

# Long-term Financial Sustainability of the Paper Industry in Tamil Nadu: A Post-Pandemic Perspective *A Descriptive and Theory-Oriented Study*

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**Abstract:** The paper industry in Tamil Nadu occupies a significant position in the state's industrial economy, with major enterprises contributing to employment, exports, and regional economic development. The COVID-19 pandemic introduced unprecedented disruptions affecting raw material supply chains, demand patterns, and the overall financial health of industrial enterprises. This study conceptually examines the long-term financial sustainability of selected paper industries in Tamil Nadu from a post-pandemic perspective. Grounded in descriptive and theoretical inquiry, the study draws on existing literature, published financial reports, and secondary data to explore the dimensions of financial sustainability, encompassing liquidity, profitability, solvency, and working capital efficiency. Theoretical frameworks including the Trade-off Theory, Pecking Order Theory, Resilience Theory, Stakeholder Theory, and the Resource-Based View are employed to provide conceptual depth. The study identifies key challenges confronted by the industry in the post-pandemic recovery phase and articulates five theoretical propositions for long-term financial sustainability. The findings are expected to serve as a conceptual foundation for future empirical research and offer practical insights for industry practitioners and policymakers concerned with the long-term industrial viability of Tamil Nadu's manufacturing sector.

**Keywords:** Financial sustainability; Paper industry; Tamil Nadu; Post-pandemic; Liquidity; Solvency; Resilience theory; Descriptive study; Working capital; Industrial recovery.

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## 1. INTRODUCTION

The manufacturing sector is widely acknowledged as the bedrock of sustained economic growth in developing economies. Within this broader landscape, the paper industry in India holds a position of strategic importance — serving as a critical input industry for education, packaging, and communication while simultaneously supporting rural livelihoods through agro-based raw material procurement. Tamil Nadu, one of India's most industrialised states, hosts a diversified paper manufacturing ecosystem ranging from large integrated mills such as the Tamil Nadu Newsprint and Papers Limited (TNPL) to small and medium enterprises engaged in specialty and packaging paper production.

The global COVID-19 pandemic, which emerged in late 2019 and intensified through 2020–21, introduced a period of acute financial stress across virtually every industrial sector. For the paper industry, the disruptions manifested in multiple dimensions: sudden demand collapse in the print paper segment due to school and office closures, supply chain dislocations in bamboo and wood pulp procurement, rising borrowing costs, and acute working capital shortfalls. These shocks were superimposed on an industry that was already grappling with structural challenges including digitisation-driven erosion of print demand, rising environmental compliance costs, and thin operating margins.

Financial sustainability, understood as the capacity of an enterprise to generate sufficient revenues, manage costs prudently, maintain solvency, and retain financial flexibility over the long term, becomes a matter of critical concern in this context.

Unlike short-term profitability, financial sustainability encompasses the ability to weather cyclical downturns, service debt obligations, and fund future investments — qualities that were severely tested during the pandemic period.

A theoretical and descriptive examination of financial sustainability in Tamil Nadu's paper industry at this juncture is warranted for several reasons. First, empirical studies on the sector's post-pandemic financial trajectory remain sparse. Second, the recovery patterns observed post-2021 — driven particularly by the surge in e-commerce packaging demand and renewed government stimulus — offer important conceptual insights into resilience and adaptation. Third, policymakers and industry practitioners require conceptually grounded guidance to frame sustainable financial strategies for the medium-to-long term.

### **1.1 Objectives of the Study**

The study is guided by the following five objectives:

1. To examine the historical financial performance and structural characteristics of the paper industry in Tamil Nadu during the period 2015–2024.
2. To conceptually analyse the dimensions of financial sustainability — liquidity, profitability, solvency, and working capital efficiency — as applicable to the paper manufacturing sector.
3. To review and apply relevant theoretical frameworks (Trade-off Theory, Pecking Order Theory, Resilience Theory, Stakeholder Theory, and the Resource-Based View) to the financial sustainability context of the paper industry.
4. To assess the financial impact of the COVID-19 pandemic on Tamil Nadu's paper industry and identify the drivers of post-pandemic recovery.
5. To formulate theoretical propositions and policy recommendations for strengthening the long-term financial sustainability of the paper industry in Tamil Nadu.

### **1.2 Scope and Limitations**

The study is geographically confined to paper manufacturing enterprises located in Tamil Nadu, with primary illustrative reference to TNPL and Seshasayee Paper and Boards Limited — two of the state's most prominent listed mills. The temporal scope spans 2015 to 2024, encompassing the pre-pandemic, pandemic, and recovery phases. The study is entirely descriptive and theory-oriented; no primary data collection or statistical hypothesis testing is undertaken. Quantitative indicators referenced are drawn from published annual reports, industry databases (CMIE Prowess, IBEF), and government publications and are illustrative rather than analytically exhaustive.

### **1.3 Organization of the Paper**

Following this introduction, Section 2 provides an overview of the paper industry in Tamil Nadu. Section 3 reviews the relevant literature. Section 4 develops the conceptual framework of financial sustainability. Section 5 analyses the pandemic's impact and the recovery narrative. Section 6 discusses challenges, emerging opportunities, and theoretical propositions. Section 7 concludes the study with a summary of findings, limitations, and directions for future research.

## **2. THE PAPER INDUSTRY IN TAMIL NADU: AN OVERVIEW**

### **2.1 Historical Development**

The origins of the modern paper industry in Tamil Nadu can be traced to the mid-twentieth century, when post-independence India's industrialisation drive encouraged investment in forest-based industries. The establishment of Seshasayee Paper and Boards Limited in Pallipalayam, Erode district, in 1960 marked one of the earliest milestones in the state's paper manufacturing history. A significant inflection point came with the incorporation of Tamil Nadu Newsprint and Papers Limited (TNPL) in 1979 as a joint venture of the Government of Tamil Nadu and the Industrial Development Bank of India (IDBI), with the express objective of producing newsprint from sugarcane bagasse — a renewable agricultural by-product — thereby reducing India's dependence on imported newsprint.

Over subsequent decades, Tamil Nadu witnessed the proliferation of small and medium-sized paper mills concentrated in districts such as Erode, Vellore, Tirunelveli, and Coimbatore. The availability of agro-residue raw materials (bagasse, rice straw), proximity to textile and packaging industries, and supportive state industrial policies collectively fostered this expansion.

## 2.2 Structure and Classification

The paper industry in Tamil Nadu can be broadly classified along product lines as follows: (i) newsprint — produced primarily by TNPL for the print media segment; (ii) writing and printing paper — serving the educational and stationery markets; (iii) industrial and packaging paper — including kraft paper, corrugated board, and carton boards used extensively in manufacturing and FMCG supply chains; and (iv) specialty papers — including tissues, filter papers, and coated papers serving niche industrial applications. This product diversification is both a strength and a complexity, as different segments face distinct demand dynamics, raw material requirements, and margin profiles.

## 2.3 Key Players and Their Profiles

Tamil Nadu Newsprint and Papers Limited (TNPL) stands as the largest integrated paper mill in the state and one of India's foremost newsprint producers. Operating with an installed capacity exceeding 4,00,000 tonnes per annum across its paper and board divisions, TNPL has progressively diversified from newsprint into packaging boards, contributing to revenue resilience. Seshasayee Paper and Boards Limited, a publicly listed entity with operations in Namakkal and Erode districts, is a significant producer of writing, printing, and industrial papers. Several smaller mills — including Pugalur Papers, Coimbatore-based units, and specialty paper manufacturers in Vellore — constitute the mid-tier segment.

## 2.4 Economic Contribution

The paper industry in Tamil Nadu contributes directly to state GDP through manufacturing value addition and indirectly through backward linkages with agriculture (sugarcane cultivation, bamboo farming) and forward linkages with printing, packaging, and publishing industries. The sector collectively employs an estimated 40,000 to 50,000 workers in direct manufacturing roles, with substantially larger indirect employment in logistics, raw material supply, and downstream processing. TNPL alone has historically been among Tamil Nadu's significant industrial exporters, supplying to Asian and Middle Eastern markets.

## 2.5 Regulatory and Policy Environment

The paper industry operates within a layered regulatory framework encompassing environmental regulations (effluent treatment and zero liquid discharge mandates under the National Green Tribunal and Tamil Nadu Pollution Control Board), raw material allocation policies (bamboo auction policies of the Tamil Nadu Forest Department), and central government schemes under the Ministry of Paper & Pulp. The Pradhan Mantri Mudra Yojana and the Emergency Credit Line Guarantee Scheme (ECLGS) have also been accessed by smaller mills for working capital support.

## 2.6 Pre-Pandemic Financial Snapshot (2015–2019)

In the five years preceding the pandemic, the Tamil Nadu paper industry maintained a broadly stable but unspectacular financial profile. Industry average current ratios hovered between 1.35 and 1.45, indicating adequate short-term liquidity. Debt-equity ratios, reflecting the capital-intensive nature of the industry, averaged between 1.7 and 1.9, with TNPL's ratio being somewhat higher owing to its large-scale capital expenditure programmes. Profitability margins remained modest typically in the 4 to 8 percent net profit margin range driven by tight competition, raw material cost pressures, and limited pricing power in commodity paper segments. Table 1 presents selected financial and operational indicators for the industry during the study period.

**Table 1: Key Indicators of the Paper Industry in Tamil Nadu (2015–2024)**

Indicator	2015–16	2018–19	2020–21	2023–24 (Est.)
No. of Paper Mills (TN)	45	48	41	46
TNPL Net Revenue (INR Cr.)	2,640	3,120	2,290	4,850
Seshasayee Net Revenue (INR Cr.)	1,050	1,240	840	1,760
Industry Avg. Current Ratio	1.42	1.38	0.98	1.31
Industry Avg. Debt-Equity Ratio	1.85	1.72	2.41	1.96
Employment (approx. '000s)	38	41	29	43

Source: TNPL Annual Reports (2015–2024); Seshasayee Paper Annual Reports; CMIE Prowess Database; Author's Compilation. (\*Est. = Estimated)

### **3. REVIEW OF LITERATURE**

#### **3.1 Conceptualising Financial Sustainability**

Financial sustainability has evolved as a multi-dimensional construct in management and finance literature. Dees and Anderson (2003) conceptualised organisational financial sustainability as the capacity to maintain sufficient financial resources to pursue mission and strategy over time. In the industrial context, Atkinson (2000) distinguished between short-term financial stability (liquidity) and long-term financial viability (solvency and profitability), arguing that both dimensions are necessary but not sufficient independently. Hawawini and Viallet (2011) operationalised financial sustainability through key ratios — return on invested capital, economic profit, and free cash flow generation — that together signal an enterprise's capacity to create and preserve value through economic cycles.

In the Indian context, Pandey (2015) examined financial sustainability across manufacturing industries, identifying leverage management and working capital efficiency as the two most critical determinants of long-term financial health among capital-intensive firms. Singh and Bansal (2016) studied the financial performance of paper companies listed on the BSE and found that firms with conservative debt policies and higher asset turnover demonstrated superior resilience during industry downturns.

#### **3.2 Financial Performance Studies on the Paper Industry**

The paper industry has been the subject of several financial performance studies, though predominantly focused on large, publicly listed entities. Barua and Saha (2018) analysed the working capital management of Indian paper companies and found that excessive inventory holding periods and elongated debtor cycles were the most common sources of liquidity stress. Their study highlighted that the cash conversion cycle in the paper sector — averaging 85 to 120 days — was significantly higher than in comparable industrial sectors, suggesting systemic inefficiencies in receivables management.

Goswami (2017) examined the capital structure decisions of paper manufacturing firms in India through the lens of the Pecking Order Theory, finding evidence that Indian paper companies preferred internal accruals and bank debt over equity issuance — consistent with the theoretical prediction of Myers and Majluf (1984). Ramamurthy and Raghavan (2019) conducted a financial analysis of TNPL over a ten-year period and documented a consistent improvement in interest coverage ratios following the company's shift towards packaging board production, validating the resilience offered by product diversification.

#### **3.3 Post-Pandemic Industrial Recovery Literature**

The pandemic-era literature on industrial financial recovery has rapidly expanded since 2021. Buchheit and Frankel (2021) analysed the financial impact of COVID-19 across manufacturing sectors and found that industries with high fixed cost structures and inelastic input costs — both characteristic of paper manufacturing — suffered disproportionately severe financial distress during demand contractions. Thakur and Vyas (2022) studied the role of government credit guarantee schemes in sustaining small and medium manufacturing enterprises through the pandemic, finding that the ECLGS scheme in India materially reduced bankruptcy rates in the paper, textile, and food processing sectors.

Internationally, Sharma et al. (2022) examined paper industry recovery trajectories across Asian economies and identified that firms that pivoted towards sustainable packaging paper — driven by the global e-commerce boom — achieved revenue recovery within 12 to 18 months of the pandemic peak, whereas print paper-focused firms faced structural demand headwinds beyond the recovery phase.

#### **3.4 Tamil Nadu Industry-Specific Studies**

Regional studies on Tamil Nadu's industrial financial performance have been relatively limited in scope. Kannan and Muthukumar (2020) examined the profitability trends of listed manufacturing companies in Tamil Nadu and noted that paper and pulp companies consistently underperformed relative to pharmaceutical and electronics sectors in return on equity, largely attributable to high depreciation burdens and raw material cost volatility. Sivakumar (2021) assessed the financial impact of the COVID-19 lockdown on Tamil Nadu's MSME manufacturing sector and found that paper and packaging units experienced the sharpest working capital deterioration in Q1 and Q2 of FY 2020–21, with recovery beginning only in Q3 following the resumption of e-commerce and FMCG supply chains.

### 3.5 Research Gap

Despite the volume of literature on financial sustainability, paper industry performance, and post-pandemic recovery, a significant gap exists in the form of a descriptive-theoretical synthesis specifically addressing Tamil Nadu's paper industry in the post-COVID context. Existing studies are either too narrowly focused on individual firms, too quantitatively oriented to offer theoretical generalisability, or too broad in their industry scope to capture the specific structural and regional characteristics of Tamil Nadu's paper manufacturing ecosystem. This study seeks to address this lacuna by integrating theoretical frameworks with descriptive analysis of the sector's financial trajectory from 2015 to 2024.

## 4. CONCEPTUAL FRAMEWORK: FINANCIAL SUSTAINABILITY

### 4.1 Defining Financial Sustainability in an Industrial Context

For the purposes of this study, financial sustainability is defined as the capacity of a paper manufacturing enterprise to generate adequate and consistent cash flows, maintain optimal capital structure, service its debt obligations, manage working capital efficiently, and retain sufficient financial flexibility to fund growth investments and absorb external shocks — across both favourable and adverse economic conditions. This definition integrates short-term operational dimensions (liquidity) with medium-term structural dimensions (solvency) and long-term value creation dimensions (profitability and efficiency).

Financial sustainability is distinct from mere profitability. An enterprise may record profits in a given period while simultaneously deteriorating in liquidity or accumulating unsustainable debt — conditions that render it financially fragile in the medium term. Conversely, a highly liquid firm with negligible debt but also negligible returns may be financially stable but not dynamically sustainable. True financial sustainability requires simultaneous adequacy across all four dimensions.

### 4.2 The Four Dimensions of Financial Sustainability

#### 4.2.1 Liquidity

Liquidity reflects an enterprise's ability to meet its short-term obligations as they fall due without disrupting ongoing operations. In the paper industry, liquidity is particularly critical given the long cash conversion cycles inherent in raw material-intensive manufacturing. The most widely employed indicators include the current ratio (current assets to current liabilities), the quick ratio (excluding inventories), and the cash ratio. A current ratio consistently below 1.0 — as observed across several Tamil Nadu paper mills during 2020–21 — signals acute financial vulnerability.

#### 4.2.2 Profitability

Profitability indicators measure the efficiency with which an enterprise converts revenues into profits and generates returns on capital deployed. For the paper industry, the most relevant indicators include the net profit margin, return on assets (ROA), return on equity (ROE), and EBITDA margin. EBITDA margin is of particular significance in capital-intensive industries as it captures operating profitability before the distorting effects of depreciation and financing costs — providing a cleaner measure of operational performance. Sustained profitability is necessary for retained earnings generation, which, under Pecking Order Theory, constitutes the preferred source of financing.

#### 4.2.3 Solvency

Solvency relates to the enterprise's ability to meet its long-term financial obligations. In the capital-intensive paper industry — where large investments in plant, machinery, and raw material inventories are financed significantly through debt — solvency management is a critical determinant of financial sustainability. Key solvency indicators include the debt-equity ratio, debt-to-assets ratio, and interest coverage ratio (earnings before interest and taxes to interest expense). Under Trade-off Theory, firms seek an optimal debt level that balances the tax shield benefit of debt against the costs of financial distress.

#### 4.2.4 Working Capital Efficiency

Working capital efficiency captures the effectiveness with which an enterprise manages its operating cycle — the time between cash outflow for raw material procurement and cash inflow from sales realisations. The cash conversion cycle (CCC), comprising the inventory conversion period, debtor collection period, and creditor payment period, is the primary integrative measure. In the paper industry, inefficient working capital management — characterised by excessive raw material stockpiling or slow debtor recovery — is a common source of financial strain, particularly during periods of demand uncertainty.

**Table 2: Dimensions of Financial Sustainability — Indicators, Theories, and Industry Relevance**

Dimension	Key Indicators	Theoretical Link	Industry Relevance
Liquidity	Current Ratio, Quick Ratio, Cash Ratio	Resilience Theory	Short-term operational stability
Profitability	ROA, ROE, Net Profit Margin, EBITDA Margin	Trade-off Theory, RBV	Long-term viability and investor returns
Solvency	Debt-Equity Ratio, Interest Coverage, D/A	Trade-off Theory, Pecking Order	Capital structure health and debt serviceability
Working Capital Efficiency	Inventory Turnover, Debtor Days, CCC	Stakeholder Theory	Operational cycle management

Source: Synthesised from Hawawini & Viallet (2011); Pandey (2015); Modigliani & Miller (1958); Myers & Majluf (1984); Barua & Saha (2018)

### 4.3 Theoretical Underpinnings

#### 4.3.1 Trade-off Theory

The Trade-off Theory of capital structure, rooted in the foundational work of Modigliani and Miller (1958, 1963), posits that firms balance the tax shield benefits of debt financing against the escalating costs of financial distress as debt levels increase. For paper industry firms — which are inherently capital-intensive and maintain high debt levels to finance long-gestation infrastructure — the theory suggests an optimal debt-equity ratio beyond which incremental debt destroys firm value. The pandemic disrupted this equilibrium for many Tamil Nadu mills by simultaneously reducing earnings (the numerator of coverage ratios) and increasing absolute debt levels through emergency credit drawdowns.

#### 4.3.2 Pecking Order Theory

Myers and Majluf (1984) advanced the Pecking Order Theory, arguing that firms prefer internal financing (retained earnings) over external debt, and external debt over equity issuance, due to information asymmetry between management and external investors. This preference hierarchy is particularly observable in closely-held or government-promoted paper mills in Tamil Nadu. TNPL's historical financing pattern — prioritising internal accruals and bank debt before accessing equity markets — is broadly consistent with this theoretical prediction. The pandemic disrupted pecking order behaviour by depleting retained earnings, forcing enhanced recourse to bank credit and government guaranteed lending.

#### 4.3.3 Resilience Theory

Resilience Theory, adapted from ecological systems literature into organisational and financial management by Wildavsky (1988) and subsequently Lengnick-Hall and Beck (2005), conceptualises organisational resilience as the capacity to absorb disruption, adapt to changed conditions, and recover functionality following a shock. In the context of industrial financial sustainability, Resilience Theory suggests that firms with adequate liquidity buffers, diversified revenue streams, and flexible cost structures are better positioned to withstand and recover from exogenous shocks such as the COVID-19 pandemic. The post-2021 recovery trajectories of TNPL — which leveraged its packaging board division to offset newsprint demand losses — exemplify this theoretical mechanism.

#### 4.3.4 Stakeholder Theory

Freeman's (1984) Stakeholder Theory asserts that enterprise sustainability requires the simultaneous attention to the interests of multiple stakeholder groups — shareholders, creditors, employees, suppliers, customers, and regulatory bodies — beyond the traditional shareholder primacy focus. For Tamil Nadu's paper industry, Stakeholder Theory has particular relevance given the sector's deep interdependencies with agricultural raw material suppliers (bagasse, bamboo), state government as both regulator and promoter (in the case of TNPL), and communities dependent on mill employment. Sustainable financial management, in this framework, is not solely a shareholder value maximisation exercise but a multi-stakeholder balancing act.

#### 4.3.5 Resource-Based View (RBV)

The Resource-Based View of the firm, developed by Penrose (1959) and refined by Barney (1991), holds that sustained competitive advantage — and by extension, sustained financial performance — derives from firm-specific resources and

capabilities that are valuable, rare, inimitable, and non-substitutable (VRIN). For paper manufacturers, strategically relevant resources include proprietary raw material sourcing relationships, technological efficiency in pulping and paper-making processes, environmental compliance infrastructure, and brand reputation in end markets. Firms possessing superior VRIN resources are theoretically expected to demonstrate superior financial sustainability, particularly in the face of industry-wide disruptions.

#### **4.4 Conceptual Model**

The conceptual framework of this study positions financial sustainability as an outcome jointly determined by four operational dimensions — liquidity, profitability, solvency, and working capital efficiency — moderated by theoretical mechanisms from the five frameworks described above. External shocks (pandemic, policy changes, commodity cycles) impact each dimension differentially, while firm-level strategic choices (capital structure decisions, product diversification, raw material strategy) mediate the impact. Government policy interventions serve as an additional moderating variable in the post-pandemic recovery phase. This integrative model provides the conceptual scaffolding for the propositions developed in Section 6.

### **5. COVID-19 AND ITS IMPACT ON THE PAPER INDUSTRY**

#### **5.1 Macro-Level Disruptions**

The COVID-19 pandemic triggered an unprecedented contraction in India's GDP, with the economy shrinking by an estimated 6.6 percent in FY 2020–21 — the sharpest annual contraction in India's post-liberalisation history (Ministry of Statistics and Programme Implementation, 2021). The nationwide lockdown imposed in March 2020, followed by extended regional restrictions, caused an immediate shutdown of non-essential manufacturing activities, severely disrupting production schedules, raw material procurement, and distribution logistics across the industrial sector. For capital-intensive industries like paper manufacturing, fixed cost obligations — including debt servicing, minimum workforce retention costs, and plant maintenance — continued to accrue even as production ceased, dramatically widening operating losses in Q1 and Q2 of FY 2020–21.

#### **5.2 Sector-Specific Impact on the Paper Industry**

The paper industry confronted multiple simultaneous demand and supply disruptions. On the demand side, the closure of educational institutions resulted in an abrupt collapse in the demand for writing and printing paper — a segment that typically accounts for approximately 30 to 35 percent of total paper consumption in India. Office closures and the suspension of print media distribution created additional demand voids. Conversely, the surge in online grocery and pharmaceutical purchases generated incremental demand for corrugated and packaging paper — though this segment-level recovery was partial and insufficient to offset aggregate demand losses in Q1 FY 2020–21.

On the supply side, the wood and bamboo procurement chains — dependent on forest workers and inter-state transportation — were severely disrupted by lockdown restrictions. Bagasse availability was impacted by reduced sugar cane crushing at cooperatives. Chemical input supplies from industrial clusters in Gujarat and Maharashtra were similarly constrained by regional lockdowns. These supply disruptions, combined with inventory drawdown needs, created raw material shortfalls that pushed input costs sharply higher in Q2 FY 2020–21.

#### **5.3 Financial Stress Indicators**

Published annual reports and industry data for FY 2020–21 reveal a consistent pattern of financial deterioration across Tamil Nadu's paper mills. Industry-average current ratios fell below the critical 1.0 threshold for several mills, indicating acute short-term liquidity stress. Debt-equity ratios rose sharply as firms drew on emergency credit lines to bridge cash flow deficits. TNPL's consolidated debt level increased by approximately 18 percent in FY 2020–21, while its interest coverage ratio fell from 5.2x in FY 2018–19 to 2.8x in FY 2020–21. Seshasayee Paper similarly reported a sharp decline in net revenue and operating profit, accompanied by elevated inventory days as unsold stock accumulated during demand disruption. These indicators collectively confirmed a state of financial stress broadly consistent with what Resilience Theory describes as an organisation operating at or near the boundaries of its adaptive capacity.

#### **5.4 Government Relief Measures**

The Government of India and the Reserve Bank of India deployed a series of relief measures that materially supported the financial survival of paper industry enterprises through the pandemic. The RBI's loan repayment moratorium (March to

August 2020) provided immediate cash flow relief by suspending EMI and interest payments. The Emergency Credit Line Guarantee Scheme (ECLGS) — offering collateral-free loans up to 20 percent of outstanding credit — was extensively accessed by paper mills for working capital replenishment. The Production Linked Incentive (PLI) scheme, though not directly applicable to paper manufacturing, stimulated packaging paper demand through its incentivisation of FMCG and pharmaceutical manufacturing. At the state level, the Tamil Nadu government extended property tax deferrals and expedited electricity bill restructuring for industrial units — measures of direct relevance to energy-intensive paper mills.

### 5.5 Recovery Narrative: 2021–2024

The period from FY 2021–22 onwards witnessed a structured recovery in Tamil Nadu's paper industry, driven by three principal factors. First, the explosive growth of e-commerce — accelerated by pandemic-era behavioural shifts — generated sustained demand for corrugated and kraft packaging materials, partially offsetting structural declines in print paper demand. Second, global supply chain realignments and import substitution dynamics favoured domestic paper producers, improving export realisations for specialty and kraft paper segments. Third, the gradual reopening of educational institutions through FY 2022–23 restored demand for writing paper, enabling fuller utilisation of affected production capacities.

By FY 2023–24, industry data suggest that TNPL's net revenue had recovered to approximately INR 4,850 crore — representing a significant rebound from its pandemic trough — while Seshasayee Paper similarly reported revenues approaching INR 1,760 crore. Industry average current ratios returned to levels above 1.3, though debt-equity ratios remained elevated relative to pre-pandemic norms, reflecting the residual burden of emergency credit drawdowns.

**Table 3: COVID-19 Impact and Recovery — Key Sector Indicators**

Impact Area	Pre-Pandemic (2018–19)	Pandemic Peak (2020–21)	Recovery Phase (2022–24)
Print Paper Demand	Moderate Growth	~35% Decline	Partial Recovery
Packaging Paper Demand	Stable	~15% Decline	Strong Growth (+28%)
Raw Material Costs	Controlled	Volatile (up 40%)	Normalising
Working Capital Position	Adequate	Stressed	Improving
Government Intervention	—	Moratorium, ECLGS	PLI Schemes, Credit Lines

Source: TNPL Annual Reports (2019–2024); Seshasayee Paper Annual Reports; IBEF Paper Industry Report (2024); RBI Monetary Policy Reports; Author's Compilation

## 6. CHALLENGES, PROSPECTS, AND THEORETICAL PROPOSITIONS

### 6.1 Key Financial Challenges

Notwithstanding the recovery momentum of 2021–24, Tamil Nadu's paper industry confronts a set of enduring financial challenges that pose risks to long-term sustainability.

Raw material cost volatility remains the single most significant financial challenge. Bamboo and wood pulp procurement is subject to auction-based pricing by state forest departments, creating periodic cost spikes. Bagasse supply is contingent on sugar cane production cycles and cooperative crushing capacity — both inherently variable. In FY 2021–22, raw material costs as a proportion of net revenues for TNPL and Seshasayee Paper averaged between 42 and 48 percent — among the highest across Indian manufacturing sectors — constraining operating margins even as revenues recovered.

Debt burden and interest cost pressures represent a structural concern. The pandemic necessitated emergency borrowings that have elevated debt-equity ratios above pre-pandemic norms. With the RBI's interest rate tightening cycle (2022–2024) pushing benchmark rates higher, interest costs have risen proportionally, compressing already thin profit margins. Smaller mills — which typically borrow at higher rates and with shorter tenors — face the most acute vulnerability.

The progressive digitisation of reading, communication, and information consumption continues to erode the structural demand for newsprint and writing paper. While packaging paper demand provides a partial offset, the print paper segment's decline is expected to be secular rather than cyclical, creating long-term revenue mix challenges for mills that remain heavily dependent on it.

### 6.2 Structural Challenges

Environmental compliance represents an escalating structural cost. The National Green Tribunal's increasingly stringent mandates on effluent treatment, solid waste management, and air emission control require continuous capital investment in pollution abatement infrastructure expenditures that offer no direct revenue return and compress capital available for productive capacity expansion. Smaller mills, unable to amortise these fixed compliance costs over large production volumes, face disproportionate competitive disadvantage relative to large integrated players like TNPL.

Energy intensity is another structural vulnerability. Paper manufacturing is among the most energy-intensive industrial processes, with energy costs constituting 15 to 20 percent of total production costs for most Tamil Nadu mills. Volatility in industrial electricity tariffs compounded by intermittent power supply issues in certain districts creates an additional source of cost instability. Transition to renewable energy and captive power generation offers a long-term mitigation path, but requires substantial upfront capital.

### 6.3 Emerging Opportunities

Against this landscape of challenges, several structural opportunities are reshaping the industry's financial trajectory. The sustainable packaging revolution driven by global corporate commitments to reduce plastic usage and circular economy mandates across the European Union and increasingly in Asia is creating substantial demand for paper-based packaging alternatives. Tamil Nadu's established infrastructure and technical expertise in packaging paper position the state's mills favourably to capture this demand shift.

Export market expansion, particularly to Southeast Asian and Middle Eastern markets, offers revenue diversification opportunities for Tamil Nadu paper manufacturers. TNPL's emerging presence in export markets for specialty boards represents an early indicator of this opportunity. The Digital India infrastructure build-out while paradoxically a threat to print paper demand has stimulated demand for specialty papers used in electronic product packaging, further reinforcing the packaging segment's growth potential.

### 6.4 Theoretical Propositions

Drawing upon the theoretical frameworks reviewed in Section 4 and the descriptive analysis of pandemic impact and recovery in Sections 5 and 6, the following five theoretical propositions are advanced:

**Table 4: Theoretical Propositions for Long-term Financial Sustainability**

Prop.	Proposition Statement	Theoretical Basis	Implication
P1	Firms maintaining a current ratio above 1.2 demonstrate superior post-pandemic recovery trajectories.	Resilience Theory	Liquidity buffers enable operational continuity during shocks.
P2	Paper mills with diversified product portfolios (packaging + printing) exhibit greater financial resilience.	Resource-Based View	Asset and revenue diversification reduces vulnerability.
P3	Firms adopting sustainable and recycled raw material sourcing show improved long-term profitability margins.	Stakeholder Theory, Trade-off Theory	Environmental compliance reduces regulatory cost risks.
P4	A debt-equity ratio maintained below 2.0 is positively associated with long-term solvency in capital-intensive paper mills.	Trade-off Theory, Pecking Order Theory	Optimal capital structure lowers cost of capital.
P5	Government policy support (ECLGS, PLI) significantly moderates the negative financial impact of pandemic disruptions on Tamil Nadu paper industries.	Stakeholder Theory, Resilience Theory	State intervention as a resilience mechanism.

Source: Author's theoretical synthesis from Freeman (1984); Barney (1991); Myers & Majluf (1984); Modigliani & Miller (1963); Wildavsky (1988)

### 6.5 Policy-Level Recommendations

For state and central government policymakers, the following recommendations are advanced:

- Institutionalise a dedicated Paper Industry Development Fund at the state level, enabling subsidised long-term credit access for pollution abatement infrastructure, raw material security investments, and renewable energy transition — addressing the structural capital constraint that inhibits environmental compliance among smaller mills.
- Extend and expand the Production Linked Incentive framework to include specialty and sustainable packaging paper segments, thereby aligning fiscal incentives with global demand trends and creating a policy tailwind for high-growth sub-segments.
- Establish transparent, long-term bamboo and agro-residue supply agreements between state forest departments and paper mills — replacing volatile spot auctions with indexed pricing mechanisms — to reduce the raw material cost uncertainty that is the industry's primary financial risk factor.
- Strengthen credit rating infrastructure for mid-tier paper mills through mechanisms such as SIDBI-supported credit enhancement, enabling better access to bond markets and reducing dependence on high-cost bank borrowing.

### 6.6 Industry-Level Financial Management Recommendations

For enterprise-level financial managers and boards, the following practices are recommended:

- Adopt a formal liquidity adequacy framework that maintains a minimum current ratio target of 1.2 as a non-negotiable financial covenant, operationalised through conservative working capital policies and maintenance of revolving credit facilities.
- Pursue deliberate product portfolio diversification strategies that increase the packaging paper and specialty paper revenue share to at least 50 percent of total revenues — reducing structural exposure to the declining print paper segment.
- Implement integrated raw material risk management programmes encompassing long-term supply contracts, agro-residue stockpiling during harvest peaks, and supplier development investments — translating the Resource-Based View's prescriptions into operational sourcing strategy.
- Conduct periodic capital structure reviews anchored to a target debt-equity ratio range of 1.5 to 2.0, with systematic deleveraging through retained earnings allocation — consistent with Trade-off Theory's optimal capital structure prescription.

## 7. CONCLUSION

This study has undertaken a descriptive and theory-oriented examination of the long-term financial sustainability of the paper industry in Tamil Nadu, covering the period from 2015 to 2024 and encompassing the pre-pandemic, pandemic, and recovery phases. The study was motivated by the absence of a conceptual-theoretical synthesis specifically addressing this sector and region in the post-COVID context a gap that existing empirical and quantitative studies have not filled.

The examination of Tamil Nadu's paper industry anchored in the profiles of TNPL, Seshasayee Paper and Boards, and the broader mill ecosystem reveals an industry of considerable strategic importance to the state's economy, characterised by deep backward linkages with agriculture, significant employment generation, and growing participation in global packaging supply chains. The industry's pre-pandemic financial profile, while stable, was marked by capital intensity, modest margins, and structural dependence on a declining print paper segment vulnerabilities that the COVID-19 pandemic exposed with acute severity.

The conceptual framework developed in this study articulates financial sustainability as a four-dimensional construct encompassing liquidity, profitability, solvency, and working capital efficiency. The application of five theoretical frameworks Trade-off Theory, Pecking Order Theory, Resilience Theory, Stakeholder Theory, and the Resource-Based View provides a multi-lens analytical foundation that transcends the limitations of single-theory explanations. The pandemic impact analysis demonstrates that the industry's recovery has been real but uneven, with packaging-segment mills recovering faster than print paper-focused counterparts a pattern consistent with both Resilience Theory (diversification as an adaptive mechanism) and the Resource-Based View (product diversification as a VRIN-based competitive advantage).

The five theoretical propositions advanced in Section 6 offer a platform for future empirical testing. They collectively suggest that liquidity adequacy, product diversification, sustainable sourcing, capital structure discipline, and policy support are the key determinants of long-term financial sustainability for Tamil Nadu paper mills findings of direct relevance to boards, financial managers, and policymakers.

### **7.1 Contributions of the Study**

The study makes theoretical contributions by developing an integrated conceptual model of financial sustainability that synthesises five theoretical frameworks in the specific context of a capital-intensive, agro-based manufacturing sector in a developing economy. It makes practical contributions by translating theoretical insights into actionable policy and industry recommendations grounded in the documented experience of Tamil Nadu's paper industry through the pandemic cycle.

### **7.2 Limitations and Future Research Directions**

The study's principal limitation is its exclusive reliance on secondary data and descriptive-theoretical analysis. No primary survey data, regression analysis, or hypothesis testing has been conducted a methodological constraint that limits the empirical validation of the propositions advanced. Future research should undertake panel data analysis across Tamil Nadu paper mills over the 2015–2024 period, employing econometric models to test the relationships between capital structure variables, working capital metrics, and financial sustainability outcomes. Comparative studies contrasting Tamil Nadu's paper industry with counterpart industries in Maharashtra, Odisha, and Andhra Pradesh would offer valuable benchmarking insights. Qualitative case study research examining the strategic decision-making of CFOs and treasurers in Tamil Nadu paper mills during the pandemic would provide micro-level insights that complement the industry-level analysis presented here.

In conclusion, this study affirms that the long-term financial sustainability of Tamil Nadu's paper industry is achievable but not inevitable. It requires deliberate financial management, strategic product diversification, policy-enabled investment in sustainable operations, and the institutional resilience to navigate an external environment that will continue to generate both disruptions and opportunities.

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