction that participatory water governance could take in the presence of the enabling framework. It is the Atal Bhujal Yojana scheme that offers a top-down framework in which these approaches at the community level can be extended, and the outcomes of its implementation where done in earnest are promising signs that the model can transfer.

11. RETHINKING THE NARRATIVE

Among the most intractable impediments to solving water bankruptcy in India is not the lack of solutions. It is a cultural story of powerlessness that puts the issue into the hands of something larger than either an individual or an institution. The monsoon is or is not. The reservoir is constructed by the government or not. The issue is just too big to be influenced by an individual actor. This story makes sense considering the magnitude of what is being faced and it is not right.

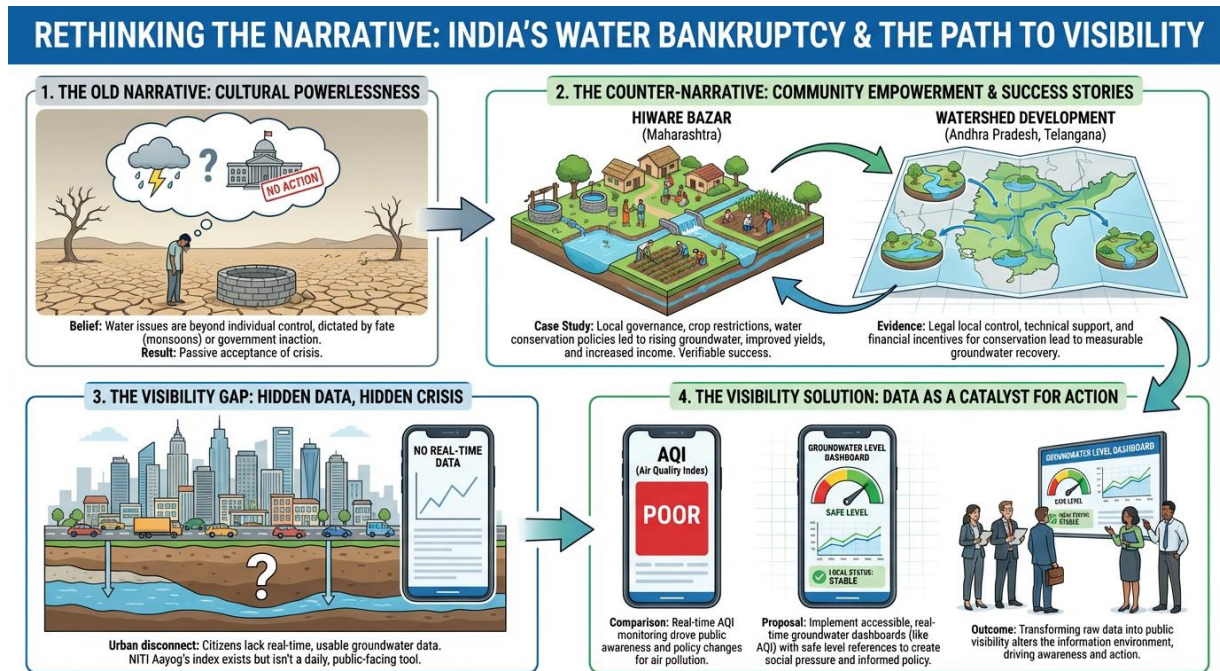


Fig -9: India's Water Bankruptcy & The path to Visibility

One of the most commonly mentioned counter-examples is the village of Hiware Bazar in Ahmednagar district, Maharashtra, which is worth repeating specifically because it is documented and verifiable and not aspirational. The village was one of the most acutely water stressed in the state in the 1990s, with chronic crop failures, seasonal migration and dropping groundwater levels. An initiative by a gram panchayat, which applied a whole set of water conservation policies such as prohibiting water-demanding crop varieties such as sugarcane, building of check dams and percolation tanks, and the establishment of shared rules on water use, turned the tide around some ten years. Groundwater levels rose. Crop yields improved. The level of income per capita rose significantly. The village turned out to be the case study that NITI Aayog and other policy organizations have used as an example of what community governance can accomplish.

In Andhra Pradesh and Telangana there is similar evidence created through watershed development programs on larger geographic scales. The statistics do not work in a straight line, there are cases where programs have been poorly implemented and the results have been limited but the general trend is very clear; as long as communities have legal control over their local water resources, technical support provided to implement conservation efforts and financial incentives provided to sustain the same, there will be measurable increases in the level of groundwater. The visibility issue is a fact and it can be resolved. The urban population of Indians does not know the level of groundwater under their cities as the data is not delivered in usable, real-time formats that resonate with everyday life. The Composite Water Management Index published by NITI Aayog was a welcome initiative to bring this information into view at an aggregate



level, although it has not been operationalized into the type of granular, frequently refreshed publicly facing dashboard that builds social pressure to act locally.

The history of air quality monitoring in India is a good point of comparison. A decade of serious air pollution in Delhi was reported on annual reports which were followed by policy attention on high profile incidents and forgotten afterwards. This changed with the implementation of real time air quality monitoring and the inclusion of the AQI measure in popular weather and mapping applications. The politics of air pollution were no longer episodic as the people were able to see the air quality number on a daily basis on their phone. It was followed by investments in monitoring infrastructure, emission controls, and responses to protect the health of the population. Water should also have a similar visibility architecture available live groundwater level displays with references to safe extraction levels, made as accessible and ubiquitous as the AQI. The data of the Central Ground Water Board is to a large extent available. The interface that will turn the raw data into the publicly visible form that people see daily is the presentation layer it is not yet present on the scale it needs to be. Neutral observers of this gap are not technology companies and data journalists. They are technically able to construct the tools that would seal it. An effective, publicly available, dashboard, of real-time aquifer levels of major Indian cities, based on existing monitoring well data, with reference to past safe extraction levels, and presented at the level that journalists, urban planners, and citizens can use without specialist training, would alter the information environment surrounding the water policy in ways that no lobbying by itself can accomplish.

12. THE CLIMATE MULTIPLIER, WHY THE WINDOW FOR REFORM IS NARROWER THAN IT LOOKS

Policy failure or economic mismanagement is not the only source of water bankruptcy in India, although both matters are major contributors. It is similarly being created by alterations of the physical climate regime that are squeezing the natural recovery processes on which India has long relied in managing its water. The Indian monsoon, supplying about 70 to 80 per cent of the yearly rainfall in 3 or 4 months, has been detectably becoming more erratic over the last 30 years. Scientific publications issued by the Indian Institute of Tropical Meteorology and supported by global data on climate indicate that although the amount of monsoon rainfall has not decreased significantly in total form, its structure and distribution has changed. Wet spells are now more intensive and shorter. The dry spells in the monsoon season have increased. The practical implication is that higher amounts of rain occur in the form of rapid high intensity events that generate surface runoff instead of groundwater recharge since the soil cannot absorb the rapidly falling water at the rate at which it falls. Less rain comes in the form of slow and continuous rain that seeps into the ground. India receives about the same quantity of rainfall but does not store it in its aquifers.

Northern India is experiencing another axis glacial recession. The Himalayan glaciers which supply the Indus, Ganges and Brahmaputra are melting at recorded rates because of increasing temperatures. This in fact boosts river flows in the short run because of the melting of stored ice. Long term In the medium to long term, it will decrease the dry-season base flow upon which millions of people in the Indo-Gangetic Plain rely. This is not a far-off thing. The Wadia Institute of Himalayan Geology and international research organisations such as the Intergovernmental Panel on Climate Change have recorded a rapidly increasing loss of ice over the Hindu Kush Himalayan range, and forecasts that, in most warming scenarios, the contribution of meltwater to river systems will see major declines by the mid-century.

The increase in temperatures is enhancing the rate of evapotranspiration in the Indian agricultural belt, that is, the higher the temperature, the more water a crop requires to yield the same quantity of products. This is already being felt in irrigation demand in Madhya Pradesh and Maharashtra, as farmers are reporting higher

applications of water per season than they reported 20 years ago, on the same crop and on the same land. This is not anecdotal. It agrees with agronomic studies of temperature and crop water demand. The economic reforms and governance that this article proposes will always be the right ones. Clear water pricing, national water regulation, water neutrality of industrial consumers and watershed governance by communities are all feasible and desirable. They must, however, be designed bearing in mind that the climate window is actually closing. A reform program based on the proposition that effective groundwater recharge will bring aquifer levels back to 1990s levels is potentially establishing an unrealistic goal. The more practical objective, and one that remains a critical one, is to stabilize depletion to a level at which aquifers might offer a significant buffer to variability in rainfall, despite an increase in that variability. This will necessitate not only a decrease in extraction but also an investment in recharge infrastructure: check dams, percolation tanks, urban stormwater collection systems, and ensuring that the recharge areas are not encroached by development.

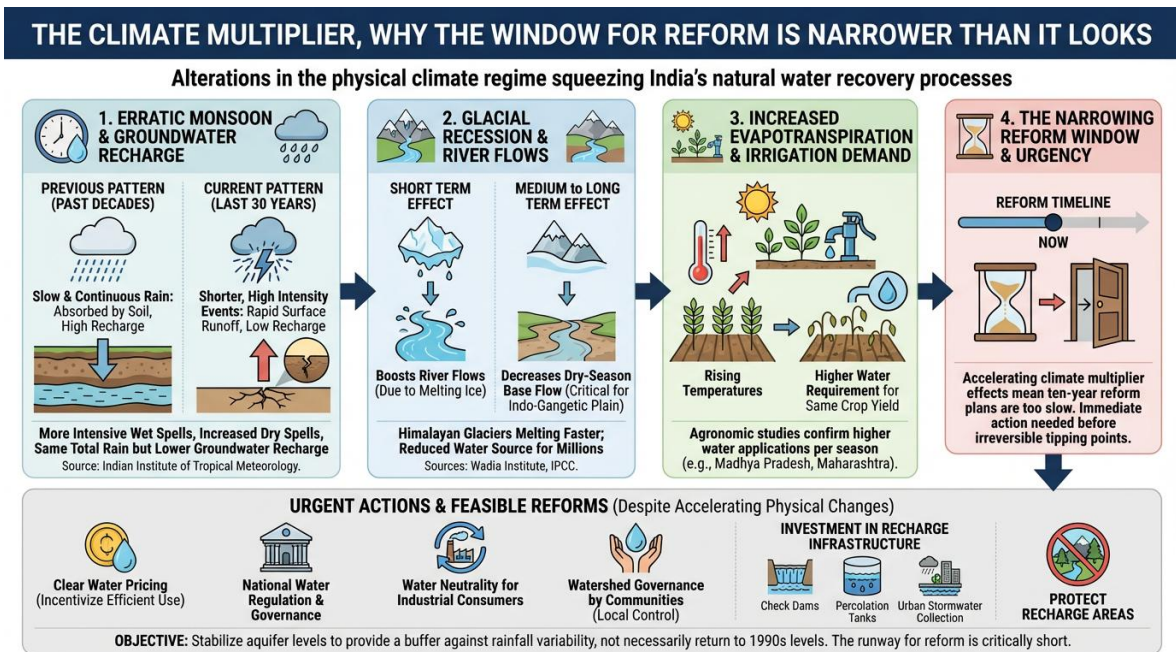


Fig -10: The Climate Multiplier

The calculus of urgency is also altered by the climate multiplier. When the physical system that a governance reform is intended to stabilize is becoming worse at an accelerating rate, a ten-year governance reform design and implementation process would look quite different. India has no ten-year runway in its water reforms. Their one is shorter than most of those who are making the decisions, seem to believe.

13. CONCLUSION

13.1 The Budget Nobody Writes

All financially savvy individuals understand how to budget. Rent, loan payments, grocery, insurance, school fees, investment payments. These line items are followed since the results of not following them are close and instant. Water has never been an item of this budget since for most Indian history, it did not have to be. It came out of the tap, or out of the well, or of the rain, and the thought that it might ever come to an end was



not a business procedure worthy of daily attention. Water is already on the Bengaluru menu in 2024, with tanker loads of 4,000 to 5,000 rupees each, and the supply already rationed against demand, and so valuable as to cause a waterfall to stop. The distance between that experience and the rest of urban India is less than most people who feel comfortable with the sound of the term someday are taking into consideration.

The main points made in this article boil down to the four points that are worthy of being taken off the page. To begin with, India is suffering water bankruptcy, not water crisis. The difference sets the type of response needed, and the type of response being used is insufficient to the present state. Second, water bankruptcy overlapping with the Indian population spending 43 billion dollars on the AI infrastructure renders unpriced subsidy to foreign-based technology corporations on the behalf of the Indian people, and especially vulnerable members of Indian communities. Explicitly making that subsidy contingent and conditional on real water neutrality requirements is not anti-development. It is dynamic development accounting. Third, the commoditization of water by commodity markets and the packaged water business is already spreading the costs and benefits of scarcity along lines of already existing inequality. The extent to which this dynamic can play out before structural correction depends on governance decisions that are made today. Fourth, solutions are available at all levels including the household up to the national policy framework, and there is no paucity of evidence on what works. It is found in Hiware Bazar, in the experience of pricing in Israel, in the experience of basin management in Australia, and in the performance on operations of the Atal Bhujal Yojana where it has been taken seriously. Water bankruptcy is not responsive to ideology or industry needs. It reacts to the accounting and physics. The accounting, at this point, is racing with India. Changing it is still, at least, possible.

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