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An Empirical Analysis of Rail Neer Supply Deficit in Indian Railways: Institutional, Operational, and Policy Perspectives

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Abstract

Drinking safe water on trains is essential for public health and service quality. Indian Railways introduced Rail neer through Indian Railway Catering and Tourism Corporation to provide affordable and safe packaged drinking water to passengers. However, Rail neer has not been able to meet growing passenger demand, leading to a persistent supply shortage across many routes and trains. This study examines the reasons behind the Rail neer supply deficit using secondary data from IRCTC Annual Reports (2021–23), CAG audit observations, FSSAI guidelines, Ministry of Railways publications, and media sources. The findings show that the shortage is not only due to high demand but also structural and operational weaknesses. Production plants operate at only about 65–75% of their installed capacity. There is excessive dependence on centralized plants, weak coordination in distribution, lack of real time inventory tracking, and limited monitoring of PPP operated units. Demand increases sharply during summer and festive seasons, with gaps reportedly reaching up to 46% during peak periods. In such situations, private brands like Bisleri, Kinley, and Aquafina fill the gap. Although Rail neer remains competitively priced and quality certified, recurring complaints on passenger grievance platforms highlight issues of availability, especially on premium trains. The study recommends decentralized mini plants, better PPP regulation, technology based supply chain systems, seasonal buffer planning, and pricing reforms to strengthen Rail neer's role as a reliable water supply solution for passengers.

Keywords: Rail neer, IRCTC, Supply Chain, Passenger Satisfaction, Public Health.

1. Introduction:

Indian Railways stands as one of the world's most extensive and complex transportation networks a living testament to more than 170 years of institutional evolution since its founding in 1853(1). With over 67,000 kilometre's of track, more than 7,000 stations, approximately 23 million daily passengers, and a freight throughput of around 3 million tons per day, Indian Railways is not merely a transport utility but a social lifeline binding the diverse geography and population of India together. It operates under a framework of 18 administrative zones, each managing its regional operations independently under a zonal headquarters, yet all aligned under the overarching governance of the Ministry of Railways. Passenger welfare on trains extends far beyond seat comfort and punctuality. Access to safe, affordable drinking water during travel particularly on long distance journeys that can span 12 to 48 hours constitutes an essential public health priority. Dehydration, waterborne disease, and heat related illness remain genuine risks for railway passengers, especially during India's grueling summer months when temperatures in interior zones such as Rajasthan, Vidarbha, and the Indo-Gangetic plain routinely exceed 45 degrees Celsius. For the millions of passengers who travel in general and sleeper class compartments, they often without access to private food supplies or the purchasing power for high priced alternatives the availability of regulated, affordable packaged water is a matter of fundamental welfare. It is within this backdrop that the launch of Rail neer by IRCTC represented a transformative policy initiative. Conceptualized as a high quality, government certified, price controlled packaged drinking water available exclusively

through railway channels, Rail neer was designed to simultaneously address passenger safety, eliminate adulterated water sales that had historically plagued railway stations, and enhance brand trust in IRCTC's catering portfolio. Two decades since its inception, however, Rail neer has remained plagued by persistent, geographically widespread, and seasonally acute supply shortages that fundamentally undermine its original promise. This manuscript undertakes a systematic empirical investigation of the Rail neer supply deficit. It contextualizes the problem within Indian Railways' institutional architecture, traces the operational and structural drivers of the shortage, analyses demand supply dynamics across seasons and station categories, draws comparative lessons from private packaged water brands and international transit water supply practices, and offers a comprehensive set of evidence based policy recommendations. The scope of the study encompasses all five railway zones, with particular attention to high deficit corridors and the institutional mechanisms or their absence that govern Rail neer production and distribution(2).

1.1 Historical Context and Evolution of Rail neer

IRCTC was incorporated on 27 September 1999 as a wholly owned subsidiary of the Ministry of Railways, established to professionalize catering, tourism, and hospitality services across Indian Railways. The genesis of Rail neer lay in a well documented public health crisis: the widespread sale of adulterated and unsafe drinking water at stations and on trains by unlicensed vendors who refilled used branded bottles with tap water or contaminated sources, sometimes relabeling them deceptively. In the early 2000s, multiple media investigations and health ministry reports documented the scale of this practice, particularly on major routes connecting North India. Rail neer was formally launched with the establishment of the first bottling plant at Nangloi, New Delhi, around 2003. The product was positioned as IRCTC's quality assurance flagship in the catering domain a visible demonstration of the corporation's commitment to passenger safety. Over the subsequent two decades, the Rail neer network expanded to 20 operational plants distributed across India's five railway zones, with a combined installed capacity of 18.40 lakh bottles per day and production meeting the rigorous quality standards of BIS IS: 14543 and FSSAI regulations. Despite this institutional investment, Rail neer's supply coverage has remained deeply uneven and structurally insufficient. As of 2023-24, Rail neer meets only approximately 50-55% of estimated daily passenger demand across Indian Railways, with the gap filled imperfectly and inequitably by private branded water vendors operating under IRCTC's supplementary licensing framework(3).

2. IRCTC: Institutional Profile and the Rail neer Mandate:

The Indian Railway Catering and Tourism Corporation Ltd. (IRCTC), designated as a 'NavRatna' Central Public Sector Enterprise (CPSE) under the Ministry of Railways, occupies a unique position in India's public sector landscape. With an authorized capital of Rs.250 crore and paid up capital of Rs.160 crore, IRCTC's corporate office is located at the World Trade Centre, New Delhi(4). The corporation's Initial Public Offering (IPO) in 2019 was subscribed approximately 112 times, reflecting exceptional investor confidence in its business model and the quality of its diversified revenue streams. IRCTC's functional scope encompasses four principal verticals. First, its Online Ticketing platform processes over 8 lakh transactions daily and operates as the world's largest rail ticketing interface, having fundamentally transformed the way India books train travel by eliminating the legacy of long station queues and paper based reservation systems. Second, Catering Services encompasses onboard meal services, the e-catering programme that allows passengers to order meals from QSR partners including Domino's, McDonald's, and regional restaurant chains, and the management of food plazas and Jan-Aahar outlets at major stations. Third, the Tourism vertical offers pilgrim tours, luxury train journeys such as the Maharajas' Express and Palace on Wheels, and outbound international packages. Fourth, and most relevant to this study, the Rail neer division manages IRCTC's packaged drinking water production and distribution infrastructure. The Rail neer mandate is distinctive because unlike IRCTC's other revenue generating activities, packaged drinking water supply serves a dual purpose: revenue generation and public health service delivery. Rail neer is price regulated by the Ministry of Railways at Rs.14 per one litre bottle significantly below private market MRP of Rs.20-25. This pricing constraint, while passenger friendly and rooted in equity considerations, creates a structural tension at the core of Rail neer's sustainability: IRCTC's ability to reinvest in infrastructure upgrades, capacity expansion, and supply chain technology is materially constrained by margins that are thin relative to the capital intensity of multistage water purification and nationwide distribution(5).

2.1 Rail neer as a Public Health Instrument:

From a public health governance perspective, Rail neer's strategic significance extends well beyond commercial considerations. India's railway network serves not just urban commuters and tourists but also millions of economically vulnerable passengers' agricultural laborers, migrant workers, students, and pilgrims who travel in general and sleeper class compartments with limited access to alternative safe water sources during transit. For these passengers, the availability of affordable, certified Rail neer represents both health protection and an economic justice imperative(6).The World Health Organization's Guidelines for Drinking Water Quality (4th Edition, 2017) emphasize the primacy of multibarrier purification in ensuring water safety in mass transit contexts, where single point contamination can affect large numbers of individuals. Rail neer's 9stage purification protocol encompassing raw water screening, pre chlorination, pressure sand filtration, activated carbon filtration, micron cartridge filtration, Reverse Osmosis (RO), Ultraviolet (UV) disinfection, Ozonation, and hygienic automated bottling meets or exceeds these international benchmarks. The institutional failure examined in this study, therefore, lies not in Rail neer's product quality design but in supply chain governance, production scalability, and accountability mechanisms(7).

3. Rail neer Production Infrastructure: Capacity and Geographic Distribution:

IRCTC currently operates 20 Rail neer packaged drinking water plants distributed across India's five major railway zones(8). Of these, nine plants operate under the Public Private Partnership (PPP) model with capital support from IRCTC, while the remainders are fully IRCTC owned and operated. The total installed production capacity stands at 18.40 lakh bottles per day; however, effective operational capacity accounting for planned maintenance cycles, unplanned downtime, water source variability, bottling line speed constraints, and logistical backlogs typically ranges between 65-75% of installed capacity on any given day(9). The table1 presents the regional distribution, capacity profile, and operational characteristics of these plants.

Table 1: Regional Distribution, Capacity, and Operational Profile of IRCTC Rail neer Plants (202324)

Zone	Plant Location	Capacity (Lakh Btls/Day)	Mode	Key Constraints
Northern	Nangloi, Delhi	1.50	IRCTC Owned	Peak demand, summer stress
Northern	Hapur, UP	0.80	PPP Mode	Groundwater stress, logistics
Eastern	Danapur, Bihar	1.20	IRCTC Owned	Ageing infrastructure
Eastern	Jagiroad, Assam	0.80	PPP Mode	Transportation delays
Eastern	Sankrail, WB	1.00	PPP Mode	High station level demand
Central	Mandideep, MP	1.00	PPP Mode	Surge production limits
Central	Maneri, MP	0.80	PPP Mode	Scale limitations
Western	Sanand, Gujarat	1.20	PPP Mode	Seasonal mismatch
Western	Ambernath, MH	1.30	IRCTC Owned	Distribution inefficiencies
Southern	Palur, Tamil Nadu	1.40	IRCTC Owned	Maintenance downtime
Southern	Parassala, Kerala	1.00	PPP Mode	Geography/logistics
Southern	Bilaspur, CG	1.00	IRCTC Owned	Moderate utilization

Southern	Nagpur, MH	1.20	PPP Mode	Uneven coverage
Southern	Amethi, UP	1.00	PPP Mode	Raw water availability

The geographic distribution of plants, while broadly reflective of major railway corridors, exhibits critical gaps that contribute directly to the supply deficit. The Northeastern railway zone which encompasses states such as Assam, Meghalaya, Manipur, and Mizoram has minimal production coverage, with only the Jagiroad plant (Assam) serving the entire region. Similarly, the high demand Rajasthan corridor served by major routes including the Delhi-Mumbai, Delhi-Jaipur, and Jodhpur bound trains remain dependent on plants in neighboring zones, creating transportation delays that compound supply shortages during summer peaks. A critical distinction must also be drawn between installed capacity and effective capacity. The 18.40 lakh bottles per day installed figure represents theoretical maximum output under ideal conditions(10). In practice, a 65-75% effective utilization rate as observed across IRCTC's plant network translates to an effective daily output of approximately 11,9613,80 lakh bottles, representing a structural production shortfall before demand variations are even considered(11).

3.1 The Nine Stage Purification Process: Technical Excellence and Operational Constraints:

Rail neer's 9 stage water treatment process is simultaneously its greatest quality assurance mechanism and a significant bottle neck in achieving rapid scalability. Each production stage serves a specific purification function and introduces both quality benefits and throughput constraints. The process begins with raw water intake and screening to remove large, suspended particles, followed by pre chlorination to eliminate initial microbial load. Water then passes through Pressure Sand Filtration (PSF) to remove suspended solids and turbidity, followed by Activated Carbon Filtration (ACF) to eliminate organic compounds, Oduor, residual chlorine, and color(12). The subsequent micron cartridge filtration provides fine level particle removal, protecting the critical Reverse Osmosis (RO) membranes that form the technological core of the purification system. The RO stage removes dissolved salts, heavy metals, chemical contaminants, and microorganisms delivering water purity levels comparable to international premium bottled water standards. UV disinfection inactivates any residual bacteria, viruses, and pathogens without altering chemical composition, while Ozonation provides residual microbial protection and shelf life extension. Finally, hygienic automated bottling under sterile conditions with food grade PET bottles ensures product integrity up to the point of consumption. This capital intensive, multi barrier production philosophy makes Rail neer technically superior to most private alternatives. However, it also limits production scalability significantly. RO membranes the most critical and expensive component require periodic chemical cleaning cycles during which throughput drops by 2030% for periods of 2472 hours. During membrane replacement typically every 1218 months effective capacity can drop by 40% for the plant concerned. These maintenance related capacity fluctuations are predictable but create localized supply gaps in zones served primarily by a single plant. The subsequent micron cartridge filtration provides fine level particle removal, protecting the critical Reverse Osmosis (RO) membranes that form the technological core of the purification system. The RO stage removes dissolved salts, heavy metals, chemical contaminants, and microorganisms delivering water purity levels comparable to international premium bottled water standards. UV disinfection inactivates any residual bacteria, viruses, and pathogens without altering chemical composition, while Ozonation provides residual microbial protection and shelf life extension. Finally, hygienic automated bottling under sterile conditions with food grade PET bottles ensures product integrity up to the point of consumption. This capital intensive, multi barrier production philosophy makes Rail neer technically superior to most private alternatives. However, it also limits production scalability significantly. RO membranes the most critical and expensive component require periodic chemical cleaning cycles during which throughput drops by 20-30% for periods of 24-72 hours(13). During membrane replacement typically every 12-18 months effective capacity can drop by 40% for the plant concerned. These maintenance related capacity fluctuations are predictable but create localized supply gaps in zones served primarily by a single plant(14).

4. Demand Supply Analysis: Magnitude and Seasonality of the Deficit:

A rigorous demand supply analysis is central to understanding the Rail neer shortage in its full dimensions. Passenger demand for Rail neer is not constant: it fluctuates dramatically by season, train type, route geography, time of day, station category, and passenger demographics. Estimating actual demand is methodologically complex because Indian Railways does not publish granular water consumption data(15). Demand must therefore be derived from passenger traffic statistics, consumption benchmarks from public health literature, train occupancy rates, and rail zone specific climate patterns. Based on conservative consumption benchmarks 1 litre per passenger for journeys of 48 hours, 1.52 litres for journeys of 816 hours, and 23 litres for journeys exceeding 16 hours and accounting for Indian Railways' daily ridership of approximately 23 million passengers (of whom roughly 60-65% travel on long distance or intercity trains), estimated daily demand for packaged water across Indian Railways ranges from 1415 million litres on ordinary winter days, spiking to 22-24 million litres during summer peaks and 24+ million litres during festival travel surges(16, 17). The table 2 presents the estimated seasonal demand supply gap analysis.

Table 2: Estimated Seasonal Demand Supply Gap for Rail neer (2023-24, Indicative Estimates)

Season / Period	Estimated Demand (Lakh Btls/Day)	Effective Supply (Lakh Btls/Day)	Deficit (Lakh Btls/Day)	Gap (%)
Winter (Oct-Feb)	12.0	11.5	0.5	~4%
Summer Peak (Apr-Jun)	22.0	13.8	8.2	~37%
Monsoon (Jul-Sep)	14.5	12.0	2.5	~17%
Festival Season	24.0	13.0	11.0	~46%
Annual Average	17.0	12.7	4.3	~25%

The data presented in Table 2 starkly illustrates the structural rather than episodic nature of the Rail neer deficit. Even during winter, a baseline gap of approximately 4% exists. During the summer peak season, effective supply falls to 13.8 lakh bottles against estimated demand of 22 lakh, creating a 37% shortfall. During major festival seasons when train occupancy consistently exceeds 100% and passenger desperation for hydration is highest, the deficit can reach 46% meaning that nearly half of the estimated demand for Rail neer goes unmet from IRCTC's own supply.

4.1 Zone wise Capacity Utilization Analysis

Beyond aggregate national figures, the capacity utilization analysis reveals significant interzonal variation that maps closely onto the geographic distribution of passenger complaints and supply shortages. The following figure presents a visual representation of zone wise utilization rates based on IRCTC operational data and secondary estimates for 202324.

Zone	Capacity Utilisation (Visual)	Rate (%)
Northern Zone		72%
Western Zone		65%
Central Zone		68%
Eastern Zone		58%

Southern Zone		74%

Figure 1: Zone wise Rail neer Plant Capacity Utilisation Rate (202324 Estimates)

Description: The Figure 1 represents the Filled blocks represent utilised capacity; unfilled blocks represent idle capacity. Target threshold: 85%

The Eastern Zone's lowest utilisation rate of 58% is particularly alarming given that it encompasses some of India's most densely populated and high traffic travel corridors, including routes from Howrah, Sealdah, Patna, and Varanasi. The combination of ageing plant infrastructure, high summer temperatures affecting raw water quality, and complex logistics networks makes the Eastern Zone the most deficitprone region in the Rail neer ecosystem. The Northern Zone's 72% utilisation, while above the Eastern baseline, remains significantly below the 85% efficiency threshold that IRCTC's operational guidelines notionally target(18).

4.2 Current Examples: Evidence from 2023-2025:

The abstract nature of supply chain deficits becomes vivid and urgent when examined through specific contemporary evidence. The following incidents from 2023-2025 illustrate the operational reality of the Rail neer shortage and its human consequences:

* Parliamentary Attention (2024): Multiple questions were raised in both the LokSabha and RajyaSabha regarding persistent non-availability of Rail neer on premium trains including Rajdhani Express, Shatabdi Express, and Vande Bharat Express. The Ministry of Railways acknowledged the deficit in written replies, attributing it to logistical challenges, uneven plant distribution, and capacity constraints an admission that effectively confirmed the structural nature of the problem.

* Rail Madad Complaints (2023-24): The Rail Madad grievance portal recorded a 28-34% year on year increase in complaints related to non availability of Rail neer and related drinking water quality issues during 2023, according to media analyses. The Northern Railway zone registered the highest absolute complaint volume while the Eastern Railway zone recorded the highest per train complaint rate consistent with the capacity utilization data presented in Figure 1.

* CAG Audit Findings (2022): The Comptroller and Auditor General's audit report on Indian Railways' catering services highlighted systemic failures in Rail neer supply management, documenting instances where trains departed major originating stations without adequate Rail neer stock a fundamental operational failure that no amount of enroute restocking can remedy.

* Summer 2024 Crisis: Investigative media reports documented acute Rail neer shortages across trains operating through Rajasthan and Uttar Pradesh during the exceptionally hot summer of 2024, when temperatures exceeded 47-48 degrees Celsius in several districts. Passengers in general class compartments reported being unable to purchase Rail neer for stretches of 6-8 hours, with private vendors reportedly charging Rs.30-50 per litre two to three times the regulated Rail neer price.

* Vande Bharat Express (2023-25): Despite the Vande Bharat Express being positioned as Indian Railways' premium semihighspeed showcase product, multiple operational services reported Rail neer unavailability during early operational phases and continued to register water related complaints in 2024 and 2025. This reputational juxtaposition India's most modern train unable to guarantee its cheapest onboard amenity encapsulates the systemic gap at the heart of the Rail neer crisis.

* Mo Jal vs. Rail neer Comparison (2024): Odisha government's 'Mo Jal' initiative providing packaged drinking water at Rs.5 per 500ml pouch through 1,500+ vending machines at bus stands and public spaces demonstrated that government managed distributed water supply at affordable prices is operationally achievable with the right technology and distribution architecture, setting a domestic benchmark that underscores Rail neer's delivery shortcomings.

5. Station Categorization and Supply Prioritization:

IRCTC's approach to Rail neer supply allocation is fundamentally shaped by Indian Railways' multi tiered station Categorization framework, which has been revised and refined several times since the initial classification systems of the 1990s. The current Categorization framework, effective since 2017 under Railway Board circulars, classifies stations into Non Suburban Grade (NSG) and Suburban Grade (SG) categories, further subdivided by annual passenger earnings and footfall into six NSG subgrades and three SG subgrades. For the purposes of IRCTC's catering and Rail neer supply operations, the more operationally relevant classification remains the traditional A1, A, B, C, and D Categorization that correlates with passenger footfall and commercial significance. This Categorization directly determines inventory norms, vendor licensing terms, logistics frequency, quality inspection intensity, and the mandatory versus discretionary nature of Rail neer supply at each station class(19, 20). Table 3 presents the mapping of station categories to Rail neer supply characteristics.

Table 3: Station Categorization and Rail neer Supply Profile

Category	Example Stations	Daily Footfall	Rail neer Status	Key Challenge
A1 / NSG1	CSMT, Howrah, NDLS, Chennai Central	>100,000	Mandatory	Peak season stock outs
A / NSG2	Madurai, Tirupati, Amritsar, Agra	30,000100,000	Regular Supply	Irregular replenishment
B / NSG3	District HQs, Suburban Junctions	10,00030,000	Demand Based	Dependency on private vendors
C / NSG45	Taluk/Town Stations	2,00010,000	Sporadic	Often absent
D / HG Halt	Rural Halts	<2,000	Absent	No IRCTC presence

5.1 NSG1 Station Analysis: High Volume Demand Points

India's NSG1 or A1 category stations represent the highest volume Rail neer demand points in the network and the locations where supply failures are most visible and most consequential from passenger welfare and brand reputation perspective. Table 4 presents footfall data for key NSG1 stations and the Rail neer supply challenges specific to each.

Table 4: NSG1 HighTraffic Station Footfall and Rail neer Supply Context

Station	Approx. Daily Footfall	Annual Footfall	Rail neer Supply Challenge
Howrah Junction, WB	167,000	~61 million	High variability in summer; Eastern Zone plant capacity constraints
New Delhi (NDLS)	108,000	~39 million	Summer peak demand; close Nangloi plant provides partial relief
Mumbai CSMT	140,000	~51 million	Suburban+longdistance mix; Ambernath plant under strain
Chennai Central	82,000	~30 million	Better coverage from Palur plant; distribution more effective
Sealdah, WB	140,000+	~51 million	High suburban volume; Rail neer less critical for short trips

Madurai Junction, TN	38,000	~14 million	Midtier demand; Southern plants partially cover this route

5.2 Equity Implications of Category Based Supply Allocation

The current category based supply model creates a systematic and ethically troubling inequity in Rail neer access. Passengers travelling from or through B, C, and D category stations who are disproportionately from lower income economic strata and often travelling in general or unreserved class compartments have the least reliable access to affordable, quality assured drinking water(21). This stands in direct contradiction to the Rail neer initiative's founding rationale of ensuring universal access to safe, regulated water across Indian Railways, regardless of journey class, route, or station category. The equity gap is further compounded by the time pressure dynamics of express train operations. Major express, Rajdhani, and Shatabdi trains spend minimal time at lower category intermediate stations, reducing the commercial viability for vendors to maintain Rail neer inventory at these points. Platform vendors at smaller stations predominantly offer private brands at unregulated prices or, in many documented cases, unregulated water sold in refilled and re-labelled bottles precisely the practice that Rail neer was designed to eradicate. The absence of IRCTC's regulatory reach at these stations thus perpetuates the original problem that motivated Rail neer's creation two decades

ago(8, 9).

6. Comparative Analysis: Rail neer versus Private Packaged Water Brands:

The chronic Rail neer shortage has created a market vacuum that private packaged water brands have moved to fill most prominently Bisleri (Bisleri International Pvt. Ltd.), Kinley (CocaCola India), and Aquafina (PepsiCo India), alongside numerous regional brands such as Bailley (Parle Agro), Yes Natural, and hundreds of statelevel FSSAIregistered producers. Under IRCTC's licensed vendor framework, these brands are permitted to sell on trains and at stations as supplementary supply when Rail neer is unavailable. While this provision serves as a pragmatic short term gap filling mechanism, it raises fundamental questions about IRCTC's accountability, quality assurance sovereignty, and the coherence of its public health mandate(22). Table 5 represents that Rail neer cheaper, regulated; private brands dominate scale, distribution.

Table 5: Comparative Analysis Rail neer versus Leading Private Packaged Water Brands (2024)

Parameter	Rail neer (IRCTC)	Bisleri / Kinley / Aquafina	Remarks
Retail Price (1 L)	Rs.14 (regulated)	Rs.2025 (MRP)	Rail neer is price controlled
Purification Stages	9Stage (RO+UV+Ozone)	68 Stage (varies)	Rail neer standard is higher
Regulatory Standard	BIS IS:14543 + FSSAI	FSSAI / BIS	Similar compliance frameworks
Availability on Trains	Mandated but deficit	Licensed as supplement	Gap met by private brands
Annual Production (approx.)	~67 Cr bottles (202223)	500+ Cr bottles (industry)	Massive scale difference
Quality Complaints (2023)	Increasing on grievance portals	Variable by brand	IRCTC brand trust eroding
Cold Chain Capability	Limited	Stronger distribution net	Competitive disadvantage
Market Share on	~4555%	~4555% (supplement)	Near parity in practice

Trains			

The comparative analysis reveals a nuanced and paradoxical picture. Rail neer's 9 stage purification protocol is technically superior to most private alternatives. Its regulated price of Rs.14 per litre is meaningfully more affordable than private MRP of Rs.20-25. Its production is fully subject to BIS IS:14543 standards and IRCTC's internal quality oversight. However, these advantages are rendered academic when Rail neer is simply unavailable: passengers have no practical choice but to pay higher prices for private alternatives, effectively imposing an informal and regressive tax on IRCTC's supply chain failures. Furthermore, the opacity of private vendor quality compliance on trains where IRCTC's inspection capacity is extremely limited means that passengers supplemented by private brands receive less quality assurance than Rail neer's production standards would guarantee(23).

6.1 International Comparisons: Best Practices in Transit Water Supply

Examining international precedents for onboard drinking water supply management in large transit systems provides valuable benchmarks against which India's Rail neer ecosystem can be evaluated and aspirationally positioned. China Railway (CR) represents the most directly comparable case study. China's national rail network which carries approximately 3.8 billion passenger trips annually, dwarfing even Indian Railways' scale integrates free boiling water dispensers (kaishui) at each train car as a deeply embedded cultural and service standard(24, 25). Passengers bring their own flasks or purchase bottled water commercially, but the availability of free hot water eliminates the baseline dehydration risk entirely. The Chinese model's success is underpinned by deliberate central investment in train level infrastructure during the HSR (High Speed Rail) buildout of the 2000s2010s an investment threshold not easily replicable within IRCTC's current capital allocation framework. Japan Rail (JR) provides a contrasting model of universal commercial availability. JR's Shinkansen and conventional networks ensure dense vending machine coverage at every station regardless of size or passenger volume, with frequent in carriage trolley services on long distance services. JR's model is instructive for its station level universality: no station, regardless of category, operates without basic beverage vending infrastructure. The lesson for IRCTC is that universal availability is achievable through distributed vending infrastructure even without centralized onboard production. Deutsche Bahn (DB) of Germany and SNCF of France manage onboard water through dining car services with complimentary water available in first class compartments. These European models are characterized by lower geographic scale, higher percapita infrastructure investment, and a more economically homogeneous passenger base conditions not directly replicable in India's context. Nevertheless, the principle of classdifferentiated water service standards, with a guaranteed minimum for all classes, offers relevant design inspiration for IRCTC's tiered service architecture.

7. Policy and Regulatory Framework: Constraints and Opportunities

The Rail neer supply deficit is fundamentally as much a governance problem as an operational one. The institutional architecture within which IRCTC manages Rail neer production and distribution creates several policylevel constraints that amplify the operational challenges documented in previous sections. Understanding these constraints is prerequisite to designing effective, durable solutions.

7.1 Pricing Controls and Financial Sustainability

Rail neer's mandated retail price of Rs.15 per one litre bottle set and regulated by the Ministry of Railways and effectively unchanged for a significant period despite rising production costs creates a structural tension between public affordability goals and operational financial sustainability. IRCTC's Annual Report 2022-23 indicates that the Rail neer division operates on thin margins, with key cost drivers including rising PET resin prices (a petroleum derivative affected by global commodity cycles), increased electricity tariffs (energy constitutes 18-22% of bottling plant operating costs), RO membrane replacement costs, skilled technician salaries, and distribution logistics expenses.A comparison with analogous government water brands is instructive. Odisha's 'Mo Jal' initiative prices its 500ml pouch at Rs.5, but crosssubsidies distribution infrastructure costs through state government budget allocation rather than relying on product margin. Himachal Pradesh's 'HP Natural Mineral Water' is sold at Rs.20 per litre, enabling a more sustainable margin that supports distribution network maintenance. Delhi Jal Board's branded

drinking water programme similarly prices products at Rs.15-18 with partial government subsidy for the distribution network. A carefully calibrated MRP revision for Rail neer to Rs.18-20, combined with a targeted subsidy or voucher scheme for economically weaker class passengers, could generate additional revenue of Rs.250-350 crore annually directly financeable investment in supply chain modernization and capacity expansion.

7.2 PPP Framework and Accountability Gaps

Nine of IRCTC's 20 Rail neer plants operate under the PPP model, with private operators responsible for day to day production while IRCTC provides capital support and quality oversight. The PPP approach, while pragmatic given IRCTC's capital budget constraints, has introduced significant accountability gaps that directly contribute to supply unreliability. CAG reports and media investigations suggest that PPP plant operators have in several instances failed to meet production targets, delayed scheduled maintenance, and in some cases underreported production figures without facing commensurate contractual penalties. The root cause of this accountability gap lies in the structure of current PPP agreements, which often lack: specific minimum production utilization targets expressed as contractual KPIs; financial penalty clauses calibrated to the economic value of supply shortfalls; mandatory independent audit mechanisms conducted by third parties empanelled with IRCTC and FSSAI; and transparent public reporting of plantlevel performance against agreed standards. By contrast, Singapore's Public Utilities Board (PUB), which operates under a government regulated but partly privatized water utility model, enforces strict SLAs with financial penalties and public reporting requirements that ensure consistently high compliance rates. India's own airport infrastructure PPP model under the Airports Authority of India (AAI) provides a domestic precedent for effective performance linked contracts with robust oversight mechanisms adaptable to the Rail neer context.

7.3 FSSAI Compliance and Quality Monitoring:

Rail neer's compliance with FSSAI's Packaged Drinking Water Standards and BIS IS:14543 represents a non negotiable quality floor that is central to the brand's public health credentials. However, the frequency and rigor of regulatory audits varies across IRCTC's 20 plants, and FSSAI's finite inspection bandwidth the authority oversees millions of food and beverage businesses nationwide means that Rail neer plants may not receive audit attention proportionate to their public health significance and daily production volumes. Periodic quality complaints documented in consumer grievance forums and media investigations between 2023 and 2025 including reports of particulate matter in bottled samples, inadequate bottle sealing allowing bacterial ingress, and batch coding irregularities that compromise traceability suggest that quality management systems at some plants may not be operating at design specification. While these incidents remain exceptional rather than systematic across the network, their occurrence at any frequency is both a public health concern and a brand credibility risk for IRCTC.

8. Supply Chain Analysis: Logistics, Cold Chain, and LastMile Delivery:

The production of high quality Rail neer bottles at a plant constitutes only the first step in a supply chain that must ultimately place the correct quantity of water in the hands of passengers aboard moving trains. This supply chain encompassing plant dispatch, regional warehouse consolidation, stationlevel storage, train stocking at originating and intermediate stations, and onboard distribution is fragmented, insufficiently digitized, dependent on multiple contractual intermediaries, and vulnerable to failure at each transition point.

8.1 Transportation Network and Cold Chain Limitations:

Rail neer distribution relies primarily on road transport between plants and regional distribution hubs, and subsequently between hubs and individual railway stations. This roadbased distribution model is both costeffective in normal conditions and critically vulnerable in adverse ones. During monsoon disruptions which regularly affect road connectivity in states such as Himachal Pradesh, Uttarakhand, Assam, and Kerala Rail neer delivery schedules to stations in these zones can be delayed by 24-72 hours, directly creating localized supply voids on precisely the days when train passenger volumes may be elevated due to festival or seasonal travel.Temperature management during transportation and storage represents an additional systemic vulnerability. While Rail neer does not require refrigeration for safety, storage of PET bottles in ambient temperatures exceeding 4045 degrees Celsius common in freight vehicle cabins and station warehousing during Indian summers accelerates antimony leaching from PET packaging, potentially affecting taste and long term safety. Unlike private brands such as Bisleri and Kinley, which have invested in refrigerated vending infrastructure at major stations, IRCTC's Rail neer distribution operates without

any cold chain component, limiting both product quality under adverse storage conditions and the practical ability to preposition buffer stocks during peak periods.

8.2 Last Mile Failure: Train Level Stocking Gaps:

Perhaps the most operationally acute supply chain failure in the Rail neer ecosystem occurs at the trainloading level the final stage where Rail neer must be physically stocked into pantry cars and dining carriages before trains depart originating stations. This process depends on seamless coordination between the Rail neer plant or regional hub, the station's platform loading contractor, the pantry car vendor or caterer, and IRCTC's supervisory staff. In practice, each interface between these parties represents a potential failure point. Trains with compressed turnaround times at originating stations particularly over night sleeper trains that turnaround within 60-90 minutes of arriving present particularly challenging loading windows. When Rail neer delivery to the station platform is delayed by even 20-30 minutes due to road traffic, documentation processing delays, or short staffing at the loading bay, the entire train may depart without adequate stock. This failure mode is entirely preventable through technology but requires real time information systems that IRCTC currently lacks at scale.The absence of a real time inventory management system comparable to what is standard practice in modern FMCG distribution networks operated by Hindustan Unilever Limited (HUL), Nestle India, or Dabur means that IRCTC has no mechanism for proactive supply chain intervention. By the time a shortage is identified typically through passenger complaints lodged on Rail Madad during a journey the train may be midroute with no practical resupply option until the next major station stop. A technology platform integrating RFID tagged crates, GPS enabled delivery vehicle tracking, pantry car inventory sensors, and AI powered demand forecasting could transform this reactive system into a genuinely predictive one.

9. Grievance Redressal Mechanisms and Reputational Impact:

IRCTC operates multiple passenger grievance channels relevant to Rail neer complaints and service quality issues: the Rail Madad app and portal (IRCTC's primary grievance interface), the IRCTC customer care helpline (139), the Public Grievance (PG) portal of the Government of India, social media monitoring across Twitter/X and Facebook, and the formal parliamentary question mechanism through which Members of Parliament raise constituent complaints. These channels collectively function as both a feedback mechanism and an institutional performance barometer. Analysis of publicly available Rail Madad complaint data and media reports for 2022-2025 reveals a consistent and worsening pattern. Complaints related to Rail neer non availability and drinking water quality rank consistently among the top five catering related grievances across multiple railway zones. The Northern Railway zone which includes the high density Delhi-Mumbai, Delhi-Kolkata, and Delhi-Chennai trunk routes records the highest absolute volume of water availability complaints. The Eastern Railway zone records the highest pertrain complaint rate, consistent with the capacity utilization shortfalls identified in Section 4.1.

9.1 Brand Equity Erosion and Reputational Consequences:

The persistent supply failure has quantifiable consequences for IRCTC's brand equity in the domestic market. Rail neer was conceived as IRCTC's quality assurance flag ship a visible signal of the corporation's commitment to passenger welfare that would differentiate its service ecosystem from the unreliable private vendor alternatives that plagued pre Rail neer train travel. When passengers repeatedly encounter Rail neer unavailability particularly on premium, high visibility trains like the Rajdhani Express, Shatabdi Express, and the flagship Vande Bharat the gap between IRCTC's service quality narrative and operational reality creates a credibility deficit that extends well beyond the immediate water supply complaint. Brand equity research consistently demonstrates that failures in categories associated with basic physiological needs food, water, safety generate disproportionately negative brand associations relative to failures in discretionary service attributes. Passengers who cannot obtain water on a 12 hour journey are not merely inconvenienced; they experience genuine discomfort and health anxiety, and they attribute this experience directly to IRCTC's institutional competence. Social media amplification through viral posts of empty pantry cars, over priced private water alternatives, and passenger distress accelerates the reputational damage well beyond those directly affected.

9.2 Vendor Exploitation in Shortage Conditions:

In the absence of Rail neer availability, licensed private water vendors and in many cases unlicensed opportunistic hawkers exploit shortage conditions to price gouge passengers with no alternatives. Multiple investigative media reports from 2023 and 2024 documented systematic above MRP pricing on trains experiencing Rail neer stock outs,

with prices of Rs.30-50 per litre reported on some routes two to three times the regulated Rail neer price. On some routes through desert and semi arid zones in Rajasthan and Gujarat during summer 2024, passengers reportedly paid Rs.60-80 for 1.5 litre bottles from unlicensed hawkers at intermediate stations.This price gouging is illegal under both the Consumer Protection Act, 2019 and IRCTC's vendor licensing conditions, which mandate compliance with Maximum Retail Price regulations. However, enforcement on moving trains is logistically challenging given IRCTC's limited supervisory presence on board. The practical consequence is that IRCTC's supply failure imposes a financial burden on the very passengers often travelling in general class for economic reasons whom Rail neer's regulated pricing was specifically designed to protect.

10. Strategic Recommendations for Addressing the Rail neer Deficit:

Addressing the Rail neer supply deficit requires a coordinated, multidimensional strategy that simultaneously tackles production capacity constraints, supply chain architecture fragmentation, governance accountability gaps, technological enablement deficits, and the structural pricing dilemma. The following recommendations are sequenced by implementation feasibility and potential impact magnitude, while remaining cognizant of IRCTC's financial constraints, organizational capabilities, and regulatory environment. Table 6 presents a consolidated strategic intervention framework before each recommendation is elaborated.

Table 6: Strategic Intervention Framework for Rail neer Supply Deficit Resolution

S.No	Intervention Area	Proposed Action	Expected Outcome
1	Capacity Expansion	Commission 10 modular mini plants (0.50.8 lakh btls/day) in deficit zones	Increase effective supply by ~30%
2	Decentralization	Establish microbottling units at A1 and Acategory stations	Reduce lastmile logistics gap
3	PPP Framework Reform	Revise PPP contracts with mandatory SLAs and financial penalty clauses	Improve accountability and quality
4	Technology Adoption	IoTbased realtime inventory tracking and AI demand forecasting	Eliminate stockout blind spots
5	Seasonal Surge Mechanism	Preposition 7–10day buffer stock at major junctions by March and September	Reduce peak deficit by ~60%
6	Pricing Reform	Gradual MRP revision to Rs.1820 to finance infrastructure upgrades	Improve financial sustainability
7	Grievance Redressal	Dedicated Rail neer helpline with mandatory 48hour resolution	Restore passenger trust
8	Regulatory Oversight	Monthly FSSAIaligned thirdparty audits at all 20 plants	Ensure quality compliance

10.1 Capacity Expansion Through Decentralized Modular Mini Plants:

The single most impactful structural intervention is a programmatic expansion of Rail neer production capacity through geographically decentralized modular mini plants. Rather than building additional largecapacity plants requiring 18-24 months construction timelines and Rs.50-80 crore capital investment each, IRCTC should commission modular containerized bottling units with capacities of 0.5- 0.8 lakh bottles per day, deployable in 6-9 months at a capital cost of Rs.15-25 crore per unit. Priority locations for new mini plant deployment, identified on the basis of existing supply deficit analysis, include: Jodhpur or Jaipur in Rajasthan (Western Zone deficit corridor); Guwahati, Assam (Northeastern coverage gap); Agartala, Tripura (Northeast India connectivity hub); Dhanbad or Ranchi in

Jharkhand (Eastern Zone highdemand corridor); and Vijayawada in Andhra Pradesh (SouthCentral zone gap). A targeted investment of Rs.300-400 crore across 10 new miniplants, potentially partfinanced through a revised PPP model with IRCTC retaining quality oversight, could increase effective daily production by 58 lakh bottles sufficient to reduce the annual average deficit by approximately 60%.

10.2 Technology Enabled Supply Chain Transformation:

IRCTC should urgently implement an integrated, IoT based Rail neer Supply Chain Management (SCM) platform as a foundational transformation initiative. The platform should integrate: RFID tagged Rail neer crates enabling real time inventory tracking from plant dispatch through station receipt to train loading; AI driven demand forecasting that incorporates historical consumption data, passenger traffic projections, weather forecasts, festival calendars, and seasonal trends to generate zone level and station level demand predictions with 7 day advance horizons; GPS enabled fleet management for all distribution vehicles providing realtime ETA visibility; a mobile application for pantry car supervisors to record stock levels at each station stop and trigger automated replenishment alerts; and a management dashboard for IRCTC operations team providing network wide visibility. A model for this technology approach exists within India's most sophisticated FMCG distribution networks. Hindustan Unilever Limited's Project iShakti distribution management system provides nearrealtime inventory visibility across 8,000+ distributor and stockiest points nationally, enabling rapid restocking interventions when depot levels breach minimum thresholds. Adapting comparable technology principles to IRCTC's approximately 500 major station supply points is technically feasible and could be implemented within 18-24 months through a competitive technology procurement process, at an estimated implementation cost of Rs.40-60 crore.

10.3 Seasonal Surge Buffer Protocol:

IRCTC should institutionalize a formal Seasonal Surge Buffer Protocol (SSBP) operationalized biannually activated before the summer peak (commencing March 15 annually) and before the festival season (commencing September 15 annually). Under this protocol, IRCTC would direct all 20 plants to operate at maximum sustainable production (targeting 90% of installed capacity) for 68 weeks before each surge period, with output allocated to prepositioning buffer stocks at the 50 highestdemand junction stations. Buffer stocks equivalent to 710 days of average peak daily demand should be maintained at these junctions throughout the surge period, drawing down and replenishing dynamically based on realtime inventory data from the SCM platform described above. Climate controlled buffer storage facilities at major junctions potentially developed in partnership with state government Food Corporation of India (FCI) warehousing infrastructure or in purposebuilt IRCTC storage annexes at station premiseswould protect stock quality during prepositioning. The additional energy cost of maintaining buffer stock at appropriate temperatures (below 30 degrees Celsius) is modest relative to the reputational and supply benefits achieved.

10.4 PPP Framework Reform and Accountability Enhancement:

All existing and new PPP Rail neer plant contracts should be restructured at next renewal or amended by mutual agreement before renewal to incorporate mandatory, legally binding SLAs with quantifiable KPIs. Minimum production utilization targets (not less than 80% of installed capacity on a monthly average), quality compliance scores (minimum 95% firstpass compliance with BIS/FSSAI standards on monthly testing), and delivery reliability metrics (95%+ of scheduled dispatches completed within contracted delivery windows) should form the contractual backbone. Financial penalties for SLA breaches, calibrated as a percentage of the annual contract value proportionate to the severity and duration of the breach, should replace the current culture of discretionary enforcement.Independent thirdparty auditorsregistered with FSSAI and empaneled through a competitive process with IRCTC should conduct quarterly unannounced production and quality audits at all 20 plants, with audit reports published on IRCTC's website within 30 days of completion. This transparency mechanism, modelled on SEBI's mandatory disclosure norms for listed companies and FSSAI's Food Safety Audit Scheme, would introduce a powerful accountability incentive for both PPP operators and IRCTC's own plant management teams.

10.5 Pricing Reform and Financial Sustainability:

A carefully designed Rail neer pricing reform is essential for the longterm financial sustainability of the programme. A phased MRP revision from Rs.14 to Rs.18-20 per litre implemented over 24 months to allow passenger adaptation would generate approximately Rs.250-350 crore in additional annual revenue based on current sales volumes. This revenue increment, ringfenced through a dedicated Rail neer Infrastructure Development Fund, could finance

approximately 34 new modular mini plants annually and fund the technology SCM platform implementation within a single financial year. To protect economic equity ensuring that the price revision does not burden the most price sensitive passenger segments IRCTC could introduce a targeted subsidy mechanism: discounted Rail neer at current Rs.14 pricing for passengers holding general class and second class sleeper tickets, with the higher MRP applicable to airconditioned class passengers whose willingness to pay and disposable income levels are significantly higher. This price differentiation architecture is administratively feasible through IRCTC's existing e-ticketing and barcode verification infrastructure deployed on Rail Madad and the IRCTC app.

11. Conclusion:

The Rail neer supply deficit represents a microcosm of broader governance challenges in India's public sector service delivery: the gap between policy aspiration and operational reality, between institutional mandate and infrastructural capacity, and between the rapidly growing needs of a 23 million passenger per day rail system and the supply responsiveness of a legacy production and distribution ecosystem that has not evolved commensurately with demand growth. This manuscript has systematically demonstrated that the Rail neer shortage is structural in nature embedded in insufficient and unevenly distributed production capacity, chronic underutilization of existing plants (averaging 65-75% of installed capacity across zones), fragmented and non digitized supply chains, inadequate accountability in the PPP operator ecosystem, pricing constraints that limit reinvestment capacity, and the complete absence of adaptive mechanisms whether technological, logistical, or contractual to respond dynamically to seasonal demand surges. The deficit is not a seasonal anomaly: it is a yearround condition that intensifies dramatically during India's summer and festival periods, when demandsupply gaps can reach 46% of estimated passenger need. The consequences extend beyond passenger inconvenience. For the millions of economically vulnerable passengers travelling in general and sleeper class particularly along high temperature summer routes in Rajasthan, Uttar Pradesh, Jharkhand, and Gujarat Rail neer's unavailability is a genuine public health risk. For IRCTC as an institution one that has leveraged Rail neer as a cornerstone of its quality and safety brand identity the persistent supply failure represents sustained erosion of public trust and brand equity that is increasingly difficult to reverse as private brands consolidate their supplementary market position. For Indian Railways as a system, it signals an unresolved and deepening tension between the commercial imperatives of a publicly listed corporation and the welfare obligations of a national public service provider accountable to 23 million daily passengers. The strategic recommendations presented in this study modular mini plant capacity expansion, IoT driven supply chain transformation, a formalized Seasonal Surge Buffer Protocol, PPP framework reform with binding SLAs, and a carefully calibrated pricing review are not isolated administrative prescriptions but components of a coherent systemic reimagining of how India's state owned railway catering corporation can deliver on its founding mandate. Rail neer's story is ultimately a story about institutional will and governance accountability. The technical knowledge exists. The demand is documented. The financial instruments are designable. The regulatory frameworks are adaptable. What has been historically absent is the organized institutional commitment to apply these capabilities with the urgency, consistency, and accountability that a public health service of this scale demands. In a nation where 23 million people board trains every single day many of them among India's most economically and physically vulnerable citizens ensuring that every passenger has access to safe, affordable, quality assured drinking water without exception, without shortage, and without exploitation is not merely an operational challenge. It is a moral imperative, a public health necessity, and a test of whether IRCTC's transformation from a legacy catering organization to a modern, passenger centered service enterprise is real or merely aspirational.

12. Future Prospects

The future of Rail Neer lies in strengthening its supply chain through decentralization, technological integration, and policy reforms. Establishing modular mini plants in high-demand regions can significantly enhance production capacity and reduce regional shortages. Adoption of IoT-based real-time inventory systems and AI-driven demand forecasting will improve distribution efficiency and minimize stock-outs. Reforms in the PPP framework can ensure greater accountability and operational performance. Additionally, a gradual price revision may support financial sustainability and infrastructure investment. With these strategic interventions, Rail Neer has the potential to become a reliable, scalable, and public health-oriented service across Indian Railways.

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Declaration

Mr Naveen Pal declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person. All data, statistics, and institutional references used in this manuscript have been sourced from publicly available secondary sources including IRCTC Annual Reports, Ministry of Railways publications, CAG audit reports, and peer reviewed academic literature.

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