



INDUSTRY REPORT ON INDIAN STP, TERTIARY TREATMENT, MSW MANAGEMENT & BIOGAS MARKET

SUBMITTED TO

**SFC ENVIRONMENTAL
TECHNOLOGIES LTD.**

23 September 2026

Table of Contents

1. MACROECONOMIC OVERVIEW OF GLOBAL ECONOMY	6
1.1 Real GDP review and outlook	6
1.2 Inflation	7
1.3 Manufacturing Purchasing Managers Index (PMI)	7
1.4 Growth drivers impacting the growth of the global economy	8
2. MACROECONOMIC OVERVIEW OF INDIAN ECONOMY	8
2.1 Indian Macro-economic overview	8
2.2 Review and outlook of Real GDP growth in India	9
2.3 Index of Industrial Production (IIP)	10
2.4 India manufacturing PMI (Purchasing Managers Index).....	11
2.5 Sectoral share of Gross Value Added (GVA)	12
2.6 Foreign Direct Investment (FDI).....	14
2.7 Per capita income – India vs. leading global economies	15
2.8 Per capita electricity consumption	16
3. INDIA EMERGING AS A GLOBAL MANUFACTURING HUB.....	17
3.1 India emerging as a global manufacturing hub.....	17
3.2 India's competitiveness among the leading manufacturing economies	17
3.3 Government policies and schemes driving manufacturing in India.....	20
3.4 India emerging as the world's technology hub.....	21
4. OVERVIEW OF GLOBAL WASTEWATER TREATMENT MARKET	22
4.1 Overview of the Global Wastewater Treatment Market.....	22
4.2 Size of the global wastewater treatment market	23
4.3 Global Wastewater treatment market split by region.....	24
4.4 Factors driving the growth of the wastewater treatment market by different regions.....	24
4.5 Overview of the global Sewage treatment market.....	25
4.6 Global Sewage water treatment market split by regions	26
4.7 Factors driving the growth of the sewage water treatment market in the region	27
4.8 Prominent technologies deployed for sewage treatment in these regions	28
4.9 Growth forecast for the sewage treatment market: Middle East, Southeast Asia, and Africa	28
4.10 Notable list of upcoming sewage treatment projects	29

5.	OPPORTUNITY LANDSCAPE OF INDIA'S SEWAGE TREATMENT MARKET	30
5.1	Overview of Indian Wastewater Treatment Market	30
5.2	Factors and rules driving the Indian wastewater treatment market.....	31
5.3	Market restraints for the Indian wastewater treatment market	35
5.4	Indian sewage treatment market	35
5.5	Guidelines and Governance in the Sewage Treatment Sector: Incentives and Penalties ..	38
5.6	Indian Government's vision and initiatives for sewage treatment infrastructure growth .	41
5.7	Unique challenges in India's sewage treatment industry	42
5.8	Select upcoming sewage treatment plants in the country	42
5.9	Growth forecast of the Indian Sewage Treatment market.....	43
5.10	Overview of SBR technology	43
5.11	Overview of C-Tech process.....	44
5.12	The evolving landscape of sewage treatment: A comparative analysis of prominent technologies.....	47
5.13	Benchmarking SBR (Sequential Batch Reactor) technologies.....	48
5.14	Value chain analysis of the Indian wastewater treatment sector: Key stakeholders.....	49
5.15	Competitive landscape.....	50
5.16	Leading industrial wastewater treatment solution	50
5.17	Overview of Blowers and Fibre Disc Filters.....	51
5.18	Market presence and strategic focus of SFC Environmental Technologies	52
6.	WASTEWATER RECYCLING & REUSE - TERTIARY TREATMENT.....	53
6.1	Key Technologies India and Global – Filtration, Membrane based Ultra / Nano Filtration, RO (Reverse Osmosis).....	53
6.2	Market Size in India and Global	55
6.3	Reuse of Sewage Water	57
6.4	Administrative Reforms and Policy Guidelines	58
6.5	Policy-led Interventions	59
6.6	Policy and legal regulations framework for UWM (urban wastewater management)	59
7.	OPPORTUNITY LANDSCAPE OF INDIA'S MUNICIPAL SOLID WASTE MANAGEMENT MARKET	62
7.1	Overview of Indian Municipal Solid Waste management market	62
7.2	Municipal Solid Waste management value chain in India	63
7.3	Solid waste generation and processing across various states in India	63

7.4	Evolution of solid waste management rules and regulations in India	65
7.5	Salient features of Solid Waste Management Rules, 2026.....	65
7.6	Prominent technologies for energy generation from Municipal solid wastes	66
7.7	Overall potential of energy generation from Municipal Solid Waste in India	67
7.8	Installed capacity of Waste to Energy plants in India and historical growth.....	67
7.9	Leading developers of Waste to Energy plants in India and their portfolio	68
7.10	Key growth drivers of WTE sector in India.....	69
7.11	List of notable, successful, and currently operating WTE plants in India	70
7.12	Environmental issues and operational challenges.....	71
7.13	Expected in installed capacity of WTE plants in the country.....	72
7.14	Revenue potential from MSW (CBG, Electricity, Compost, and Recyclables).....	72
7.15	List of announced, planning, and under-construction projects.....	73
8.	OPPORTUNITY LANDSCAPE OF INDIA'S BIOGAS MARKET	74
8.1	Role of Biogas in India's CNG/PNG ecosystem	74
8.2	Potential for Bio-CNG generation in the country from Agro-waste	75
8.3	Value Chain of Indian Biogas Market	76
8.4	Government policies driving the growth of the Indian CBG sector	77
8.5	Revenue potential from Surplus Agro Residue and Press Mud (CBG and Briquettes)	78
8.6	Current state of CBG production in India.....	79
8.7	Current size of Indian Biogas Market and its growth.....	79
8.8	Growth drivers and restraints of the Indian CBG market	80
8.9	Bio-methanation process and OREX as an Organic waste pre-treatment technology	81
8.10	Plans of OMCs/CGD companies to enter Indian Biogas Market	82
8.11	Municipal Wet Waste to Biogas generation and selling as CNG/PNG	83
8.12	Leading Biogas Technology Suppliers	83
8.13	Threats and challenges to SFC Technologies and its products and services	84
9.	AGRO WASTE TO BIOGAS MARKET IN INDIA	85
9.1	Introduction	85
9.2	Policy & Regulatory Support	86
9.3	Drivers and Opportunities.....	87
9.4	Project Activity and Early Commercial Examples.....	88
9.5	Challenges and Barriers	89

9.6	Outlook and Conclusion	90
10.	SOLAR SLUDGE DRYING SYSTEM	91
10.1	Industry Overview India and Global - Historical evolution, adoption trends, and typical applications	91
10.2	Market Size India and Global - Current and projected market size	94
10.3	Future growth prospects - Regulatory support and environmental drivers	95
10.4	Key players/technologies - Leading companies, their offerings and Technology	97
11.	COMPETITIVE BENCHMARKING	98
11.1	Operational Benchmarking	98
11.2	Financial benchmarking	101
ANNEXURE		105

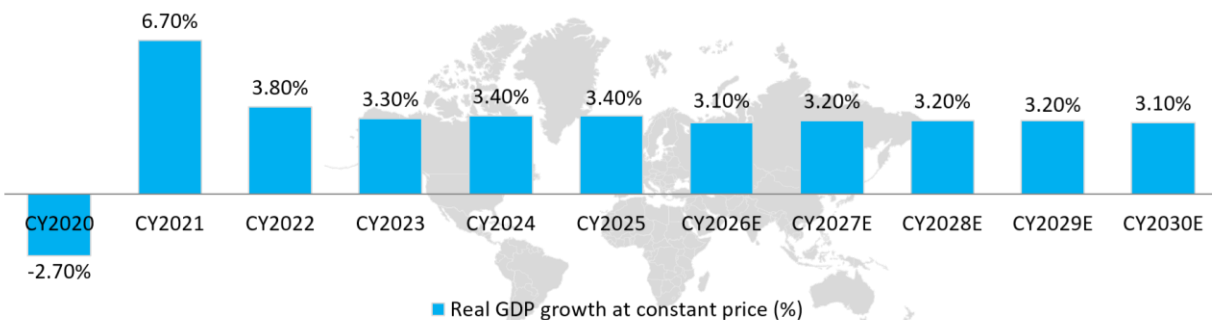
1. MACROECONOMIC OVERVIEW OF GLOBAL ECONOMY

1.1 Real GDP review and outlook

The global economy grew by 3.4% in CY2024 and in CY2025. Indian economy grew by 7.6% in calendar year CY2025, following 7.1% growth in CY2024. Economic activity remains broad-based, with contributions from domestic consumption, services, and investment in several large emerging markets. It is noted that disinflation is progressing and that financial conditions have eased in some regions, though the pace of monetary policy adjustments remains uneven. Since 2024–25, U.S. tariffs on Chinese goods—particularly EVs, semiconductors, battery components, and solar inputs have escalated trade tensions, though a temporary truce under the Geneva framework has limited broader tariff hikes.

In CY2024 and CY2025, global growth remained relatively stable at approximately 3.4%, supported by easing inflation, gradual normalization of supply chains, resilience in labor markets, and sustained investments across infrastructure, digitalization, renewable energy, and industrial diversification initiatives. Growth during this period has increasingly been driven by emerging economies, particularly across Asia, which continue to benefit from domestic consumption growth, urbanization trends, manufacturing expansion, and ongoing public and private capital expenditure programs.

Exhibit 1.1: Real GDP Growth – Historic and Forecast, World, CY2020 - CY2030E



Source: IMF April 2026 forecast, Frost & Sullivan analysis

Exhibit 1.2: Real GDP Growth by Select Regions & Countries – Historic and Forecast, World, CY2020 – CY2030E

Country / Region	CY2020	CY2021	CY2022	CY2023	CY2024	CY2025	CY2026E	CY2027E	CY2028E	CY2029E	CY2030E
World	-2.7%	6.7%	3.8%	3.3%	3.4%	3.4%	3.1%	3.2%	3.2%	3.2%	3.1%
India	-5.8%	9.7%	7.6%	7.2%	7.1%	7.6%	6.5%	6.5%	6.5%	6.5%	6.5%
China	2.3%	8.6%	3.1%	5.4%	5.0%	5.0%	4.4%	4.0%	4.0%	3.7%	3.3%
United States	-2.1%	6.2%	2.5%	2.9%	2.8%	2.1%	2.3%	2.1%	2.1%	1.9%	1.8%
North America	-2.9%	6.1%	2.8%	2.9%	2.6%	1.9%	2.2%	2.1%	2.1%	1.9%	1.8%
Europe	-5.4%	6.5%	2.6%	1.2%	1.9%	1.5%	1.3%	1.4%	1.5%	1.5%	1.4%
Asia and Pacific	-0.8%	7.3%	4.3%	4.7%	4.6%	4.9%	4.4%	4.2%	4.2%	4.1%	4.0%
Middle East and Central Asia	-2.2%	4.7%	6.4%	2.6%	2.8%	3.6%	1.9%	4.6%	4.0%	4.0%	3.8%
Africa	-2.3%	4.1%	4.5%	3.5%	3.4%	4.5%	4.2%	4.4%	4.7%	4.6%	4.5%
Latin America and Caribbean	-6.9%	7.5%	4.3%	2.3%	2.4%	2.4%	2.3%	2.7%	2.9%	2.9%	2.7%

Source: IMF April 2026 forecast, Frost & Sullivan analysis

Looking ahead, global GDP growth is projected to moderate marginally to 3.1% in CY2026E before stabilizing at around 3.1% through CY2030E. The medium-term outlook reflects a transition toward a more structurally balanced growth environment characterized by relatively higher interest rates compared to the pre-pandemic period, evolving global trade dynamics, and continued realignment of supply chains. Increasing focus on energy transition, climate resilience, industrial automation, AI integration, and strategic manufacturing localization is expected to influence investment patterns globally over the forecast period.

1.2 Inflation

Global inflation, after peaking at 8.7% in CY2022, eased to 6.7% in CY2023, 5.8% in CY2024 and 4.1% in CY2025. This decline is driven by tighter monetary policies and lower international commodity prices. Faster disinflation could ease financial conditions, while stronger reforms may boost productivity. However, new commodity price spikes or persistent inflation could prolong tight monetary policies.

Inflation is expected to continue its moderate trend, with projections at 4.4% in CY2026E and 3.7% in CY2027E. The inflation rate is estimated to stabilize closer to pre-pandemic levels, with projections of 3.4% in CY2028E and 3.2% in both CY2029E and CY2030E. The expected decline is based on improving supply conditions, better alignment of demand and supply, and a more stable global trade environment. These trends may influence the timing and pace of monetary policy adjustments across economies.

Exhibit 1.3: Inflation Rate – Historic and Forecast, World, CY2020 – CY2030E

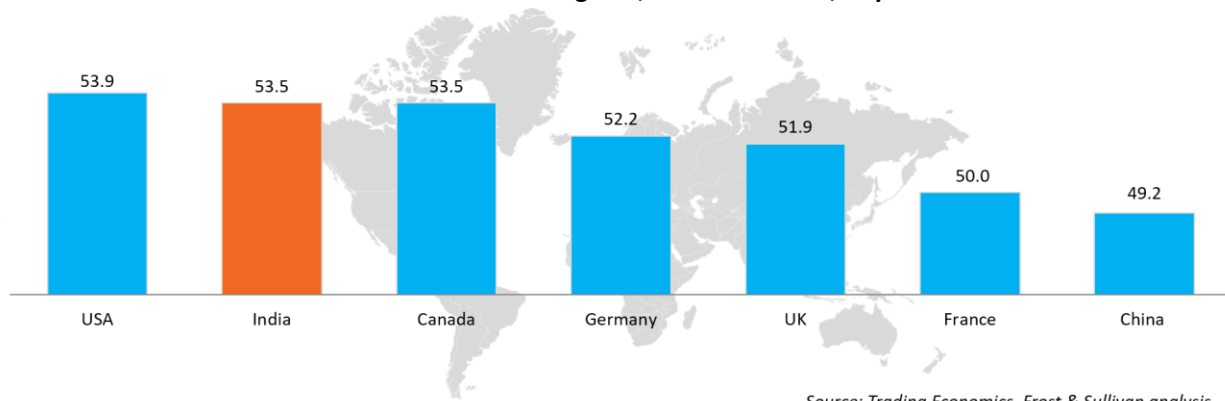
Country / Region	CY2020	CY2021	CY2022	CY2023	CY2024	CY2025	CY2026E	CY2027E	CY2028E	CY2029E	CY2030E
World	3.3%	4.7%	8.7%	6.7%	5.8%	4.1%	4.4%	3.7%	3.4%	3.2%	3.2%
India	6.2%	5.5%	6.6%	5.4%	4.6%	2.1%	4.7%	4.0%	4.0%	4.0%	4.0%
China	2.5%	0.9%	2.0%	0.2%	0.2%	0.0%	1.2%	1.5%	1.8%	1.9%	2.0%
United States	1.3%	4.7%	8.0%	4.1%	3.0%	2.7%	3.2%	2.1%	2.2%	2.2%	2.2%
North America	1.4%	4.7%	7.9%	4.2%	3.1%	2.8%	3.2%	2.3%	2.2%	2.3%	2.3%
Europe	1.2%	3.6%	10.0%	6.3%	3.6%	3.7%	3.4%	2.8%	2.6%	2.5%	2.5%
Asia and Pacific	3.2%	3.0%	6.3%	4.8%	4.3%	2.7%	3.7%	3.3%	3.2%	3.1%	3.2%
Middle East & Central Asia	10.4%	11.9%	13.3%	15.5%	13.9%	11.2%	11.9%	9.1%	7.6%	6.7%	6.1%
Africa	11.8%	12.8%	14.9%	19.3%	21.6%	13.1%	9.4%	8.8%	7.3%	6.3%	6.0%
Latin America and Caribbean	6.5%	9.9%	14.2%	14.8%	16.6%	7.6%	6.7%	4.9%	3.7%	3.5%	3.5%

Source: IMF April 2026 forecast, Frost & Sullivan analysis

1.3 Manufacturing Purchasing Managers Index (PMI)

Manufacturing activity showed a mixed trend across major economies in July 2026. India remained in expansion, although its manufacturing PMI eased to 53.5 from 55.0 in December 2025, indicating a moderation in the pace of improvement in operating conditions. The United States recorded a PMI of 53.9, moving firmly into expansion compared with 47.9 in December 2025. Germany also showed a significant improvement, with its PMI rising to 52.2 from 47.0, supported by stronger manufacturing output and export demand. Canada strengthened to 53.5, its highest level since June 2022, reflecting stronger output and new orders. The UK remained in expansion at 51.9, although growth moderated from the previous month. In contrast, China's manufacturing PMI declined to 49.2, moving back into contraction territory amid weaker production and new orders. Overall, the July 2026 readings indicate a divergent global manufacturing environment, with the US, Germany and Canada showing stronger manufacturing momentum, India maintaining expansion at a slower pace, and China continuing to face weaker manufacturing conditions.

Exhibit 1.4: Manufacturing PMI, Select Countries, July 2026



Source: Trading Economics, Frost & Sullivan analysis

1.4 Growth drivers impacting the growth of the global economy

Consumer Spending and Labor Markets: In many regions, consumer spending remains a primary driver of growth. This is supported by ongoing employment gains and wage increases, which enhance household purchasing power. Lower interest rates and reduced savings rates further encourage consumption.

Investment and Technological Advancements: Investment activity is recovering, particularly in sectors undergoing digital transformation. Advances in artificial intelligence and automation are reshaping global value chains, leading to increased efficiency and new business opportunities.

Fiscal Policies and Government Spending: Governments in various countries are implementing fiscal measures to stimulate growth. Increased public spending, especially in infrastructure and social programs, is contributing to economic activity.

Trade Dynamics and Emerging Markets: Emerging markets, notably India, continue to exhibit growth, driven by domestic demand and export activities. However, global trade dynamics are affected by policy uncertainties and tariff changes, influencing investment decisions and supply chains.

Monetary Policy Adjustments: Central banks are adjusting monetary policies in response to inflation trends. While some regions experience easing inflation, others face persistent price pressures, leading to varied interest rate strategies that impact investment and consumption patterns.

2. MACROECONOMIC OVERVIEW OF INDIAN ECONOMY

2.1 Indian Macro-economic overview

India's macroeconomic policy framework has continued to emphasise fiscal consolidation alongside public investment, manufacturing, infrastructure and domestic capacity building. The provisional Union Government accounts for FY2025-26 indicate total expenditure of approximately INR 49.05 lakh crore and capital expenditure of INR 10.69 lakh crore, with the fiscal deficit at 4.4% of GDP. For FY2026-27, the Union Budget provides for total expenditure of approximately INR 53.47 lakh crore, including capital expenditure of INR 12.22 lakh crore, while targeting a lower fiscal deficit of 4.3% of GDP. The Budget continues to prioritise manufacturing and investment, with initiatives spanning strategic sectors such as semiconductors, electronics, biopharmaceuticals, textiles, capital goods and critical minerals, alongside an INR 10,000 crore SME Growth Fund.¹

¹ <https://cga.nic.in/writereaddata/MonthAccount/32026/DATA2526.htm?utm>

Several initiatives announced under the FY2025-26 Budget have progressed into implementation. The Prime Minister Dhan-Dhaanya Krishi Yojana is being implemented across 100 districts, while the Mission for Aatmanirbharta in Pulses has been approved with an outlay of INR 11,440 crore for 2025-26 to 2030-31. The INR 1 lakh crore Urban Challenge Fund has been approved, and operational guidelines have been issued, while the INR 25,000 crore Maritime Development Fund has been established and its implementation framework put in place. The INR 10,000 crore Startup India Fund of Funds 2.0 has also been approved and notified to support deep-tech, innovative manufacturing and early-growth startups.²

The Government has also moved forward on innovation and financial-sector reforms. The INR 1 lakh crore Research, Development and Innovation Scheme has been launched to support private-sector R&D and deep-tech development, while the National Geospatial Mission remains under development. The insurance-sector FDI limit has been increased from 74% to 100% following amendments to the insurance laws. Export promotion has also moved beyond the original Budget announcement, with the INR 25,060 crore Export Promotion Mission for FY2025-26 to FY2030-31 now operational through the Niryat Protsahan and Niryat Disha sub-schemes.³

2.2 Review and outlook of Real GDP growth in India

India's economy demonstrated strong resilience in Q1FY27, with GDP growth of 7.8%, remaining robust despite persistent global and domestic macro headwinds, reinforcing the underlying strength of domestic demand and the broader economic outlook. Against this backdrop, the Union Budget FY2027 outlines a total expenditure of INR 53.47 lakh crore, with a capital expenditure of INR 12.22 lakh crore, including a capital outlay of INR 9.43 lakh crore, while targeting a fiscal deficit of 4.3% of GDP, underscoring the government's continued focus on infrastructure-led growth and fiscal consolidation. The Union Budget FY2027 emphasizes accelerating manufacturing-led growth, strengthening MSMEs, and enhancing India's global competitiveness through targeted industrial policies and continued public investment. Key announcements include the launch of the National Manufacturing Mission to scale strategic and frontier industries, expansion of the India Semiconductor Mission 2.0, a higher outlay for the Electronics Component Manufacturing Scheme, and the development of dedicated rare earth corridors to strengthen domestic supply chains. The Budget also introduces growth and risk-capital support for MSMEs, regulatory simplification, and measures to improve ease of doing business. Continued investments in infrastructure, logistics, energy security, and climate technologies, along with sector-specific initiatives for biopharmaceuticals, chemicals, capital goods, and textiles, are expected to boost domestic manufacturing and drive demand across industrial equipment, electronics, cooling, and refrigeration value chains.

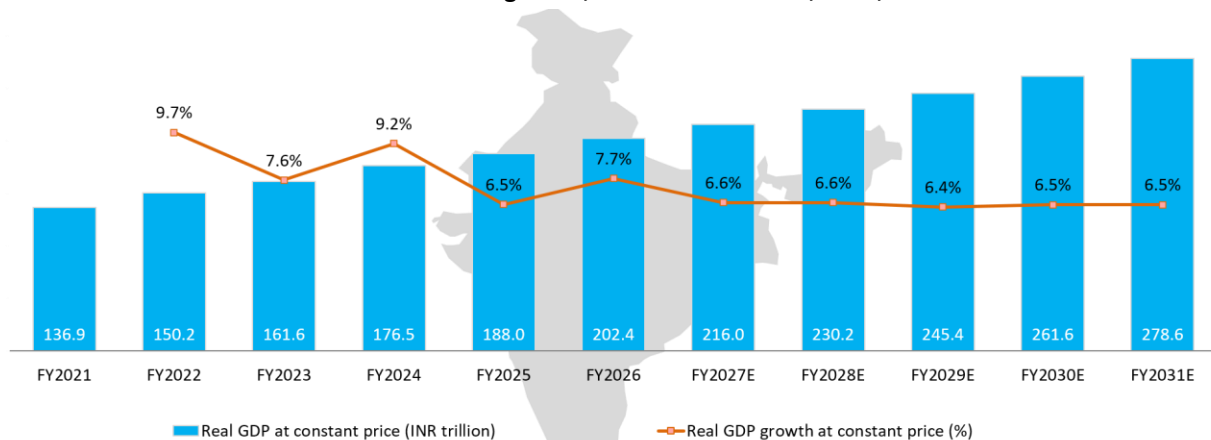
On the investment front, the Union Budget FY2027 reinforces its commitment to infrastructure, manufacturing, technology, and energy security through a total capital expenditure of INR 12.22 lakh crore while maintaining fiscal consolidation. The Budget significantly strengthens India's industrial ecosystem by increasing the outlay for the Electronics Component Manufacturing Scheme (ECMS) from INR 22,919 crore to INR 40,000 crore and launching the India Semiconductor Mission 2.0 to support semiconductor equipment, materials, indigenous IP development, and resilient supply chains. To reduce import dependence in critical minerals, dedicated Rare Earth Corridors will be established across Odisha, Kerala, Andhra Pradesh, and Tamil Nadu. Innovation and clean technology receive a further boost with an allocation of INR 20,000 crore over five years for Carbon Capture, Utilisation and Storage (CCUS), while

² <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2244624&lang=1®=1&utm>

³ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2226469&lang=1®=3&utm>

the Biopharma SHAKTI programme is launched with an outlay of INR 10,000 crore over five years to position India as a global biologics and biosimilars manufacturing hub. The Budget also provides INR 10,000 crore over five years for a Container Manufacturing Scheme and supports the establishment of three plug-and-play Chemical Parks to strengthen domestic manufacturing capabilities. MSMEs benefit from a dedicated INR 10,000 crore SME Growth Fund, expanded credit access, invoice financing reforms, and regulatory simplification to accelerate technology adoption and competitiveness. Continued investments in multimodal logistics, high-speed rail corridors, digital infrastructure, and strategic manufacturing, along with measures to promote Global Capability Centres (GCCs), data centres, and export-oriented industries, reinforce the government's roadmap towards innovation-led, manufacturing-driven, and globally competitive economic growth.

Exhibit 2.1: Annual Real GDP and growth, value in INR trillion, India, FY2021 - FY2031E



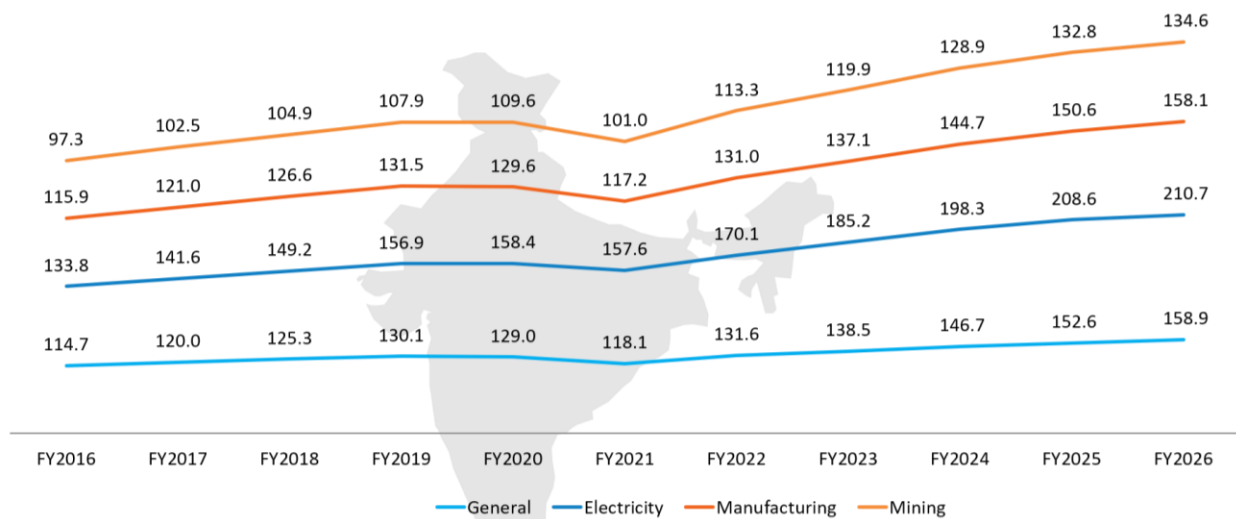
Source: MoSPI (Annual Estimates of GDP at constant price, 2011-12 series), IMF, ADB, S&P, Frost & Sullivan Analysis

India's real GDP at constant prices declined from INR 145.3 trillion in FY2020 to INR 136.9 trillion in FY2021 due to the economic disruptions caused by the COVID-19 pandemic and nationwide mobility restrictions. However, the economy recovered strongly thereafter, with real GDP increasing to INR 150.2 trillion in FY2022 and further expanding to INR 161.6 trillion in FY2023, driven by reopening of economic activities, recovery in private consumption, revival in industrial output, and increased public expenditure.

The growth trajectory continued during FY2025 and FY2026, with India's real GDP reaching INR 188.0 trillion and INR 202.4 trillion, respectively.

2.3 Index of Industrial Production (IIP)

India's Index of Industrial Production (IIP) recorded steady growth in FY2026, reflecting resilient industrial activity despite global economic uncertainties. Manufacturing remained the primary driver of growth, supported by strong domestic demand, increased infrastructure spending, improving capacity utilization, and sustained momentum in sectors such as electrical equipment, machinery, automobiles, pharmaceuticals, and consumer goods. The mining sector also registered positive growth, aided by higher production of coal, iron ore, and other key minerals to meet rising industrial and power sector demand. Electricity generation continued to expand, driven by growing consumption across industrial, commercial, and residential segments. Overall, the industrial sector benefited from continued government capital expenditure, production-linked incentive (PLI) schemes, improving private investment, and a stable macroeconomic environment, reinforcing the country's manufacturing-led growth trajectory during FY2026.

Exhibit 2.3: India - Index of Industrial Production (IIP) by sectors, FY2016 - FY2026

Source: MoSPI (Annual Estimates of GDP at constant price, 2011-12 series); RBI (Reserve Bank of India); Frost & Sullivan Analysis

India's industrial sector maintained steady momentum in FY2026, with the Index of Industrial Production (IIP) increasing from 152.6 in FY2025 to 158.9 in FY2026, reflecting a year-on-year growth of 4.1%. The manufacturing sector, which contributes nearly 77.6% to the overall IIP, remained the primary growth engine, supported by resilient domestic consumption, higher government capital expenditure, improving capacity utilization, and continued investments across sectors such as electrical equipment, machinery, automobiles, pharmaceuticals, chemicals, fabricated metal products, and consumer durables. Public infrastructure spending on roads, railways, metro projects, airports, renewable energy, and data centres continued to stimulate demand for industrial goods and capital equipment. Government initiatives, including the Production Linked Incentive (PLI) schemes, Make in India, PM Gati Shakti, and expanding electronics and semiconductor manufacturing, further strengthened domestic manufacturing activity and encouraged private investment.

2.4 India manufacturing PMI (Purchasing Managers Index)

India's manufacturing sector continued to demonstrate resilience during the period from April 2024 to May 2026, with the PMI consistently remaining above the neutral threshold level of 50, indicating sustained expansion in manufacturing activity. The strong PMI performance reflects continued growth in production activity, new order inflows, infrastructure spending, domestic demand, and improving industrial sentiment despite evolving global macroeconomic uncertainties.

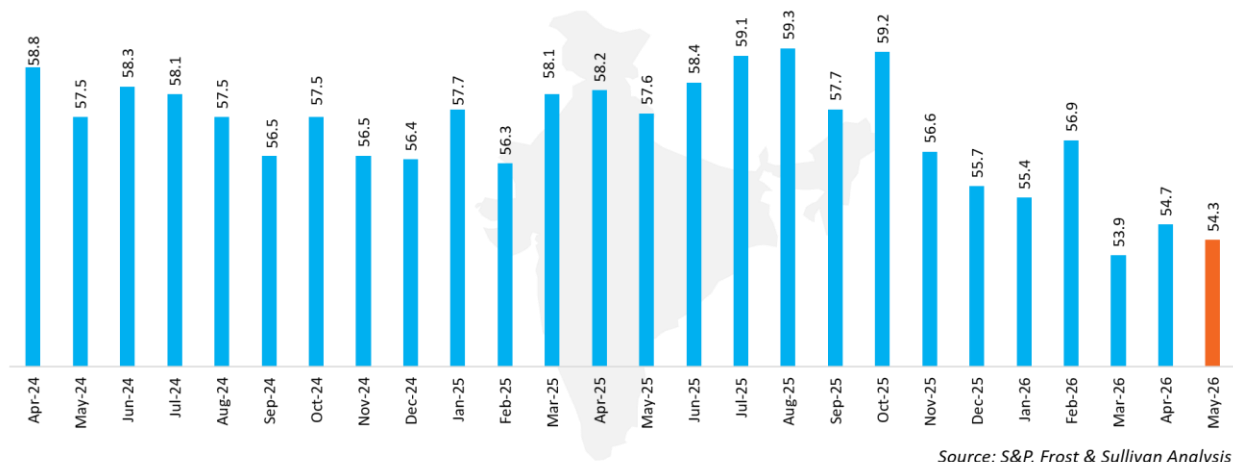
During FY2025, India's manufacturing PMI largely remained in the range of 56-59, highlighting robust industrial momentum supported by strong domestic consumption, government-led infrastructure investments, improving supply chain conditions, and increased activity across sectors such as engineering, automotive, construction materials, capital goods, electronics, and renewable energy equipment.

The PMI touched relatively elevated levels during mid-FY2026, reaching 59.1 in July 2025 and 59.3 in August 2025, reflecting strong expansion in output, improved business confidence, and rising order volumes. Growth during this phase was further supported by improving export demand in select sectors, increased capacity utilization, and continued investments across infrastructure and industrial projects.

Although manufacturing PMI moderated during the latter part of FY2026, declining to 53.9 in March 2026 and remaining at 54.3 in May 2026, the index continued to indicate expansionary manufacturing conditions. The moderation primarily reflected softer global demand conditions, cautious inventory management, evolving trade dynamics, and normalization following a period of elevated industrial activity. Nevertheless, the sector remained supported by resilient domestic demand, government infrastructure spending, PLI schemes, and continued investments in transportation, renewable energy, power transmission, railways, and industrial manufacturing.

Policy support under initiatives such as Make in India, National Logistics Policy, PM Gati Shakti, and sector-specific manufacturing incentives is expected to strengthen long-term industrial competitiveness and support sustained manufacturing growth over the medium term.

Exhibit 2.4: Indian manufacturing PMI, April 2021 – May 2026



2.5 Sectoral share of Gross Value Added (GVA)

India's Gross Value Added (GVA) data for FY2026 reflects resilient and broad-based economic growth, supported by strong domestic demand, sustained public capital expenditure, and continued expansion in the services sector. Real GVA grew by ~7% in FY2026, improving over the previous year despite persistent global trade uncertainties and geopolitical challenges.

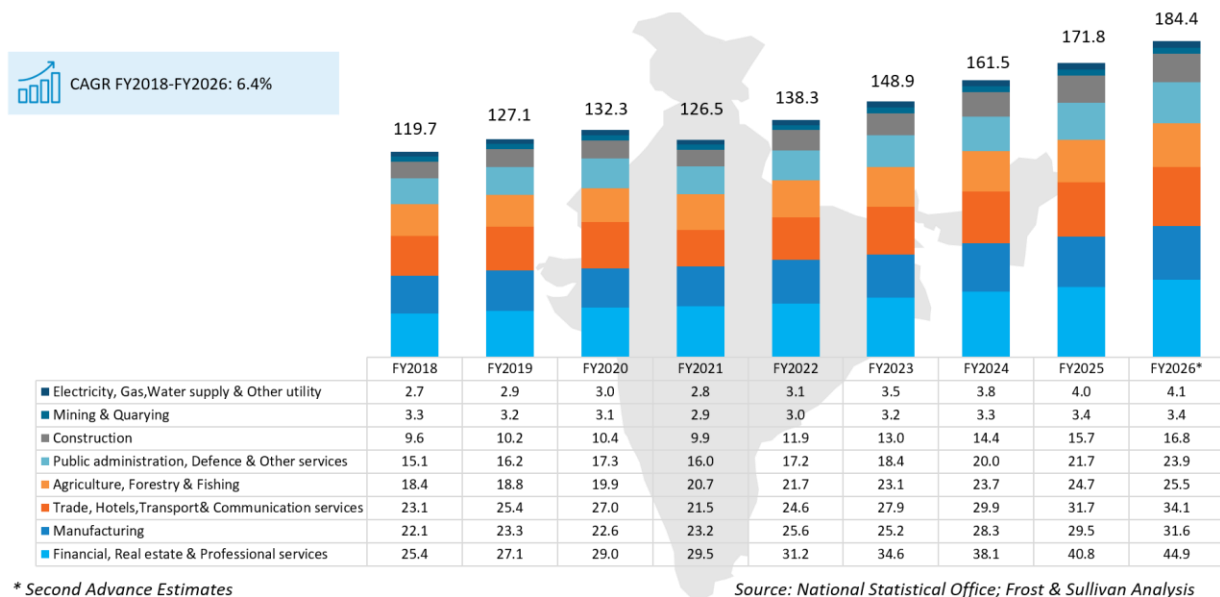
The manufacturing sector registered steady growth, supported by improving domestic consumption, the Production Linked Incentive (PLI) schemes, and increasing investments in electronics, automobiles, pharmaceuticals, and engineering industries. The agriculture, forestry, and fishing sector remained resilient, benefiting from favorable monsoon conditions, healthy crop output, and higher rural consumption. The construction sector emerged as one of the fastest-growing segments, driven by sustained government capital expenditure on transport, logistics, urban infrastructure, and housing projects.

The services sector continued to be the primary engine of economic growth. Financial, real estate, and professional services expanded steadily, supported by healthy credit growth, digitalization, and rising business activity. Trade, hotels, transport, and communication services also recorded robust growth, reflecting improving consumer spending, tourism, and logistics activity. Public administration and defense remained strong, supported by higher government expenditure and ongoing infrastructure development.

Overall, India's economic momentum in FY2026 was underpinned by resilient private consumption, rising public investment, improving urban demand, and continued policy support for manufacturing and infrastructure. While external headwinds-including global trade disruptions, geopolitical tensions, and slower growth in major export markets-continued to pose risks, the economy remained supported by strong domestic fundamentals, healthy corporate and banking sector balance sheets, and structural reforms such as the National Manufacturing Mission, PM Gati Shakti, and continued implementation of the PLI schemes.

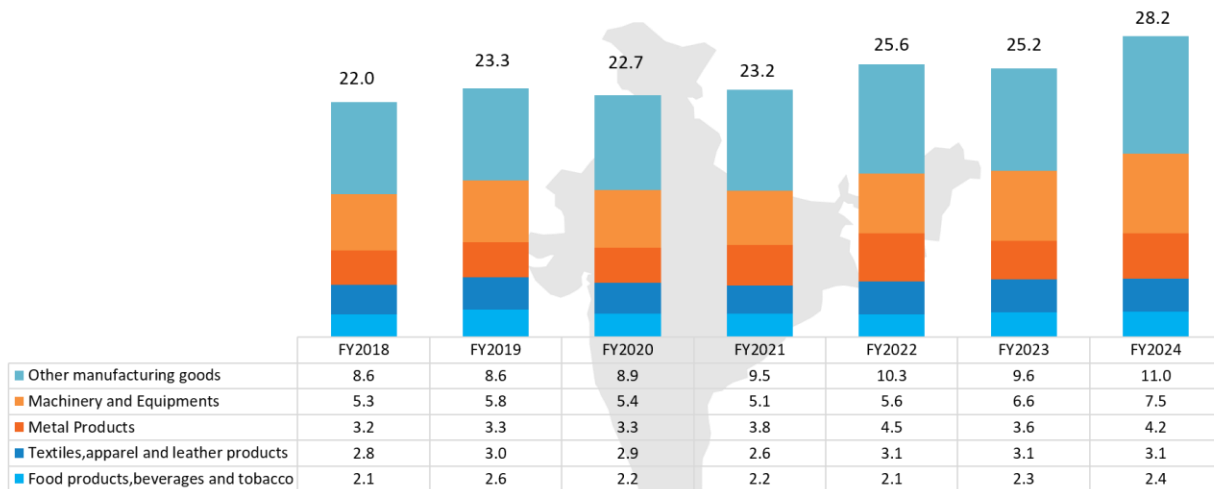
India's manufacturing sector has steadily expanded its economic contribution over the last several years, and the data reflects a clear shift towards higher value-added, capital-intensive industries. For example, machinery and equipment showed a robust rise from INR 5.3 trillion in FY2018 to INR 7.5 trillion in FY2024, growing at a CAGR of ~6.0%, reflecting growing investments in automation, industrial modernisation, and infrastructure development. This growth signals that Indian manufacturers are increasingly focusing on improving productivity and technology adoption rather than just volume growth.

Exhibit 2.5: India - Gross value added (GVA) at basic price by economic activity, INR trillion, FY2018 - FY2026



Similarly, metal products and other manufacturing goods have seen strong gains, driven by both domestic infrastructure demand and export opportunities. The surge in metal products from INR 3.2 trillion in FY2018 to INR 4.2 trillion in FY2024 can be linked to governments push on construction, automobile, and defense sectors, which rely heavily on metal inputs. Meanwhile, the relatively modest growth in food products and textiles - traditional labour-intensive sectors - indicates a gradual transition of the economy from lower-value manufacturing towards more sophisticated industries.

Underlying these sector trends are policy measures like the Production Linked Incentive (PLI) schemes, which are specifically designed to boost competitive, export-oriented manufacturing and attract global supply chains. Along with increased capital expenditure and infrastructure upgrades, these initiatives have encouraged businesses to invest in higher technology and scale up operations. This shift not only enhances India's global manufacturing competitiveness but also supports more sustainable, higher-quality job creation.

Exhibit 2.6: India - Sector wise split of GVA for manufacturing, value in INR trillion, FY2018 - FY2024

Source: National Statistical Office; Frost & Sullivan Analysis

2.6 Foreign Direct Investment (FDI)

India has continued to remain one of the leading destinations for FDIs among emerging economies, supported by its large domestic market and expanding manufacturing ecosystem.

Total FDI inflows increased from USD 74.4 billion in FY2020 to USD 84.8 billion in FY2022, driven by strong investor interest across sectors such as digital services, manufacturing, infrastructure, renewable energy, financial services, logistics, and technology. During this period, India benefited from increasing global focus on supply chain diversification, localization of manufacturing capacities, and rising investments in digital infrastructure and industrial development.

Although total FDI inflows moderated to approximately USD 71 billion during FY2023 and FY2024 amid global economic slowdown and elevated interest rates, India continued to attract significant long-term investments supported by strong domestic growth prospects and structural reforms. In FY2025, total FDI inflows recovered to USD 80.6 billion.

Equity inflows remained the largest component of total FDI during the review period. Re-invested earnings also demonstrated consistent growth, rising from USD 14.2 billion in FY2020 to USD 22.8 billion in FY2025, indicating sustained confidence among existing foreign investors regarding India's long-term economic and business outlook.

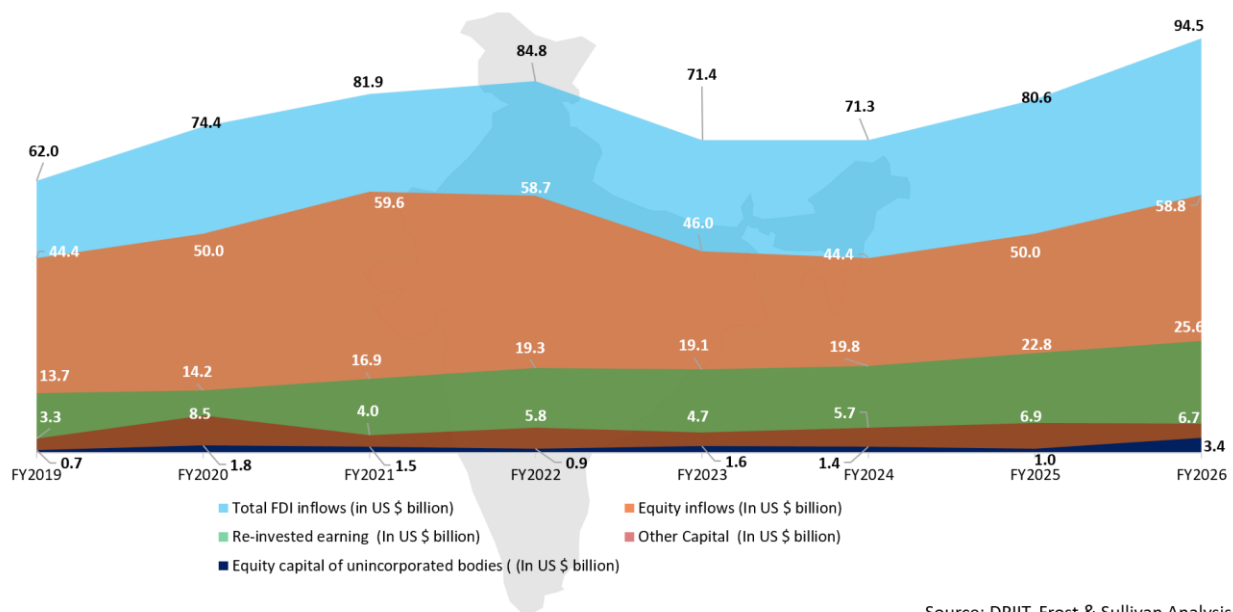
During FY2026, India recorded total FDI inflows of USD 94.5 billion, with equity inflows accounting for USD 58.8 billion. The strong contribution from equity investments reflects continued investor interest in sectors linked to manufacturing, infrastructure, renewable energy, electronics, transportation, industrial engineering, logistics, and digital services. In addition, increasing investments across semiconductor manufacturing, electric mobility, data centers, and clean energy infrastructure continue to strengthen India's position as a strategic long-term investment destination.⁴

India's growing integration into global supply chains, relatively stable macroeconomic environment, expanding consumer market, and increasing focus on industrial self-reliance continue to position the country favorably for long-term foreign investments across manufacturing and infrastructure-linked

⁴ <https://www.dpiit.gov.in/static/uploads/2026/06/58b5bb60fa2d0b268d9017d393e7eb0e.pdf>

sectors. However, global risks related to geopolitical tensions, trade fragmentation, currency volatility, and slower global economic growth may continue to influence short-term investment flows and capital allocation trends.

Exhibit 2.7: FDI inflow in India, in USD billion, FY2019 – FY2026



2.7 Per capita income – India vs. leading global economies

India's per capita income is estimated at approximately USD 2,675 in CY2025, up from about USD 2,530 in CY2023, reflecting a steady improvement driven by economic growth and gradual formalisation. Despite this progress, India remains a lower-middle-income economy, with per capita income levels significantly below the global average, estimated at around USD 14,613 in CY2025.

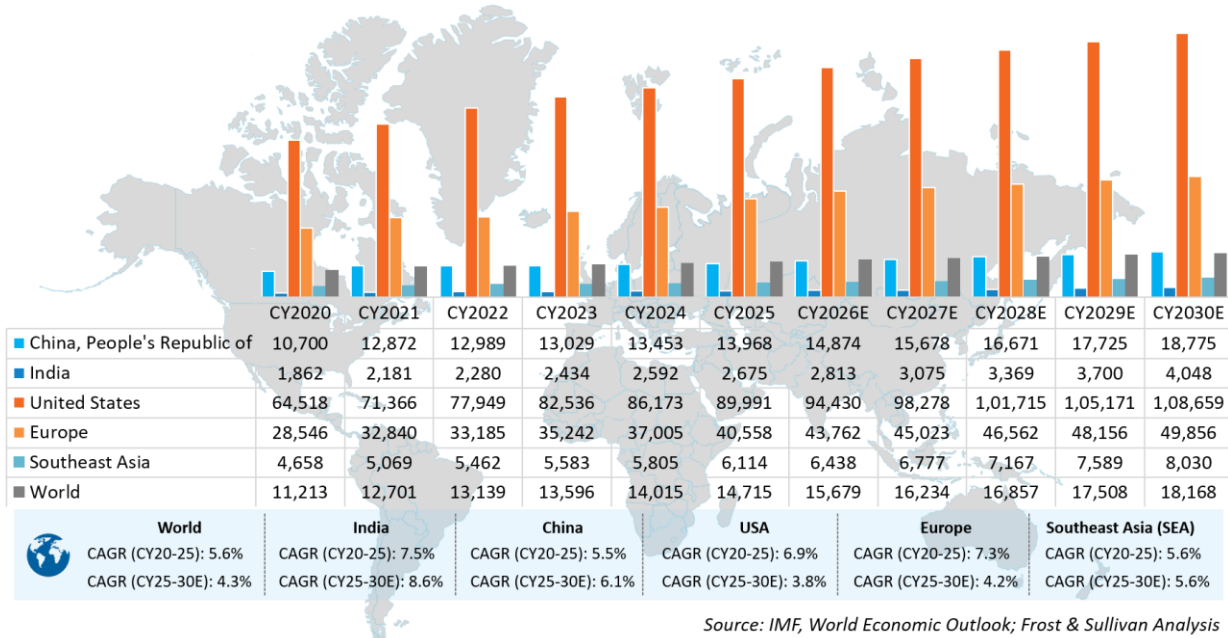
India's per capita GDP increased from around USD 2,695 in CY2024 and is projected to rise to approximately USD 4,346 by CY2030. This growth reflects sustained economic expansion, supported by rising employment, productivity improvements in manufacturing and services, and improved access to education and healthcare.

Rising income levels are expected to support a gradual increase in discretionary consumption over the medium term. This trend is likely to translate into higher demand for consumer durables, housing-related products, mobility solutions, and other manufactured goods, reinforcing domestic demand for industrial and manufacturing sectors.

India's demographic profile, combined with ongoing digitalisation and infrastructure development, is expected to support a continued expansion of the middle-income population over the remainder of the decade. This structural shift is expected to contribute to consumption-led growth and greater diversification of economic activity.

Globally, per capita income levels in advanced economies such as the United States and Europe remain significantly higher, while China and Southeast Asian economies continue to narrow the gap through sustained growth. India's per capita income growth rate during CY2024–CY2030E remains among the higher growth rates globally, reflecting its position in an earlier stage of income transition.

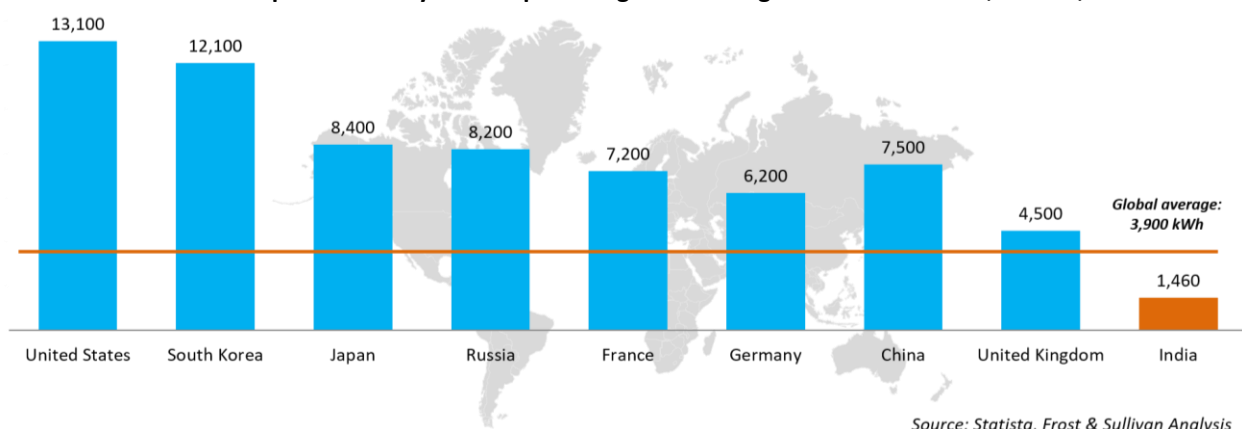
Exhibit 2.8: India vs. Global – Per capita income of India vs leading economies (USA, China, Europe and Southeast Asia), value in USD, CY2020 - CY2030E



2.8 Per capita electricity consumption

Per capita electricity consumption is an important indicator of electricity demand and the extent of electricity use across households, commercial establishments and industry. Among the world's ten largest power markets, India has the lowest per capita electricity demand at approximately 1.4 MWh (1,400 kWh) in CY2025, compared with the global average of approximately 3.9 MWh (3,900 kWh). In comparison, per capita electricity demand was approximately 13.1 MWh in the United States and 12.1 MWh in South Korea. India's relatively low per capita electricity demand reflects its large population and indicates significant headroom for growth as economic activity, industrialisation and electricity-intensive end uses increase.⁵

Exhibit 2.9: Per capita electricity consumption of global leading economies vs India, in kWh, CY2025

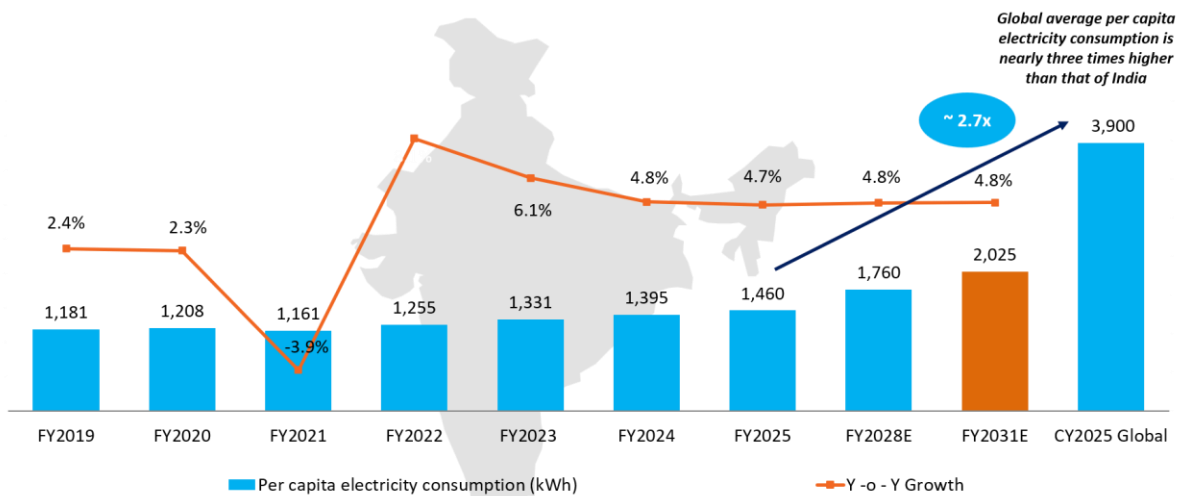


That said, India's per capita electricity consumption has increased steadily over the past several years. Based on Central Electricity Authority (CEA) data, per capita electricity consumption increased from 1,181

⁵ https://cea.nic.in/wp-content/uploads/pdm/2025/11/Growth_Book_2025.pdf?utm

kWh in FY2019 to 1,460 kWh in FY2025. The FY2025 figure represents a 52.6% increase from 957 kWh in FY2014, reflecting increasing electricity access and consumption across residential, commercial and industrial applications.⁶

Exhibit 2.10: Per capita electricity consumption of India and growth, in kWh and %, FY2019 – FY2031E



Going forward, continued economic growth, urbanisation, industrialisation, digitalisation, increasing appliance penetration and electrification of end-use sectors are expected to support further growth in per capita electricity consumption. NITI Aayog's latest long-term scenarios estimate India's per capita electricity consumption at approximately 1,400 kWh in 2025 and project it to reach approximately 4,800 kWh by 2050 under the Current Policy Scenario, highlighting the substantial long-term growth potential in electricity demand.⁷

3. INDIA EMERGING AS A GLOBAL MANUFACTURING HUB

3.1 India emerging as a global manufacturing hub

In FY2026, India's merchandise exports reached USD 441.7 billion, maintaining momentum despite global headwinds. With a target of USD 1 trillion by FY2030, the government continues to strengthen the manufacturing sector, which currently contributes about 17.5% to GDP and employs over 65 million people. Efforts are underway to increase this share to 25% by 2047, supported by robust Production-Linked Incentive (PLI) schemes. Key reforms—such as the Goods and Services Tax (GST), reduction in corporate tax rates, and the establishment of Project Development Cells (PDCs)—have boosted investor confidence, with FDI inflows rising to USD 94.5 billion in FY2026, up from USD 55.5 billion in FY2016. Programs like the Phased Manufacturing Programme (PMP) are further anchoring India's position as a global manufacturing and export hub.

3.2 India's competitiveness among the leading manufacturing economies

India's economic growth is driven by strong domestic consumption and private investment, supported by initiatives like "Make in India" and "Atmanirbhar Bharat." These programmes aim to boost manufacturing

⁶ https://cea.nic.in/wp-content/uploads/pdm/2025/11/Growth_Book_2025.pdf?utm

⁷ <https://www.iea.org/reports/global-energy-review-2026/electricity-demand?utm>

in key sectors, reduce import dependence, and drive innovation. With a young, cost-effective workforce and the "Skill India" programme focusing on modern skills, India remains competitive despite rising wages. As global manufacturing shifts, India is poised to capture a larger market share due to its favourable demographics and policies. Southeast and South Asia are emerging as key manufacturing hubs, with India being a strong contender.

A. Comparison on key economic parameters:

India continues to stand out as a high-potential economy among its global manufacturing peers, supported by its large and relatively young population. With a population of 1.46 billion and around 1.00 billion people in the 15–64 age group, India has a substantial working-age population that provides a strong demographic foundation for long-term economic and industrial growth. India's median age of 28.8 years is significantly lower than China (40.1 years), Thailand (40.6 years), Vietnam (33.4 years), and Mexico (29.6 years), highlighting India's comparatively youthful demographic profile and sustained labour availability.

From a macroeconomic perspective, India recorded 7.6% GDP growth in CY2025, the highest among the benchmarked economies like China (5.0%), Thailand (2.1%), and Mexico (0.6%) - with Vietnam (8.0%) marginally higher than India. India's economy stands at USD 3.9 trillion, significantly smaller than China (USD 19.6 trillion) and Mexico (USD 1.8 trillion), but its growth trajectory remains strong. Looking ahead, India is projected to maintain 6.5% GDP growth by CY2030, substantially higher than China (3.4%), Vietnam (2.5%), Mexico (2.1%), and Thailand (1.0%). Inflation in India stands at a moderate 2.2%, below Vietnam (3.3%) and Mexico (3.8%), while remaining higher than China and Thailand. More recently, India has demonstrated strong near-term economic resilience, with real GDP growth accelerating to 7.8% in Q1FY27, exceeding the RBI's 7.0% forecast despite persistent global and macroeconomic headwinds. The stronger-than-expected performance, supported by resilient investment, manufacturing and services activity, highlights the underlying momentum in domestic economic activity and provides a positive starting point for FY27. Overall, India's combination of a large youthful population, strong growth outlook, and moderate inflation positions it favorably for sustained economic expansion and as an increasingly attractive manufacturing and investment destination.

Exhibit 3.1: Comparison on key economic parameters – India vs. China, Thailand, Vietnam, and Mexico, CY2025

PARAMETERS		 INDIA	 CHINA	 THAILAND	 VIETNAM	 MEXICO
Total Population (Million)		1,463.8	1,406.6	71.6	101.6	131.9
Population in age 15-64 years (Million)		1,001.7	980.1	49.8	68.7	88.9
Median age (Years)		28.8	40.1	40.6	33.4	29.6
Annual GDP (USD Trillion)		3.9	19.6	0.6	0.5	1.8
GDP Growth (%)	CY2025	7.6%	5.0%	2.1%	8.0%	0.6%
	CY2030E	6.5%	3.4%	1.0%	2.5%	2.1%
Inflation (%)		2.2%	0.0%	-0.1%	3.3%	3.8%

Source: World Bank (Data Bank), IMF, UN (Population Data), Frost & Sullivan analysis

B. Labour market comparison:

India, with a total labour force of 617.6 million, has one of the largest workforce pools among the benchmarked economies, providing a significant advantage for manufacturing-led growth. However,

labour-force participation remains relatively low at 61.7%, compared with China (78.4%), Thailand (82.1%), and Vietnam (83.0%), indicating further scope to improve workforce participation.

Female representation remains a key area of opportunity, with women accounting for 28.3% of the total labour force, substantially below Vietnam (48.8%), Thailand (45.7%), China (45.4%), and Mexico (40.2%). Increasing female workforce participation could further expand India's available talent pool and support more inclusive industrial growth. At the same time, 25.8% of employment is concentrated in industry, below China (31.8%) and Vietnam (34.8%), highlighting significant potential for further industrialization and manufacturing-led job creation.

India also has a strong labour cost advantage, with a real average daily wage of approximately USD 6.5, significantly lower than Thailand (~USD 10.4), Vietnam (~USD 12.0), Mexico (~USD 14.5), and China (~USD 35.0). However, only 21.2% of total employment comprises wage and salaried workers, considerably lower than China (64.6%), Thailand (50.2%), Vietnam (41.8%), and Mexico (69.0%). This indicates a relatively high prevalence of informal employment and underscores the need to expand formal employment opportunities, enhance workforce skills, and improve labour productivity to fully leverage India's cost and workforce advantages.

Exhibit 3.2: Labour market comparison - India vs. China, Thailand, Vietnam, and Mexico, CY2025

PARAMETERS	 INDIA	 CHINA	 THAILAND	 VIETNAM	 MEXICO
Total Labour Force (Million)	617.6	768.0	40.9	57.0	61.7
Total Labour Force, Female (% of Total population)	28.3	45.4	45.7	48.8	40.2
Labour force participation rate (% of total population)	61.7	78.4	82.1	83.0	69.4
Employment in Industry (% of Total Employment)	25.8	31.8	22.4	34.8	24.5
Wage and salaried workers (% of Total Employment)*	21.2	64.6	50.2	41.8	69.0
Real Average Daily Wage	~ 6.5	~35.0	~10.4	~12.0	~14.5

Source: IMF, ILO, Statista, Frost & Sullivan analysis

C. Comparison of manufacturing ecosystem:

India is positioning itself as a key global manufacturing destination, supported by favorable government policies, expanding industrial capabilities, and strong investor interest. Manufacturing value added accounts for 13.5% of GDP, significantly below China (24.7%), Thailand (23.7%), Vietnam (24.5%), and Mexico (19.6%), highlighting substantial headroom for further industrialization and value creation.

India's total merchandise exports stand at USD 0.45 trillion, while imports are higher at USD 0.75 trillion, indicating continued reliance on imported goods and components.

Exhibit 3.3: Comparison of manufacturing ecosystem - India vs. China, Thailand, Vietnam, and Mexico, CY2025

PARAMETERS	 INDIA	 CHINA	 THAILAND	 VIETNAM	 MEXICO
Manufacturing Value Added (% of GDP)	13.5%	24.7%	23.7%	24.5%	19.6%
Total Export (USD Trillion)	0.45	3.77	0.34	0.47	0.67
Total Imports (USD Trillion)	0.75	2.58	0.35	0.45	0.68
Manufacturing Risk Index (Rank)	2	1	5	11	12
Global manufacturing output (% share)	3.2%	27.4%	0.7%	0.7%	1.7%
FDI Investments (USD Billion)	94.5	104.7	18.8	27.6	40.9
Favourable government policies	High	High	High	High	Medium
Developed component ecosystem	Medium	High	High	Medium	High

Import and Export values mentioned are only for commodities and do not include services
Rank 1 indicates the most beneficial locations for global manufacturing

Source: IMF, Statista, Frost & Sullivan analysis

Despite this trade imbalance, India accounts for 3.2% of global manufacturing output, well ahead of Thailand and Vietnam at 0.7% each and Mexico at 1.7%. India also ranks 2nd on the Manufacturing Risk Index, behind China, underscoring its attractiveness as a potential alternative manufacturing hub.

India recorded USD 94.5 billion in FDI investments, making it the second-highest among the benchmarked countries, after China at USD 104.7 billion. The country benefits from highly favorable government policies, driven by initiatives such as Make in India and the PLI schemes, which continue to support domestic manufacturing and investment. However, India's component ecosystem is currently rated medium, compared with high ratings for China, Thailand, and Mexico. Strengthening domestic component manufacturing and supply-chain localization therefore remains an important priority for India to further enhance its competitiveness in global manufacturing.

3.3 Government policies and schemes driving manufacturing in India

India's manufacturing sector is undergoing a paradigm shift, driven by large-scale policy reforms and targeted industrial support from the Government. At the center of this transformation is the Production Linked Incentive (PLI) Scheme, launched in 2020, which aims to enhance domestic value addition, attract global and domestic investments, foster innovation, and strengthen export competitiveness across priority manufacturing sectors.

The Government continues to reinforce PLI support across strategic manufacturing segments. Based on the Budgetary Estimates for FY2026–27, Automobiles and Auto Components, implemented by the Department of Heavy Industries, receive the highest allocation among the sectors presented at INR 5,940 crore, compared with INR 2,091 crore in the FY2025–26 Revised Estimate. Pharmaceuticals, implemented by the Department of Pharmaceuticals, also maintains a significant allocation of INR 2,500 crore, broadly in line with the INR 2,493 crore revised estimate for FY2025–26.

Other priority sectors continue to receive targeted support. The Department for Promotion of Industry and Internal Trade (DPIIT) has been allocated INR 1,004 crore for White Goods, covering air conditioners and LED lights, up from INR 304 crore in FY2025–26 RE. Specialty Steel, implemented by the Ministry of Steel, sees its allocation increase from INR 193 crore to INR 380 crore. The Ministry of Textiles has allocated INR 405 crore for Textile Products, marginally higher than INR 400 crore in FY2025–26 RE, while

the Advanced Chemistry Cell (ACC) Battery Storage programme, implemented jointly by NITI Aayog and the Department of Heavy Industries, receives INR 86 crore compared with INR 13 crore previously.

Notably, the Ministry of Electronics and Information Technology (MeitY) allocation for Electronics Manufacturing and IT Hardware stands at INR 1,527 crore in FY2026–27 BE, compared with INR 7,000 crore in FY2025–26 RE, reflecting a significant year-on-year reduction in the budgetary provision. Across the seven sectors presented, the combined allocation stands at approximately INR 11,842 crore in FY2026–27 BE, compared with INR 12,494 crore in FY2025–26 RE, with the overall allocation mix increasingly concentrated toward automotive manufacturing and other strategic industrial segments.

Cumulatively, the PLI Scheme continues to cover 14 critical sectors with a total approved outlay of approximately INR 1.97 lakh crore. The scheme operates through a performance-linked disbursement mechanism, providing incentives based on incremental production and sales and thereby encouraging investments, technological advancement, economies of scale, and greater domestic value addition. Sectors such as electronics, pharmaceuticals, automotive, telecom, and solar PV have emerged as key beneficiaries, supporting India's transition toward a more competitive and globally integrated manufacturing ecosystem.

Exhibit 3.4: Approved financial outlay under Production Linked Incentive (PLI) scheme (INR Cr.)

Sectors	Implementing Ministry/Department	Revised Estimate 2025–26	Budgetary Estimate 2026–27
Electronics Manufacturing & IT Hardware	Ministry of Electronics & Information Technology	7,000	1,527
Automobiles & Auto Components	Department of Heavy Industries	2,091	5,940
Pharmaceuticals	Department of Pharmaceuticals	2,493	2,500
Textile Products	Ministry of Textiles	400	405
White Goods (Air Conditioners and LED Lights)	Department for Promotion of Industry and Internal Trade	304	1,004
Specialty Steel	Ministry of Steel	193	380
Advanced Chemistry Cell (ACC) Battery Storage	NITI Aayog & Department of Heavy Industries	13	86

Source: DPIIT, Invest India, Frost & Sullivan Analysis

3.4 India emerging as the world's technology hub

As of 2025, the National Industrial Corridor Development Corporation (NICDC) oversees 11 industrial corridors under the National Industrial Corridor Development Programme (NICDP). These corridors are designed to enhance infrastructure, boost manufacturing capabilities, and promote economic growth across various regions of the country.

In addition to these, the Bharatmala Pariyojana, a significant highway development initiative, has identified 44 economic corridors in its first phase. These corridors aim to improve road connectivity, reduce logistics costs, and facilitate the movement of goods and people across the nation.

Furthermore, in the 2024 Union Budget, the Indian government announced the development of three new railway economic corridors under the PM Gati Shakti plan. These include:

- Energy, Mineral, and Cement Corridors
- Port Connectivity Corridors
- High Traffic Density Corridors

These initiatives aim to bolster multi-modal connectivity and reduce logistics costs across the nation. Collectively, these developments reflect India's commitment to enhancing its infrastructure and fostering economic growth through the strategic development of multiple economic corridors.

A total of 434 projects have been mapped under the three corridors (Energy, Mineral & Cement, High Traffic Density, and Port Connectivity) with an overall estimated cost of INR 11.17 lakh crore. These projects are aimed at boosting logistics efficiency and lowering freight costs.

Of these:

- 121 projects (track length ~12,133 km; cost ~₹2,02,551 cr) are sanctioned,
- 162 projects (track ~16,910 km; est. cost ~₹3,30,545 cr) are in appraisal/inter-ministerial review.

The government is planning up to 200 Gati Shakti Cargo Terminals (GCTs) along freight corridors (up from 77 currently), which will enhance rail–road–port interconnectivity and attract private investment via PPP models.

Exhibit 3.5: Development of 11 industrial corridors



4. OVERVIEW OF GLOBAL WASTEWATER TREATMENT MARKET

4.1 Overview of the Global Wastewater Treatment Market

As of 2025, the global wastewater treatment market remains strategically important, driven by urban growth, industrialisation, and tightening environmental regulations. Governments and industries

continue to invest in wastewater systems to support long-term sustainability objectives, with increasing focus on circular water use, energy efficiency, and regulatory compliance.

In Southeast Asia, circularity initiatives, including nutrient and energy recovery from sludge, are being adopted selectively, supported by policy-driven programmes and urban infrastructure development. Europe and North America remain focused on upgrading existing treatment infrastructure to address emerging contaminants and stricter discharge standards. Reuse of treated wastewater continues to expand across water-scarce regions, including the Middle East, Latin America, and parts of Asia and North America.

Digital monitoring tools and energy-efficient systems are increasingly being adopted to improve operational performance, cost efficiency, and compliance. Overall, wastewater treatment is evolving from a primarily regulatory function to a broader element of environmental management and resource efficiency strategies.

4.2 Size of the global wastewater treatment market

The global water and wastewater treatment market stood at USD 880 billion in CY2024 and expanded to USD 934.0 billion in CY2025. The market is projected to grow to USD 1,240.0 billion by CY2030E, reflecting a CAGR of approximately 5.8% between CY2025 and CY2030E. Growth is supported by sustained investments in urban infrastructure, industrial wastewater treatment, and regulatory-driven upgrades across key regions.

Exhibit 4.1: Global water and wastewater treatment market size, Global, in USD billion, CY2019 – CY2030E

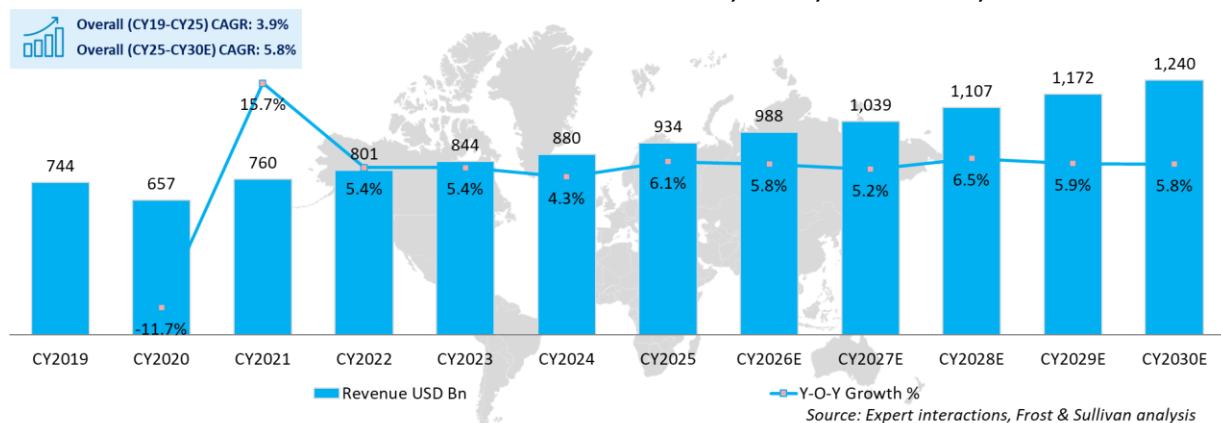
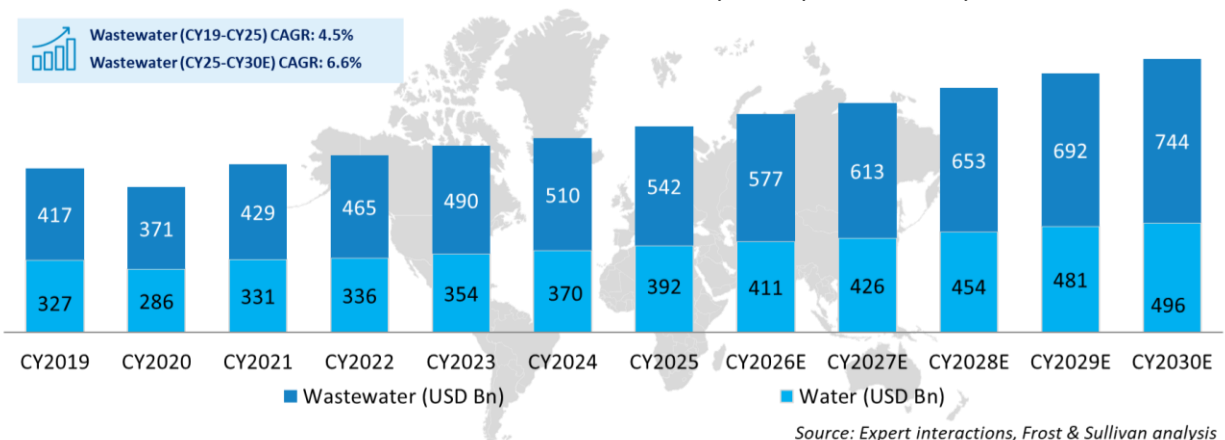


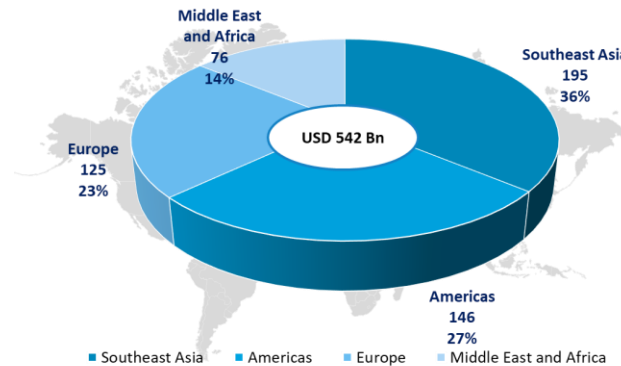
Exhibit 4.2: Global water and wastewater treatment market, Global, in USD billion, CY2019–CY2030E



4.3 Global Wastewater treatment market split by region

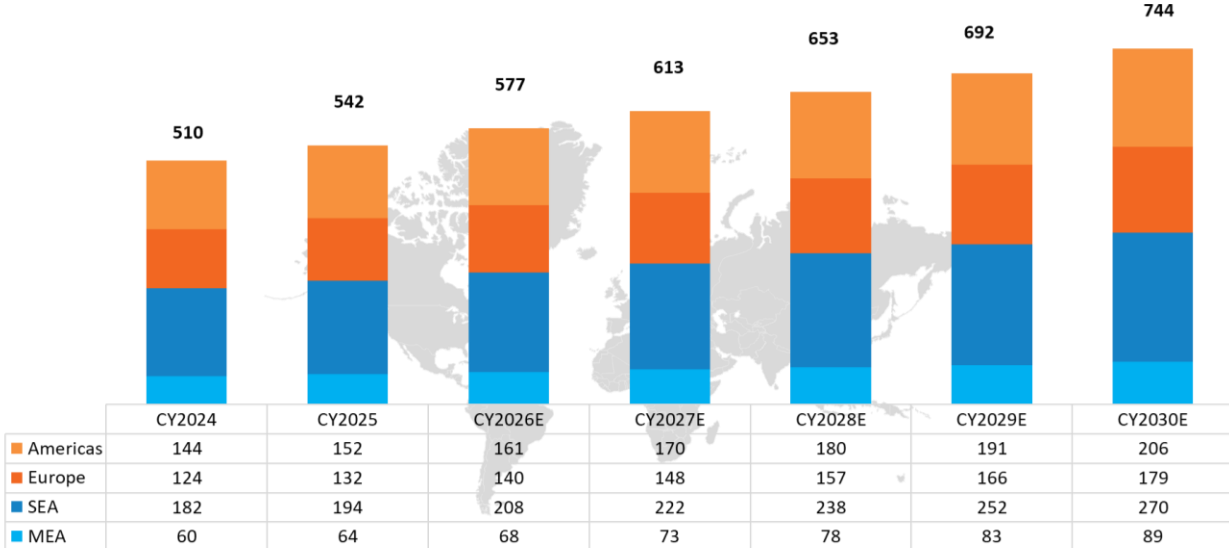
The global wastewater treatment solutions market increased from USD 510 billion in CY2024 to USD 542 billion in CY2025 (actuals) and is projected to grow to USD 692 billion by CY2029E and further to USD 735 billion by CY2030E.

Exhibit 4.3: Wastewater treatment market size by region, split by percentage, value in USD Bn, CY2025



Source: Frost & Sullivan analysis; Expert interaction

Exhibit 4.4: Wastewater treatment market forecast, by region, in USD billion, CY2024 – CY2030E



Source: Frost & Sullivan analysis; Expert interaction

billion by CY2030E, reflecting a CAGR of approximately 6.6% over CY2025–CY2030E. Market growth is driven by stricter environmental compliance requirements, rising demand for treated water reuse, and sustained investments in municipal and industrial wastewater treatment infrastructure.

This growth is driven by rapid urbanization, increased water quality awareness, water scarcity, and stringent regulations, with key investments in recycling and reuse systems across developing economies like China, India, Vietnam, and Indonesia.

4.4 Factors driving the growth of the wastewater treatment market by different regions

Middle East: Growth in the wastewater treatment market is driven by population growth, economic diversification, and a strategic shift toward water security and sustainability. GCC countries are prioritising wastewater reuse as part of broader resource management strategies, with Saudi Arabia's Vision 2030 outlining increased targets for treated wastewater recycling. Israel continues to demonstrate high levels

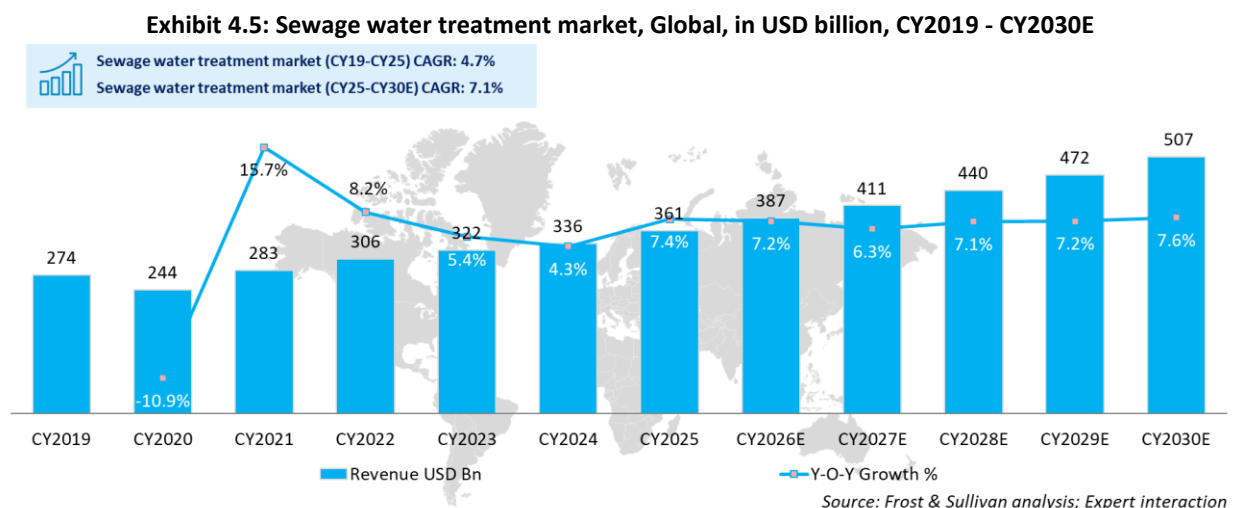
of wastewater reuse, while countries such as Jordan increasingly depend on treated wastewater for agricultural irrigation. In Sub-Saharan Africa, donor- and development agency-led programmes are supporting the expansion of basic sanitation infrastructure and decentralised wastewater treatment systems. Ongoing geopolitical tensions and regional conflicts may create some near-term uncertainty around project execution, procurement timelines and investment priorities in affected markets; however, the underlying need for water security, wastewater treatment and reuse remains strong, particularly across the GCC, where governments continue to advance strategic water infrastructure programmes.

Southeast Asia: The Southeast Asia region is experiencing rising demand for wastewater treatment solutions due to rapid urbanisation, industrial expansion, and growing adoption of circular economy principles. Governments are increasing investments in municipal and industrial infrastructure, with selective focus on resource recovery and digital monitoring. Facilities such as Singapore's Tuas Water Reclamation Plant illustrate the use of automation and advanced process controls, while projects in countries such as Vietnam reflect increasing emphasis on energy efficiency and sustainable wastewater management.

Europe: Europe's wastewater treatment market is primarily influenced by stringent regulatory requirements and the need to upgrade ageing infrastructure. Revisions to the EU Urban Wastewater Treatment Directive have introduced stricter discharge standards, driving investments in tertiary treatment and selective removal of micropollutants. Several countries are advancing initiatives related to water reuse and nutrient recovery, while others, including the UK, face increasing regulatory and public scrutiny to address infrastructure gaps and compliance challenges.

4.5 Overview of the global Sewage treatment market

Sewage treatment represents a significant sub-segment of the broader wastewater treatment sector and focuses on the treatment of wastewater generated from municipal and industrial sources. Over the period from CY2019 to CY2025, the global sewage treatment market expanded from USD 274 billion to USD 361 billion, driven primarily by sustained investments in municipal sewage infrastructure and regulatory compliance requirements.



The sewage treatment market is projected to grow to USD 472 billion by CY2029E and further to USD 507 billion by CY2030E, supported by increasing urban populations, expansion of sewerage networks, tightening discharge norms, and continued public-sector investment. Incremental growth is also

supported by greater adoption of technologies enabling water reuse, energy recovery from sludge, and improved treatment efficiency, aligning sewage treatment infrastructure with broader resource efficiency and sustainability objectives.

Municipal Segment: Sewage treatment is crucial for municipal systems, managing over 76% of municipal wastewater from households, businesses, and institutions. This segment uses comprehensive treatment stages to ensure public health and hygiene.

Industrial Segment: Industrial sewage treatment accounts for about 24% of the total Industrial wastewater, with high contaminants, often requires extensive pre-treatment before discharge. Many industries use on-site treatment solutions to manage specific wastewater characteristics and reduce environmental impact

Exhibit 4.6: Wastewater treatment market split by end-user segment, Global, CY2025

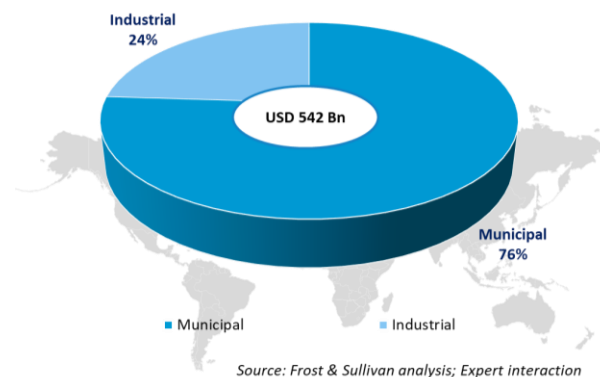


Exhibit 4.7: Primary, secondary, and tertiary sewage treatment

Primary Treatment	This involves physical processes like screening and sedimentation to remove large solids and organic matter
Secondary Treatment	This utilizes biological processes like activated sludge or trickling filters to break down organic matter through the action of microorganisms
Tertiary Treatment	This is an optional stage that provides additional treatment for specific purposes, such as removing nutrients or disinfecting the treated wastewater for reuse.

Source: Frost & Sullivan analysis

4.6 Global Sewage water treatment market split by regions

Southeast Asia continues to dominate the global sewage treatment market, driven by rapid urbanisation, increasing population density, and sustained economic expansion. Countries such as Indonesia, Vietnam, and the Philippines continue to invest in wastewater infrastructure to address sanitation requirements and flood-related challenges. In CY2025, the region (excluding India) generated an estimated ~83,500 million litres per day (MLD) of sewage, reflecting continued expansion of urban sewerage networks.

Europe generated approximately ~115,500 MLD of sewage in CY2025, maintaining its position as a mature and highly regulated market. Incremental increases in sewage generation are linked to network extensions, higher connection rates, and continued compliance-driven infrastructure upgrades toward advanced treatment systems.

The Americas produced an estimated ~136,500 MLD of sewage in CY2025. In the United States and Canada, tightening environmental regulations continue to encourage investments in advanced wastewater treatment technologies, alongside gradual increases in treated sewage volumes.

In the Middle East and Africa, sewage generation reached approximately ~62,500 MLD in CY2025. Water scarcity remains a structural challenge in the region, prompting countries such as Saudi Arabia and the UAE to continue investments in sewage reuse, capacity expansion, and zero-liquid-discharge systems.

Exhibit 4.8: Sewage generation, in MLD, in countries of interest, CY2025

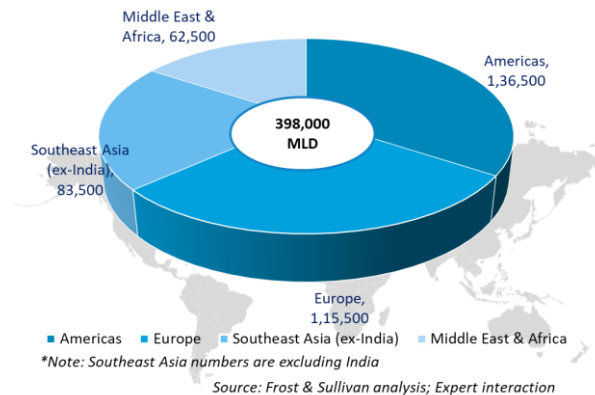
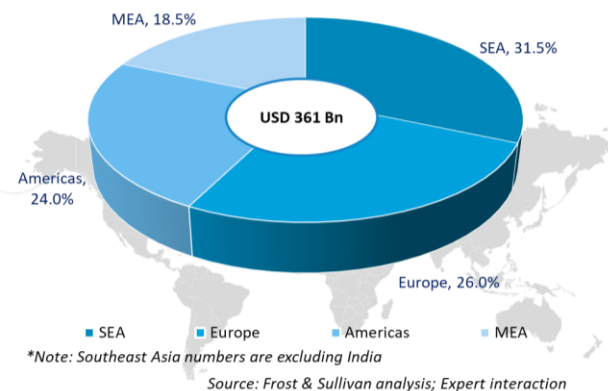


Exhibit 4.9: Sewage water treatment market size by region, split by percentage, CY2025



4.7 Factors driving the growth of the sewage water treatment market in the region

The global sewage water treatment market is experiencing notable growth driven by regional factors:

Middle East: Chronic water scarcity continues to be a major driver, with treated sewage water increasingly used for non-potable applications such as irrigation and landscaping. Gulf countries are expanding tertiary treatment capacity to support urban greening and sustainable tourism. For instance, Doha and Abu Dhabi continue to expand reuse networks, while plants in Sharm El Sheikh and NEOM (Saudi Arabia) are being upgraded with energy-efficient technologies to align with climate goals.

Southeast Asia: Urbanisation and industrial growth are putting pressure on aging sewage systems, accelerating demand for modern infrastructure. Vietnam, Indonesia, and the Philippines are investing in decentralised and modular treatment systems to quickly expand access in underserved areas. Singapore is piloting advanced bio-oxidation and membrane technologies as part of its NEWater roadmap, and regional governments are aligning more closely with ASEAN environmental targets.

Africa: Inadequate sanitation coverage continues to drive donor-led investment in sewage treatment, especially in peri-urban and rural areas. Countries like Kenya, Ghana, and Rwanda are receiving multilateral support (e.g., AfDB, World Bank) to build decentralised treatment plants. There is a growing focus on capacity-building, workforce training, and alignment with WHO wastewater safety planning to ensure long-term system sustainability.

4.8 Prominent technologies deployed for sewage treatment in these regions

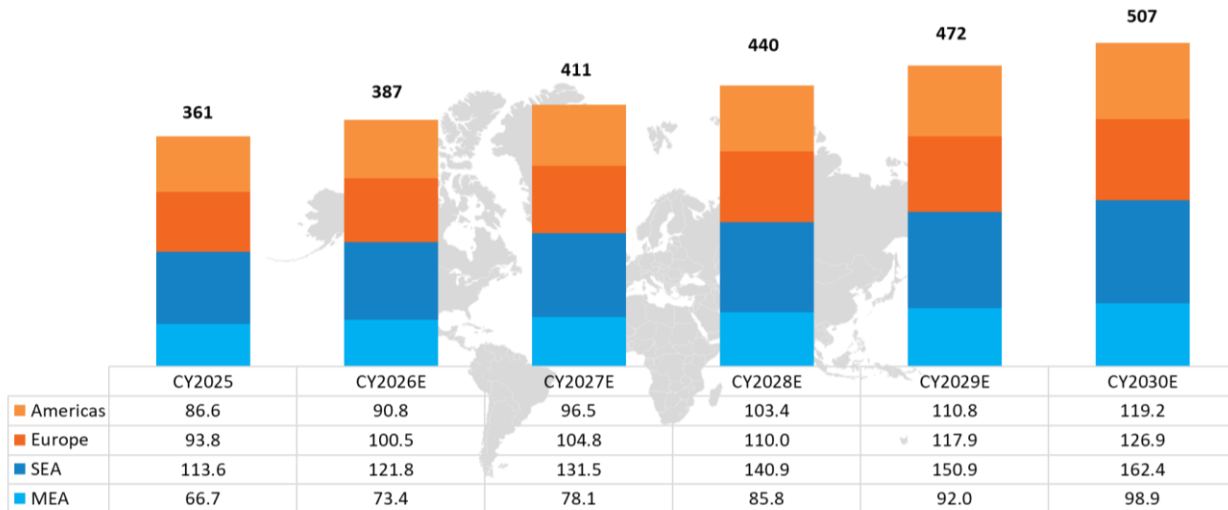
Exhibit 4.9: Comparison of sewage water treatment technologies, Southeast Asia (SEA) vs Middle East & Africa (MEA)

TECHNOLOGY	ADVANTAGES	DISADVANTAGES	SEA (POTENTIAL PREFERENCE)	MEA (POTENTIAL PREFERENCE)
Membrane Bioreactors (MBR)	High-quality water; suitable for reuse and irrigation	High investment and operational cost	Moderate	Low (due to cost)
Advanced Oxidation Process (AOP)	Removes emerging contaminants	High energy consumption	Low	Moderate (for specific applications)
Activated Sludge Process	Widely used, established technology	Requires significant space and energy	High	Moderate (due to established infrastructure)
Constructed Wetlands	Low energy consumption, natural treatment process	Requires large land area	High	Moderate (limited land availability in some areas)
Sequencing Batch Reactors (SBR)	Operational flexibility, highly efficient	Requires longer treatment time	Moderate	Low-Moderate (may not be cost-effective in all areas)
Upflow Anaerobic Sludge Blanket Reactors (UASB)	High efficiency, compact design	-	Moderate	High (suitable for areas with space limitations)

4.9 Growth forecast for the sewage treatment market: Middle East, Southeast Asia, and Africa

The global sewage water treatment market is projected to grow from USD 361 billion in CY2025 to USD 507 billion by CY2030E, reflecting a CAGR of approximately 7.1% over the period. Growth is supported by rising urban populations, expansion of sewerage networks, increasing emphasis on water reuse, and tightening environmental regulations across both developed and developing economies.

Southeast Asia remains the largest regional market, accounting for approximately 32% of the global sewage water treatment market in CY2025, driven by rapid urbanisation, infrastructure expansion, and increasing treatment coverage. The region continues to see sustained investments in municipal sewage systems and capacity augmentation.

Exhibit 4.10: Sewage water treatment market forecast by region, in USD billion, CY2025 –2030E

Source: Frost & Sullivan analysis; Expert interaction

The Middle East and Africa represent the fastest-growing region, with market size increasing from ~USD 67 billion in CY2025 to ~USD 99 billion by CY2030E, supported by water scarcity–driven reuse mandates, public-private partnership–led investments, and accelerated capacity additions. Europe and the Americas are expected to record steady growth, supported by regulatory upgrades, replacement of ageing infrastructure, and gradual adoption of advanced and energy-efficient sewage treatment technologies

4.10 Notable list of upcoming sewage treatment projects

Exhibit 4.11 provides a snapshot of various water infrastructure projects currently underway around the world. It encompasses a range of facilities, including sewage treatment plants that are geographically spread across the Middle East, Southeast Asia, Africa, and Europe.

Exhibit 4.11: List of upcoming sewage water treatment projects

REGION	PROJECT NAME	LOCATION	INVEST -MENT	CAPACIT Y (MLD)	TECHNOLOGY	STATUS	TENTATIVE TIMELINE
Middle East	Jebel Ali STP Phase 2	Dubai, UAE	N/A	1,050	Activated Sludge Reactors	In Progress	Completion by 2026–27
Middle East	SWPC – Tabuk ISTP Phase II	Tabuk, Saudi Arabia	USD 145.8 million	90	SBR (Sequencing Batch Reactor)	In Progress	Completion by 2026
Middle East	Rakwa Wastewater Infrastructure (PPP)	Ras Al Khaimah, UAE	N/A	60	New STP + associated wastewater/recycle d-water networks	In Progress	Agreement signed / In development
Middle East	Al Haer ISTP	Riyadh, Saudi Arabia	USD 371 million	200	Not publicly specified	Under construction / active	Operations targeted Q4 2026
Africa	MHHUD WWTP	Maghagha , Egypt	USD 19.4 million	30–60	Sedimentation, Biological, Filtration	In Progress	Completion by 2026
Americas	North End STP – Biosolids Upgrade	Winnipeg, Canada	N/A	Upgrade only	Biosolids Treatment Infrastructure	Planned	Start in 2025, finish by 2028

5. OPPORTUNITY LANDSCAPE OF INDIA'S SEWAGE TREATMENT MARKET

5.1 Overview of Indian Wastewater Treatment Market

India's wastewater treatment market is growing steadily, driven by opportunities in both the industrial and municipal sectors. The expansion is supported by high industrial activity, ongoing urbanization, economic growth, and increasing groundwater stress - all of which necessitate more effective wastewater management. The government's commitment to sustainability, coupled with financial incentives, continues to foster a favorable environment for adopting innovative treatment technologies. Notably, the market is witnessing a gradual shift from price-sensitive procurement to value-based approaches, with a growing number of Build, Own, Operate, and Transfer (BOOT) projects, typically spanning 15 to 30 years, that emphasize long-term performance and reliability.

Private sector participation is rising, particularly in the municipal segment through public-private partnerships (PPPs), which offer municipalities access to technical expertise and operational efficiencies while enabling private players to tap into long-term business opportunities. With many Indian cities still reliant on legacy systems, there is a strong push to modernize infrastructure to meet updated environmental and performance standards.

Exhibit 5.1(a): Water and wastewater treatment market size, in INR billion, India, FY2021 – FY2031E

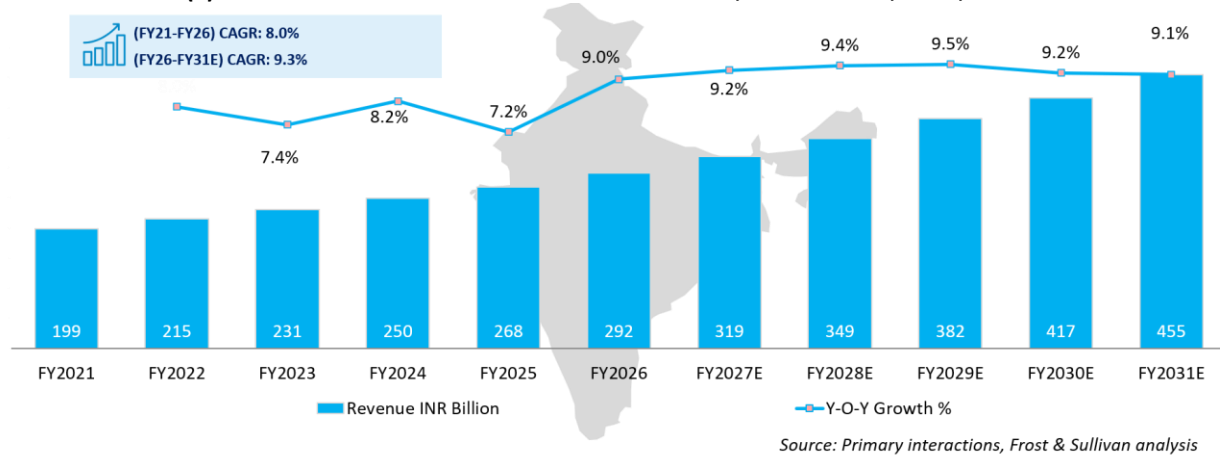
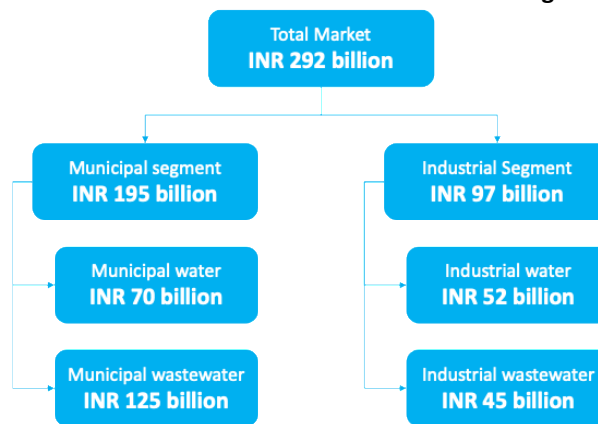


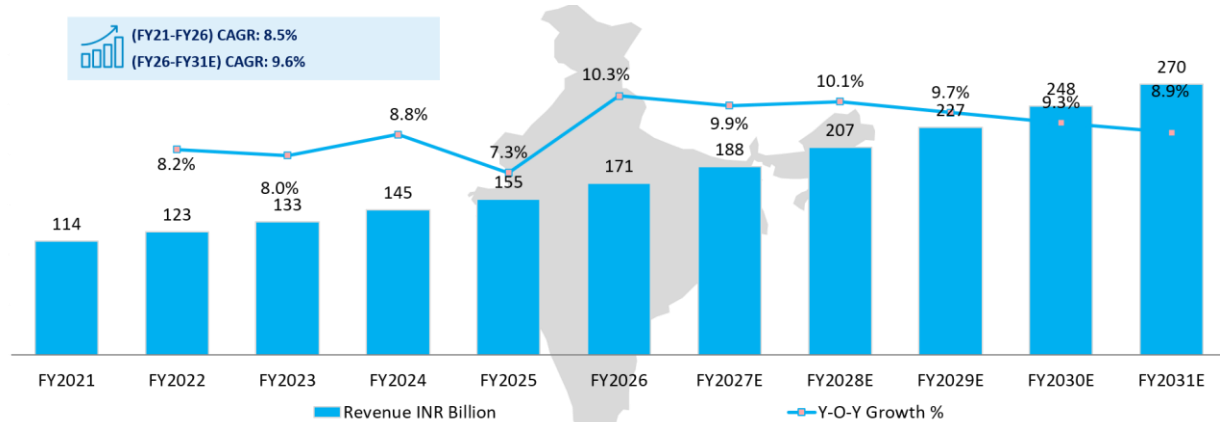
Exhibit 5.1(b): Water and wastewater treatment market size and segmentation, India, FY2026



Source: Primary interactions, Frost & Sullivan analysis

The industry recorded revenue of INR 268 billion in FY2025, reflecting a 7.2% year-on-year growth, and is estimated at INR 292 billion in FY2026. The market is projected to grow at a 9.3% CAGR between FY2026 and FY2031E to INR 455 billion, supported by renewed project allocations and increasing adoption of

Exhibit 5.1(c): Wastewater treatment market size, India, FY2021 – FY2031E



Source: Primary interactions, Frost & Sullivan analysis

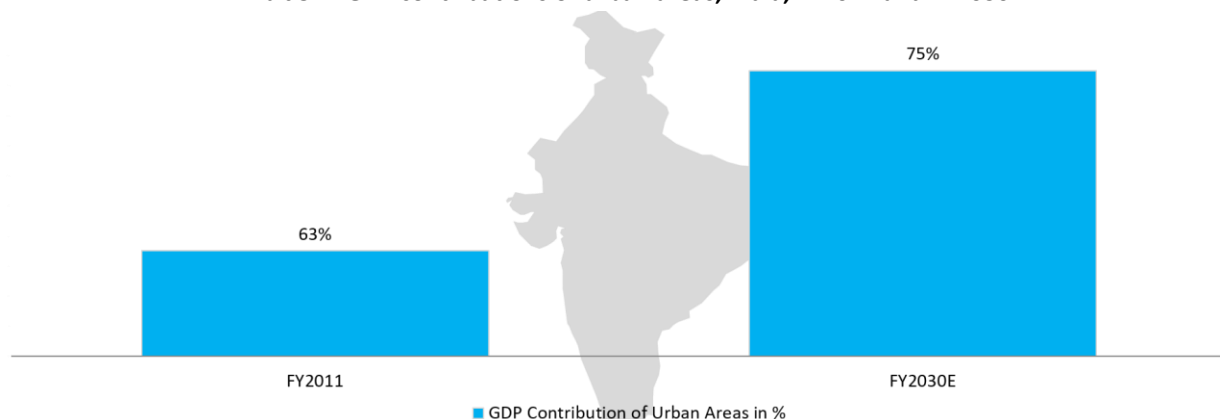
digital monitoring. In terms of capital investment, for an STP sized between 20 MLD and 100 MLD, total costs typically range from INR 300 million to INR 1,000 million, depending on factors like land, technology, and site conditions. The C-Tech⁸ package accounts for about 10–15% of the total cost, while disc filters and blowers contribute 5–8% each. The remaining budget typically covers civil works, electro-mechanical systems, instrumentation, and piping.

5.2 Factors and rules driving the Indian wastewater treatment market

A. Rising population and per capita consumption:

Urban India faces challenges in providing water and sanitation due to population growth and changing consumption patterns. Rising disposable incomes and urbanisation lead to more water-intensive lifestyles, increasing water use for activities like gardening and using appliances.

Exhibit 5.2: GDP contributions of urban areas, India, FY2011 and FY2030E



Source: Census 2011, Ministry of Urban Development's Smart Cities Mission Statement & Guidelines

Groundwater levels have declined across several urban and peri-urban regions in India, driven by uneven rainfall patterns, rapid urbanisation, and sustained over-extraction. Recent assessments by the Central

⁸ Refer to section 5.11 on C Tech Technology

Ground Water Board (CGWB) indicate continued stress in a significant number of urban assessment units, with certain metropolitan regions such as Delhi and Chennai witnessing pronounced long-term declines in groundwater levels. In response to chronic water scarcity, select coastal cities, including Chennai, have augmented supply through seawater desalination plants. These factors have collectively increased the importance of efficient wastewater treatment, reuse, and recycling infrastructure as cities seek to augment water availability and reduce dependence on freshwater sources.

B. Leachate Treatment for Municipal Solid Waste Landfill Management:

India's reliance on overflowing landfills and inadequate leachate management highlights a significant opportunity for advancements in wastewater treatment. Over 3,000 landfills lack proper leachate management systems, causing environmental damage. Although stringent regulations are in place, lax enforcement results in minimal compliance. However, anticipated stricter regulation enforcement, driven by a focus on sustainability and UN SDGs, is expected to boost the demand for effective leachate treatment technologies. Major urban centres in India will see increased demand for such solutions, presenting opportunities for companies with innovative leachate treatment technologies.

C. Decentralized solutions

India faces a persistent challenge in wastewater management due to ageing or inadequate sewerage infrastructure in several urban areas, particularly in smaller towns and peri-urban regions. This results in untreated or partially treated wastewater contaminating groundwater and posing public health risks.

Demand for decentralised wastewater treatment solutions is rising, supported by policy initiatives such as AMRUT 2.0 and SBM-U 2.0, which encourage on-site and localised treatment systems. These compact solutions enable treatment at the point of generation, reduce pressure on centralised networks, and facilitate local reuse for applications such as irrigation, flushing, and non-potable municipal use.

D. Growing water scarcity and need for reuse

Growing water scarcity has intensified the focus on efficient water management and accelerated investments in advanced wastewater treatment technologies. Rapid urbanisation, climate variability, and rising industrial and domestic demand are placing sustained pressure on freshwater resources in India.

In response, wastewater treatment and reuse are increasingly positioned as critical components of water security strategies. Treated wastewater, when processed to appropriate standards, can be reused for non-potable applications such as industrial processes, landscaping, and irrigation, effectively creating a reliable alternative water source. In addition to the National Water Policy (2012), recent initiatives such as the National Framework for Safe Reuse of Treated Wastewater (2023) reinforce this approach by encouraging large-scale adoption of reuse practices. Policy support, targeted funding, and sustainability commitments are strengthening the role of treated wastewater in addressing India's long-term water needs.

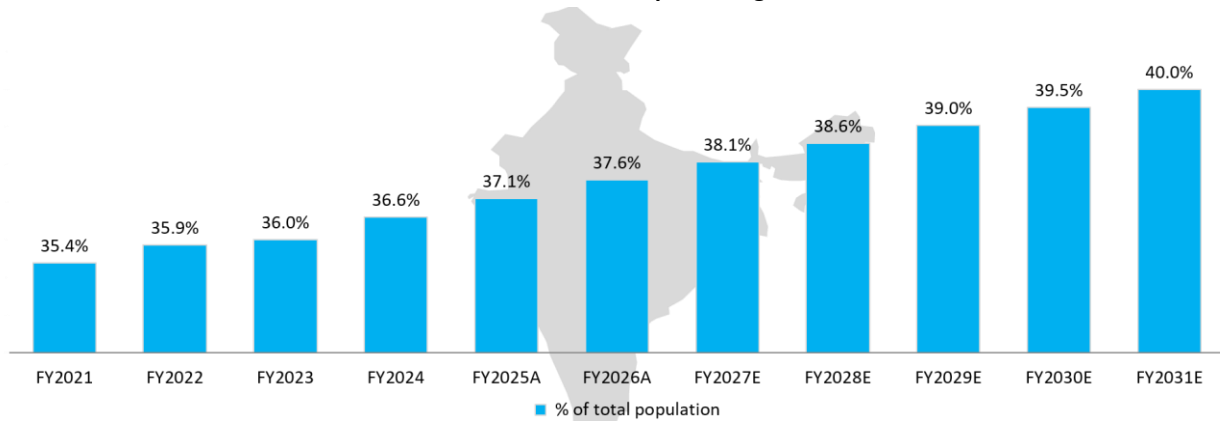
E. Urbanization and Industrial growth

Rapid urbanisation in India continues to drive significant increases in wastewater generation, as growing urban populations and dense infrastructure development place additional demand on sanitation and treatment systems. Concurrently, industrial expansion, particularly in water-intensive segments such as textiles, pharmaceuticals, chemicals and food processing, is a major source of wastewater generation and presents distinct treatment and compliance challenges.

The regulatory framework governing urban and industrial wastewater management includes:

- **Town and Country Planning Acts (state-specific)** – These Acts often mandate provisions for sewerage and wastewater infrastructure in urban development and master plans, reinforcing the integration of sanitation requirements into urban growth planning.
- **Core environmental statutes** – The Water (Prevention & Control of Pollution) Act, 1974 and the Environment (Protection) Act, 1986 require industries to install and operate effluent treatment facilities and comply with prescribed discharge standards, enforced by the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs).

Exhibit 5.4: Urbanisation rate in India, in percentage, FY2021 - FY2031E



Source: Trade Economics, World Bank, Primary interactions, Frost & Sullivan analysis

- **Draft Liquid Waste Management Rules** - The Ministry of Environment, Forest and Climate Change published the draft Liquid Waste Management Rules, 2024 on October 7, 2024 for public comment. The draft addresses the collection, treatment, reuse and disposal of liquid waste across urban, industrial and mixed-use contexts, and proposes registration of bulk users of water (those using more than 5,000 litres per day), an Extended User Responsibility mechanism and staged treated-wastewater reuse obligations with the following minimum reuse obligations applicable from 2030-31 onwards:
 - For Residential Societies:
 - 50% (for new bulk users)
 - 25% (for existing bulk users)
 - For Institutional/Commercial/Establishments:
 - 40% (for new bulk users)
 - 20% (for existing bulk users)
- **Evolving wastewater reuse policies** – Government policies and guidance issued through 2025 increasingly promote wastewater recycling and reuse for non-potable applications, encouraging circular water management approaches and setting targets for reuse by urban bodies and large consumers.

Together, these regulations and evolving policy frameworks are enhancing compliance expectations, driving investment in treatment infrastructure and creating a market environment conducive to advanced wastewater treatment solutions.

F. Government initiatives and funding

The Indian government recognizes the importance of wastewater treatment and has launched several initiatives to accelerate infrastructure development. Key Programs are:

- **Atal Mission for Rejuvenation and Urban Transformation (AMRUT):** The AMRUT programme has significantly improved urban wastewater infrastructure, adding over 4,400 MLD of STP capacity under AMRUT 1.0. Under AMRUT 2.0, 592 sewerage and septage management projects worth INR 67,607.67 crore had been approved covering 6,739 MLD of sewage treatment capacity as reported in March 2025, with a strong push toward water reuse. As of July 2026, 605 Sewerage and Septage Management projects worth ₹71,133 crore had been taken up under AMRUT 2.0, covering approximately 40,021 km of sewer network. The Jal Hi Amrit (JHA) initiative, launched in late 2024, incentivises better STP performance - already 880 plants have enrolled.
- **National Mission for Clean Ganga (NMCG):** Invests in wastewater treatment projects along the Ganges River to clean the river. Under the Namami Gange programme, 218 sewerage infrastructure projects costing INR 35,794 crore with an aggregate treatment capacity of 6,610 MLD have been taken up, of which 138 STP projects with a capacity of 4,050 MLD have been completed and made operational. As of February 2026, 524 projects had been sanctioned at a cost of INR 43,030 crore, of which 355 had been completed. NMCG has targeted a cumulative sanctioned sewage treatment capacity of 7,000 MLD by December 2026.
- **Jal Jeevan Mission (JJM):** Aims to provide piped drinking water to rural households and requires investments in wastewater treatment to prevent contamination. JJM's focus on piped water reduces open defecation, decreasing raw sewage contamination. It also promotes decentralized wastewater treatment through greywater management plans in villages with piped water. As of March 2026, about 15.83 crore of India's 19.36 crore rural households were reported to have tap water supply, and the Union Cabinet approved a restructured Jal Jeevan Mission 2.0 on March 10, 2026, moving the mission from an infrastructure-centric approach to a service delivery model with an enhanced total outlay of INR 8.69 lakh crore and an extended horizon to December 2028.

The growing emphasis on wastewater treatment and reuse could also create opportunities for vertically integrated players like SFC Environmental Technologies, which can provide a comprehensive range of services from treatment to reuse management.

G. Technological advancements and efficiency:

The Indian wastewater treatment market is witnessing a wave of tech-driven innovation. Start-ups and established companies are developing cost-effective and efficient treatment solutions tailored to India's specific needs. These innovations include:

- **Modular Treatment Plants:** These prefabricated units offer a faster and more cost-effective solution for setting up wastewater treatment facilities, particularly in smaller communities.

- **Internet of Things (IoT) Integration:** Integrating sensors and real-time monitoring systems allows for remote monitoring and optimization of wastewater treatment processes, leading to improved efficiency and reduced operational costs.
- **Low-Energy Treatment Technologies:** With rising energy costs, developing treatment technologies that require less energy consumption is crucial for the long-term sustainability of wastewater treatment solutions in India.

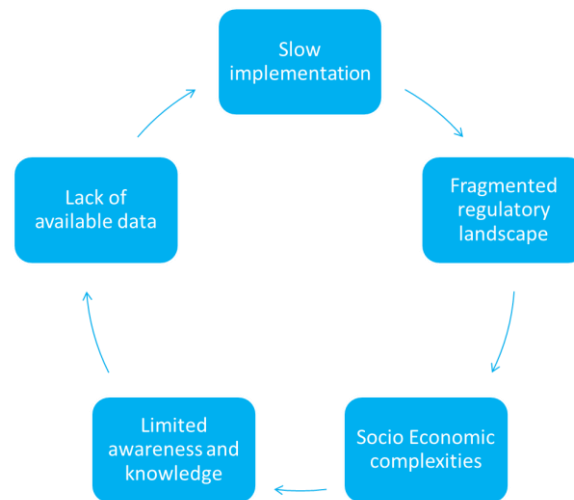
H. A shift of mindset:

Traditionally, wastewater in India has been seen as a waste product. However, there is a growing shift in perspective, with government initiatives and public awareness campaigns promoting wastewater as a resource. Treated wastewater can provide an alternative source for irrigation, addressing agricultural water scarcity and reducing reliance on freshwater. Advances in treatment technologies also enable the reuse of treated wastewater for non-potable urban applications, such as toilet flushing and park irrigation. This approach decreases freshwater demand and supports a more circular water economy in cities.

5.3 Market restraints for the Indian wastewater treatment market

With rapid urbanization, many Indian cities are facing significant waste management challenges. Consequently, wastewater treatment has emerged as a critical sector, promising not only environmental benefits but also the potential for water reuse and resource recovery. While the market presents a significant opportunity, its growth is not without its challenges. Beyond the frequently cited hurdles of infrastructure investment and technological adoption, several unconventional restraints hinder the sector's full potential. These restraints include:

Exhibit 5.5: Market restraints for the Indian wastewater treatment market



Source: Frost & Sullivan analysis

5.4 Indian sewage treatment market

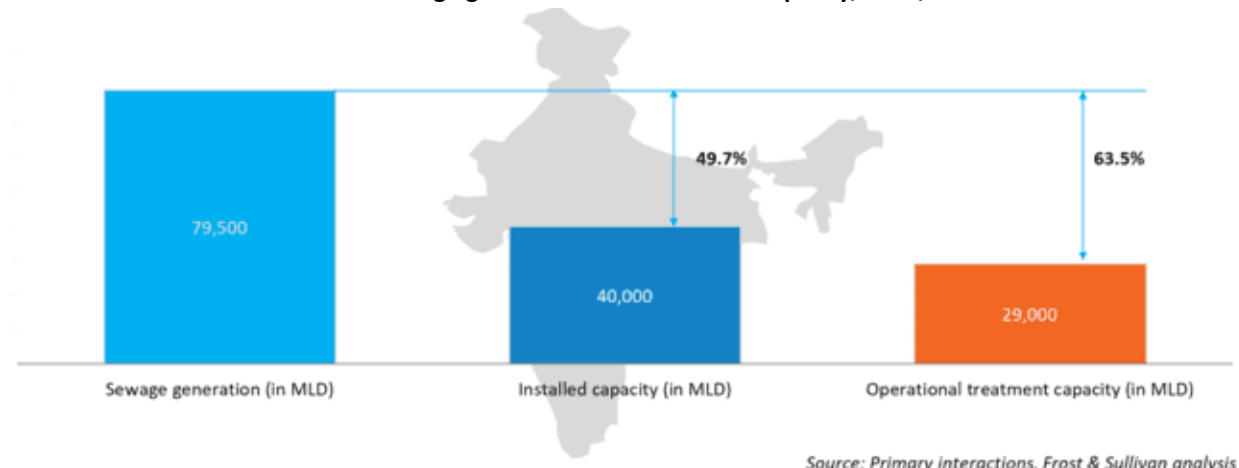
India's sewage water treatment market is experiencing a surge driven by the urgent need for effective wastewater management. Expanding industries, and the alarming state of river pollution are all converging to create a critical situation. Fortunately, the Indian government recognizes this challenge and is taking steps to remedy this.

A. Sewage generation and treatment capacity in India

Stringent environmental regulations, a focus on sustainability, and infrastructure development are fostering innovation in wastewater treatment. India's urban population generates 79,500 million litres per day (MLD) of sewage, but the operational treatment capacity is only 29,000 MLD, leaving a shortfall of 50,500 MLD.

This results in 63.5% of sewage being untreated, leading to river and groundwater pollution, harming ecosystems, contaminating drinking water, and spreading waterborne diseases. Addressing these challenges requires new technologies to modernize outdated treatment plants and enhance the water cycle's sustainability.

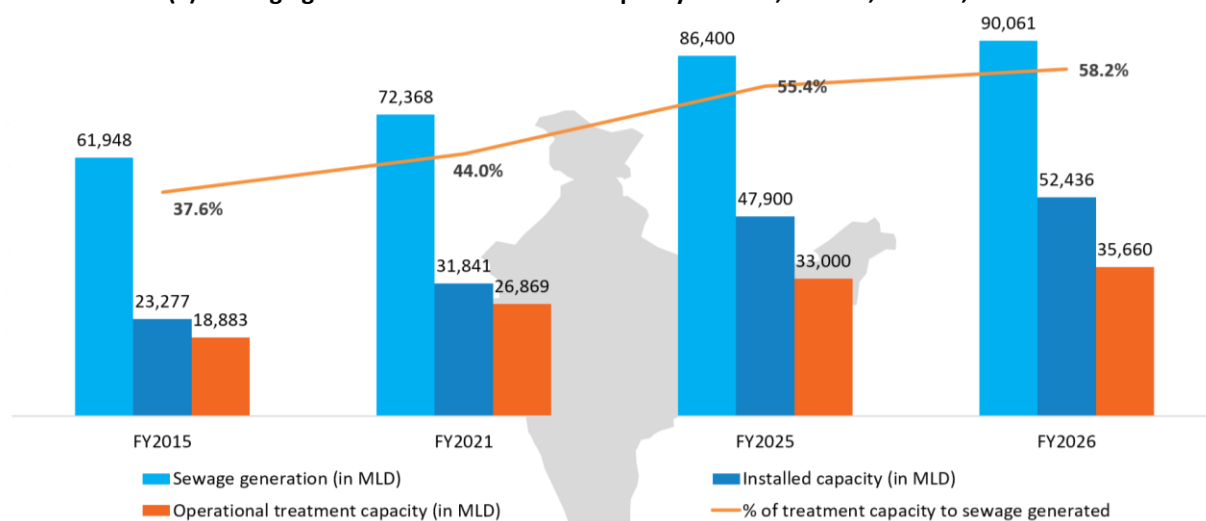
Exhibit 5.6: Sewage generation and treatment capacity, India, FY2023



B. Current inventory of Sewage Treatment plants in the country

Effective wastewater management is a cornerstone of environmental health and sustainable development. In India, significant efforts are underway to address the challenge of untreated sewage. A crucial aspect of this endeavor is maintaining a comprehensive inventory of existing Sewage Treatment Plants (STPs).

Exhibit 5.7(a): Sewage generation and treatment capacity in India, FY2015, FY2021, FY2025 and FY2026



Note: No newer nationwide CPCB inventory has been traced in the public domain as of August 2026, so this remains the latest official national benchmark; the FY2025 and FY2026 figures presented in this chapter are Frost & Sullivan estimates and are not official actuals.

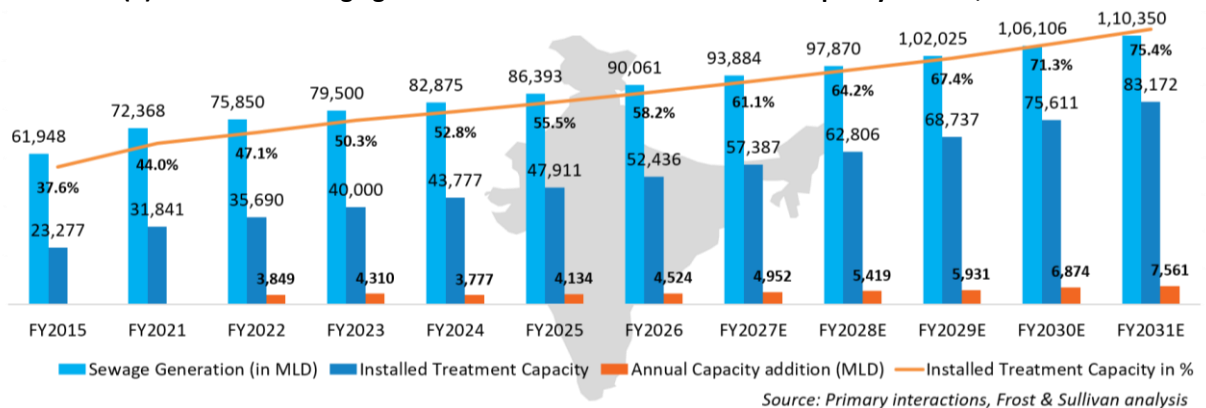
According to the Central Pollution Control Board's (CPCB) latest report published in March 2021, India possesses a network of 1,093 Operational Sewage Treatment Plants (STPs) (no. of installed STPs being 1,469) spread across its 35 states and union territories as on June 30, 2020. The same inventory recorded 72,368 MLD of urban sewage generation, 31,841 MLD of installed treatment capacity and 26,869 MLD of operational treatment capacity.

India's sewage generation for urban areas has steadily increased from 61,948 million litres per day (MLD) in FY2015 to an estimated ~86,400 MLD in FY2025 and ~90,061 MLD in FY2026, reflecting urbanisation and population growth. Over the same period, sewage processing capacity is estimated to have risen from 23,277 MLD in FY2015 to 47,900 MLD in FY2025 and 52,436 MLD in FY2026, indicating efforts to expand infrastructure but still lagging behind the growing sewage output. Projections show that by FY2031E, sewage generation is expected to reach 110,350 MLD, while processing capacity is expected to improve to 83,172 MLD, highlighting the need for continued investment to bridge the gap and meet environmental sustainability goals.

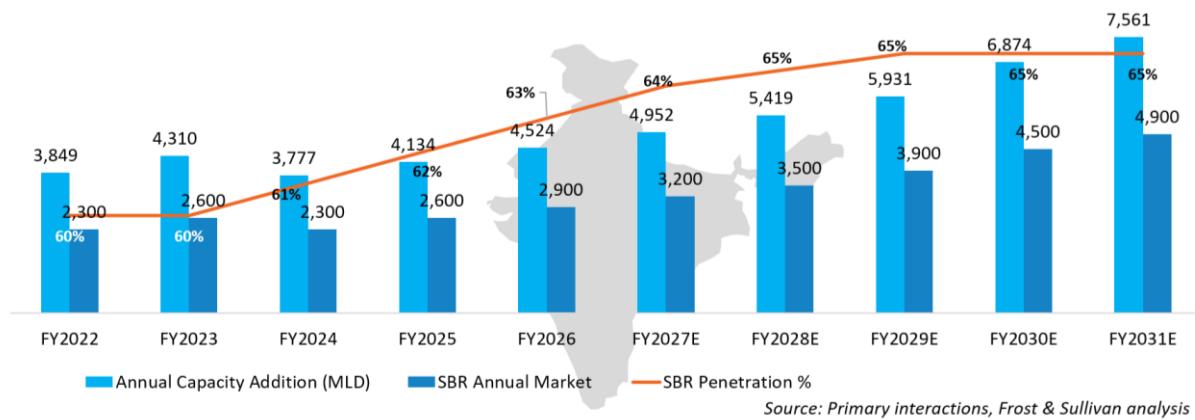
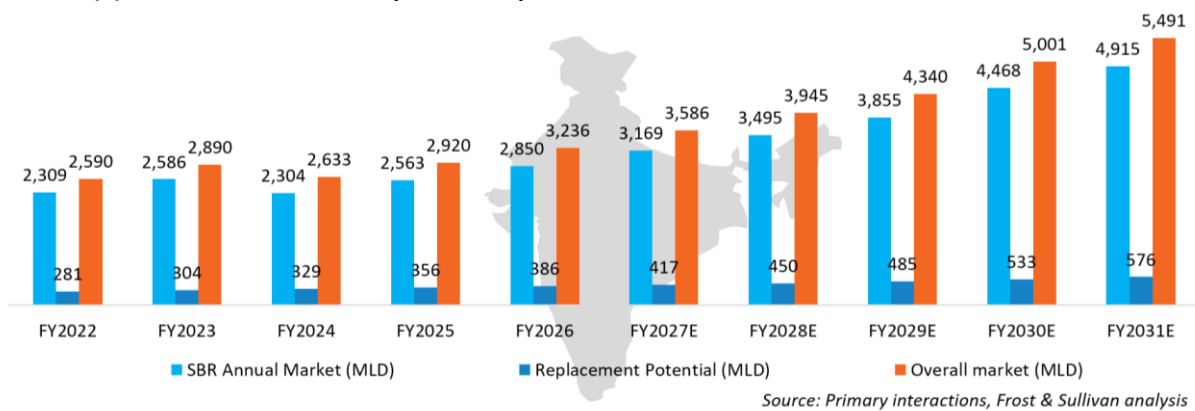
The data indicates a significant and consistent issue with the gap between sewage generation and processing capacity in India, yet it shows a promising trend of gradual improvement. From FY2015 to FY2031E, sewage generation is projected to increase from 61,948 MLD to 110,350 MLD. Although installed treatment capacity is also projected to increase from 23,277 MLD in FY2015 to an estimated 83,172 MLD in FY2031E, the gap between generated sewage and its processing remains substantial.

However, it is noteworthy that the gap is slowly narrowing over the years. In FY2015, the gap was 38,671 MLD, and it is projected to decrease to 27,178 MLD by FY2031E. Additionally, the percentage of sewage processed is expected to improve from 38% in FY2015 to an expected 71% by FY2030E and 75% by FY2031E, indicating progressive strides towards enhancing sewage treatment infrastructure.

Exhibit 5.7 (b): Estimated sewage generation versus installed treatment capacity in India, FY2015 – FY2031E



Despite these improvements, the persistent gap highlights the need for accelerated efforts in expanding sewage treatment facilities to keep pace with increasing urbanization and population growth. This challenge underscores the importance of investing in more efficient and scalable sewage treatment technologies and policies to bridge this gap more rapidly.

Exhibit 5.7 (c): Estimated annual capacity addition and penetration of SBR in India, FY2022 – FY2031E**Exhibit 5.7 (d): SBR annual market, Replacement potential and overall market, India, in MLD, FY2022 – FY2031E**

The Sequential Batch Reactor (SBR) market is experiencing steady growth, driven by both new installations and replacement needs. The annual market for SBR systems is expected to increase from 2,309 MLD in FY2022 to an estimated 2,850 MLD in FY2026 and 4,915 MLD by FY2031E. Replacement potential has also expanded, from 281 MLD in FY2022 to an estimated 386 MLD in FY2026 and is anticipated to grow to 576 MLD by FY2031E. As a result, the overall annual market for SBR, which combines new demand and replacements, is projected to increase from 2,590 MLD in FY2022 to 5,491 MLD in FY2031E, reflecting rising investment in wastewater treatment infrastructure.

5.5 Guidelines and Governance in the Sewage Treatment Sector: Incentives and Penalties

The Indian government enforces a combination of regulatory requirements, incentives, and enforcement mechanisms to promote environmentally sound wastewater management in the sewage treatment sector. The Central Pollution Control Board (CPCB), along with State Pollution Control Boards (SPCBs), mandates certain categories of infrastructure, including apartments, commercial developments, educational institutions, townships, and area development projects, install sewage treatment plants (STPs) subject to prescribed thresholds and conditions. Regulatory oversight covers aspects such as STP siting, technology selection, operation, monitoring, and maintenance, with the objective of ensuring safe treatment, regulatory compliance, and improved environmental outcomes.

A. The Technology of STP

As per the Central Pollution Control Board's regulatory framework applicable to sewage treatment plants (STPs), CPCB does not prescribe a single mandatory treatment technology. Instead, sewage treatment

technologies are evaluated and approved through consent mechanisms administered by State Pollution Control Boards (SPCBs), based on compliance with CPCB-notified effluent standards.

Accordingly, multiple treatment technologies are permitted, subject to their ability to meet the applicable discharge standards under the CPCB effluent/emission framework. Commonly deployed technologies under this framework include:

- **Sequential Batch Reactor (SBR)**, including cyclic activated sludge variants
- **Activated Sludge Process (ASP)**, typically used for larger installations
- **Membrane Bioreactor (MBR)**
- **Moving Bed Biofilm Reactor (MBBR)**

Technology selection is driven by influent characteristics, scale of sewage generation, land availability, and compliance with effluent standards applicable to sewage treatment plants under CPCB's regulatory classification.

B. Regulations:

In India, the requirement for installation of sewage treatment plants (STPs) in large residential, commercial, and institutional developments arises from a combination of environmental clearance conditions, urban development regulations, and state or local authority building byelaws. Under prevailing frameworks, housing and real estate projects exceeding 20,000 square metres of built-up area are typically required to install on-site STPs, with developers responsible for installation and initial operation and maintenance.

Regulation of sewage treatment and effluent discharge is governed under the Environment (Protection) Act, 1986 and the Water (Prevention and Control of Pollution) Act, 1974, with standards prescribed by the Central Pollution Control Board (CPCB) and enforced by State Pollution Control Boards (SPCBs) through consent-to-establish and consent-to-operate mechanisms. Sewage treatment plants are classified as regulated effluent sources under CPCB's effluent and emission standards framework, and compliance applies to both municipal and private STPs.

Since 2019, regulatory oversight of STP performance has intensified due to sustained judicial intervention by the National Green Tribunal (NGT). NGT orders have significantly strengthened enforcement of existing discharge standards, particularly for parameters such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), nitrogen, pH, and fecal coliform, and have mandated corrective actions, disinfection measures, and time-bound upgrades for non-compliant STPs.

In parallel, recent policy initiatives, such as the National Framework for Safe Reuse of Treated Wastewater (2023) and urban water reuse guidelines issued by the Ministry of Housing and Urban Affairs, have increased regulatory emphasis on treated wastewater reuse, thereby indirectly tightening performance expectations for STPs. While no single consolidated CPCB notification has revised national discharge limits in 2025, enforcement agencies increasingly require both new and existing STPs, including those in residential complexes, to meet reuse-oriented quality benchmarks through consent conditions and monitoring requirements.

C. Incentive Structures for Investment and Participation:

The Government of India promotes private sector participation in sewage treatment infrastructure through structured contracting and financing models, particularly for municipal-scale projects. A key mechanism in this regard is the Hybrid Annuity Model (HAM), which has been adopted under the National Mission for Clean Ganga (NMCG) for the development and operation of sewage treatment plants.

Under the HAM framework, the public authority provides a portion of the project cost during the construction phase, while the private developer invests the balance and is responsible for construction as well as long-term operation and maintenance. The private partner receives annuity payments over the concession period, typically extending up to 15 years, subject to performance and compliance conditions. This model is designed to balance upfront capital support with long-term operational accountability.

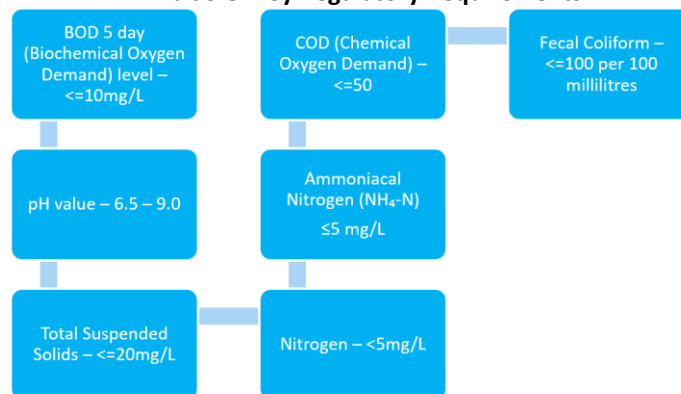
The HAM model has seen increasing adoption across several urban centres, including cities such as Mathura, Varanasi, and Meerut, particularly for sewage treatment projects within the Ganga river basin. In parallel, contracting approaches such as the “One City, One Operator” model are being implemented in select cities, whereby multiple sewage treatment plants within a city are bundled under a single operator to improve coordination, monitoring, and consistency in operations.

Together, these incentive and contracting structures aim to encourage sustained private participation, improve lifecycle performance of sewage treatment assets, and strengthen compliance with regulatory and environmental objectives.

D. Penalty for non-compliance:

State governments impose penalties under the Water (Prevention and Control of Pollution) Act, with maximum fines of INR 5 lakh - typically insufficient to deter violations. However, the National Green Tribunal (NGT) has taken stronger action by imposing environmental compensation for mismanagement of sewage and solid waste. Major penalties include.

Exhibit 5.8: Key Regulatory Requirements



Source: Frost & Sullivan analysis

Exhibit 5.9: Total fine levied for non-compliance, by State

STATE	FINE (INR BILLION)
Maharashtra	120
Telangana	38
West Bengal	35
Karnataka	34

STATE	FINE (INR BILLION)
Rajasthan	30
Punjab	21

5.6 Indian Government's vision and initiatives for sewage treatment infrastructure growth

While India does not have a single, overarching national target for sewage treatment capacity expansion, the Government of India has consistently acknowledged the need for significant improvement in wastewater management. The government's policy direction focuses on achieving sustainable wastewater management outcomes, reducing pollution load on water bodies, and strengthening public health through a combination of national missions and urban infrastructure programmes.

A. Vision for sewage treatment infrastructure:

Environmental Sustainability: The government aims to expand and modernise sewage treatment infrastructure to prevent the discharge of untreated or inadequately treated sewage into rivers, lakes, and other water bodies, thereby improving environmental quality and supporting ecosystem health.

Public Health Improvement: Effective sewage treatment is viewed as a critical public health intervention, helping to reduce waterborne diseases and improve living conditions, particularly in densely populated urban and peri-urban areas.

Resource Recovery and Reuse: Policy frameworks increasingly promote the reuse of treated wastewater for non-potable applications such as irrigation, industrial processes, and urban services, supporting water conservation and circular water management practices.

B. Key Government initiatives and potential targets:

National Mission for Clean Ganga (NMCG): Launched in 2011, NMCG focuses on pollution abatement and ecological restoration of the Ganga River. A core component of the mission is the interception, diversion, and treatment of sewage generated in towns along the Ganga and its tributaries. The programme continues to drive substantial investments in sewage treatment capacity and sewerage infrastructure across the Ganga basin, with time-bound project implementation and performance-based operation and maintenance.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT): Initiated in 2015 and implemented as AMRUT 2.0, whose approved mission period ran from FY2021-22 to FY2025-26 with sanctioned projects continuing through their scheduled completion, the programme aims to achieve universal coverage of water supply and sewerage services in statutory towns. AMRUT 2.0 places a stronger emphasis on 100% treatment of wastewater generated in cities and promotes the reuse of treated wastewater, thereby driving expansion and upgradation of urban sewage treatment infrastructure.

Swachh Bharat Mission Urban 2.0 (SBM-U 2.0): Launched in 2021 for the mission period FY2021-22 to FY2025-26, SBM-U 2.0 focuses on comprehensive sanitation outcomes, including faecal sludge and septage management, used water management, and remediation of legacy waste. The mission highlights the need for improved sewage and wastewater treatment infrastructure, particularly in cities without full sewerage networks, and integrates sanitation objectives with broader urban transformation and river rejuvenation efforts.

5.7 Unique challenges in India's sewage treatment industry

The Indian government recognizes the critical need to improve sewage treatment infrastructure. However, the industry faces a multitude of challenges beyond the usual suspects of funding and infrastructure limitations. Here's a comprehensive analysis of 10 unique issues hindering growth:

Exhibit 5.10: Challenges in India's sewage treatment industry



Source: Frost & Sullivan analysis

5.8 Select upcoming sewage treatment plants in the country

Exhibit 5.11: Upcoming STP Plant in India (public-domain status reviewed as at August 2026)

CITY / STATE	PROJECT DESCRIPTION	CAPACITY (MLD)	ESTIMATED COST (INR CR)	EXPECTED OPERATIONAL YEAR	STATUS/NOTES
Delhi	29 new decentralised STPs across Delhi	~773(170 million gallons per day)	~₹ 3,151	2028	Contracts for 13 of these projects have been awarded.
Ahmedabad, Gujarat	424 MLD STP (Pirana) – new facility	424	~₹599	2028	Under construction by L&T under the World Bank-supported Ahmedabad resilience programme; revised completion date to be confirmed
Ahmedabad, Gujarat	375 MLD STP (Vasna)	375	Tender ~₹825-900+	2028	Construction ongoing under resilient cities programme
Hyderabad, Telangana	Musi River STPs (comprehensive plan)	~1,259.5 (combined)	~₹3,866	2025–27	Partially operational; 39 STPs of 972 MLD sanctioned under AMRUT 2.0 within the ORR
Bengaluru, Karnataka	Karnataka Water Security & Resilience Programme – STPs	TBD (9 STPs planned)	~\$426M (~₹3,700+)	2026–27+	World Bank-supported programme includes STPs; capacities TBD

CITY / STATE	PROJECT DESCRIPTION	CAPACITY (MLD)	ESTIMATED COST (INR CR)	EXPECTED OPERATIONAL YEAR	STATUS/NOTES
Greater Noida, UP	Kasna (137), Badalpur (2), Ecotech 2 (15), Ecotech 3 (20)	~174 (operational)	Not specified	Active	Existing STPs; online monitoring being introduced
Greater Noida, UP	12 MLD STP (Techzone IT City)	12	₹38	2026–27	Under construction
Greater Noida, UP	45 MLD STP (Sector 1)	45	Not specified	2026	Under construction
Nashik, Maharashtra	Four new STPs (Tapovan, Agartakli, Chehedi, Panchak)	416 (combined)	~₹1,450	2027	Under construction; replace older plants

**Includes projects under construction and upcoming projects at tender stage*

Sourced from data in the public domain and this may include the cost of construction of ancillary infrastructure facilities in addition to STP

5.9 Growth forecast of the Indian Sewage Treatment market

India's urbanisation and economic growth have led to increased wastewater generation, driving government and private sector efforts to improve sewage treatment infrastructure. This collaboration is advancing the sewage treatment market through new technologies that enhance treatment efficiency and support resource recovery, such as converting wastewater into reusable water or biogas.

The Indian sewage water treatment market has grown at a CAGR of 5.4% between FY2020 and FY2025 and is projected to grow at a CAGR of 9.6% between FY2025 and FY2030E and approximately 9.4% over the extended FY2025 to FY2031E window. A key factor driving this growth is India's population, which, while growing at a slower rate (approximately 0.9% annually as of FY2025), still results in a significant increase in sewage generation, particularly in urban and industrial areas. The pace of sewage generation, driven by both population growth and urbanization, is expected to outpace the growth in operational sewage treatment capacity.

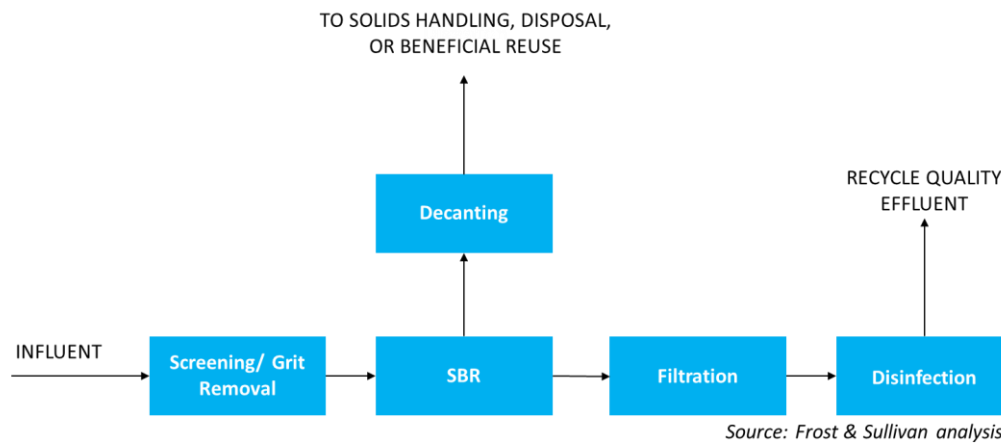
Imbalance emphasizes the critical need for expansion and modernization of wastewater treatment infrastructure. As more people migrate to cities and industrial activity intensifies, the existing systems struggle to handle the volume of waste produced. Addressing this gap will be essential to meeting both environmental standards and public health needs.

5.10 Overview of SBR technology

The Sequencing Batch Reactor (SBR) is a key wastewater treatment technology in India, representing about 28% to 30% of installed capacity for municipal and industrial plants. It treats wastewater in a single batch reactor, combining equalisation, aeration, clarification and nutrient removal (nitrogen and phosphorus). Wastewater is screened and grit is removed before entering a partially filled reactor with acclimated biomass. The reactor operates in batches, performing aeration and mixing, then allowing

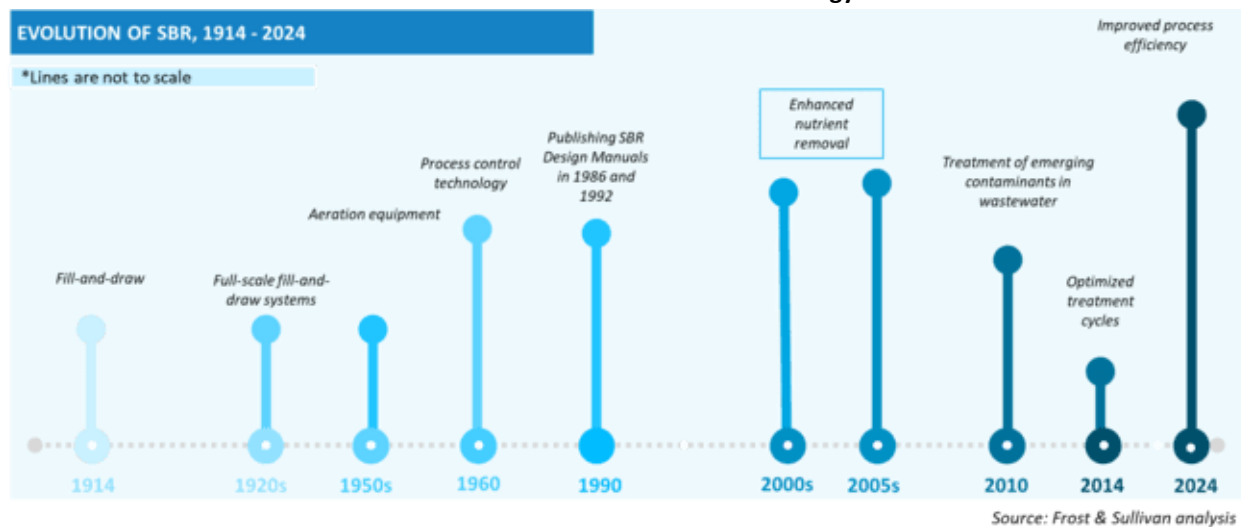
biomass to settle before removing treated water. Excess biomass is periodically removed to maintain the proper influent-to-biomass ratio. In continuous flow systems, this ratio is maintained by adjusting return activated sludge flowrates. After SBR treatment, the wastewater may flow to an equalisation basin for controlled flow to additional processes. In some cases, it is further filtered and disinfected.

Exhibit 5.13: Process flow diagram for a typical SBR



The SBR technology, though not entirely new, has seen a resurgence in recent decades due to its flexibility and efficiency.

Exhibit 5.14: Evolution of SBR technology



5.11 Overview of C-Tech process

C-Tech is the latest generation SBR process, employed extensively for treating both domestic sewage and industrial effluents to achieve recyclable quality water with low life cycle cost, and has installations in many countries, including the UK, Germany, Poland, Austria, China, Russia, Australia, Vietnam and Malaysia. Unlike traditional SBR systems, C-TECH uses two or more batch tanks in parallel, with their sequences out of phase, allowing continuous flow without the need for an upstream buffer tank. This design reduces the site footprint by approximately 50%. C-TECH operates as a cyclic-activated sludge process and is fully automated through PLC and SCADA, requiring minimal operator intervention. C-Tech technology offers up to 40% savings in power consumption as compared to other conventional technologies, thereby reducing the overall O&M cost of the STP.

C-Tech is a versatile technology that effectively handles seasonal, diurnal and quality variations compared to conventional technologies by automatically adjusting water level, decanting rate and air supply, and has successfully been implemented to treat wastewater from refineries / pharmaceutical / petrochemical / textile industries.

The C-TECH system features several circular or rectangular batch reactor basins, each with an anoxic-anaerobic selector zone, aeration zone, internal recycle, decant arm, and an oxygen uptake rate (OUR) based aeration control system. It operates with one equalization tank and one tank or with two or more batch tanks in parallel, with their cycles out of phase, enabling continuous flow and eliminating the need for an upstream buffer tank, thus reducing space requirements compared to traditional SBR systems. C-Tech is SFC's proprietary technology for wastewater treatment which is an advanced technology for treating sewage and effluents. The Company was the first technology provider in the SBR space, with the introduction of C-Tech in India in the WWT segment. A primary advantage of the C-Tech system, as compared to other conventional technologies, is that it offers an efficient method of a cyclic activated sludge treatment, that produces a recyclable quality effluent in a single step. This proprietary technology is not only superior to conventional systems but also drives significant cost, space, and environmental benefits. This technology stands out for its ability to handle large volumes of sewage, achieving superior treatment efficiency with a smaller footprint compared to traditional systems.

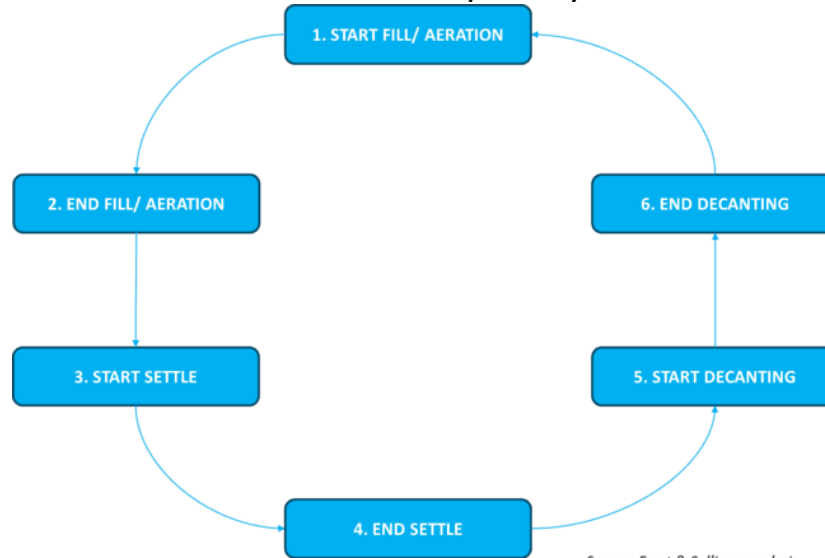
Exhibit 5.15: Summary of C-TECH Wastewater Treatment System

ASPECT	DETAILS
Process Flow	Fill and Anoxic Mix: Influent fills reactor; mixed with previous cycle effluent for microorganisms. Anoxic conditions favour PAOs for nutrient removal.
	Aeration: Dissolved oxygen increases, promoting aerobic bacteria growth.
	Settle: After aeration, solids settle; clarified supernatant is treated effluent.
	Decant: Clarified effluent removed from the top; sludge may be withdrawn.
Performance Parameters	Effluent Quality:
	BOD: ≤ 10 mg/l (typical 5-10 mg/l).
	SS: ≤ 10 mg/l (typical 5-10 mg/l).
	TN: ≤ 10 mg/l (typical 5-10 mg/l).
	TP: ≤ 1 mg/l (typical 0.5-1 mg/l).
	Process Efficiency:
	SVI: Target 40 mL/g – 60 mL/g
	Cycle Time: 3-6 hours.
	OUR: Oxygen Uptake Rate control for energy optimisation.
	Footprint: 30-50% reduction compared to conventional SBRs.
	Costs: 10-20% capital cost savings; 75-85% energy savings compared to ASPs.
Benefits	High efficiency, compact footprint, flexibility, low energy consumption.

ASPECT	DETAILS
Applications	Municipal and industrial wastewater treatment, small communities, remote locations.

C-Tech uses the latest automation technology, using the PLC / SCADA systems. The process of automation is designed for operation without manual intervention and the performance of the STP is independent of the operators' skill. C-Tech technology introduced three path-breaking innovations, namely bacterial selection by using selectors prior to main treatment, concurrent nitrification and denitrification, and biological phosphorus removal by unique process designed based on simply switching air on and off, thereby facilitating the efficient removal of both carbon and nutrients (nitrogen and phosphorus) in a single treatment step, while also generating sludge with very low SVI, which results in excellent settling of suspended solids giving a crystal clear outlet with low suspended solids (<10 ppm) and BOD (< 5-10 ppm).

Exhibit 5.16: C-TECH process cycle



Source: Frost & Sullivan analysis

With 728 C-Tech installations commissioned in the wastewater treatment segment, particularly in STPs, SFC holds over 80% market share in SBR technology in India, as of July 31, 2026. This demonstrates their experience and leadership in this technology. SFC's C-Tech technology has been implemented in the large-scale SBR-based STPs in India, including one of the largest STP under development, which has a treatment capacity of 424 MLD wastewater, as of July 31, 2026. Over the years, the Company has successfully executed diverse portfolio of projects spanning various capacities and geographical locations. This underscores the Company's reliability, trustworthiness, and ability to consistently deliver value, solidifying its position as a preferred partner in the industry. The company's C-Tech technology generates sludge having one of the best sludge volume index ("SVI"), offering up to 98% biochemical oxygen demand ("BOD") removal efficiency in a single step.

These projects span diverse locations, including Germany, the UK, Austria, China, Iran, Saudi Arabia, Hungary, Mexico, and importantly, India. SFC's C-Tech technology has been implemented in the large-scale SBR-based STPs in India which has an impressive treatment capacity of 424 MLD (under construction) wastewater and even smaller plants handling 0.35 MLD. This demonstrates the company's ability to cater to diverse wastewater treatment needs across the country. This positions C-Tech as a promising technology for efficient and sustainable wastewater management in India.

5.12 The evolving landscape of sewage treatment: A comparative analysis of prominent technologies

Effective sewage treatment is crucial for public health and environmental protection. With rising urbanisation and industrial activity, the need for efficient wastewater treatment solutions has become increasingly critical. Key technologies in the global sewage treatment market, including C-Tech, are evaluated based on their performance across parameters such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), and capital investment costs. A structured comparison of these technologies is presented, highlighting their relative effectiveness and cost-efficiency. Notably, the SFC and broader wastewater treatment industry in India has not experienced any sudden instances of technological disruption in the recent past.

Exhibit 5.17: Performance Comparison of Sewage Treatment Technologies, India, for 1,000 MLD plant

TECHNOLOGY	BOD / COD REMOVAL EFFICIENCY (%)	TSS REMOVAL EFFICIENCY (%)	NUTRIENT REMOVAL	LAND FOOTPRINT (HA)	ESTIMATED CAPITAL (₹ Cr)	OPERATIONAL COST (₹/M ³)
Activated Sludge Process (ASP)	BOD: 80–90 COD: 90–95	85–90	Moderate (requires tertiary processes)	10–15	200–250	3–5
Membrane Bioreactor (MBR)	BOD: 90–95 COD: 95–98	98–99	High (with BNR configuration)	5–8	300–400	4–6
Trickling Filters	BOD: 80–85 COD: 85–90	80–85	Low	20–25	100–150	2–4
Lagoons	BOD: 60–70 COD: 70–80	60–70	Low (natural processes)	40–50	50–80	1–2
C-Tech (SBR variant)	BOD: 90–98 COD: 90–95	90–95	High (with optimised cycle design)	8–12	250–300	3–5

Key considerations:

CRITERIA	HIGH	MEDIUM	LOW
BOD/COD Removal Efficiency	Excellent: Removes most organic pollutants effectively	Moderate: May require additional treatment steps for stricter regulations	-
TSS Removal Efficiency	Excellent: Removes most pollutants effectively	Moderate: May require additional treatment steps	-

CRITERIA	HIGH	MEDIUM	LOW
Nutrient Removal	Efficiently removes nitrogen and phosphorus	May require additional processes for advanced nutrient removal	Limited nutrient removal capabilities
Land Footprint	Requires significant space	Moderate land needs	Minimal land area required
Capital Investment	Highest upfront costs	Moderate initial investment	Very low initial costs
Operational Cost	Requires significant ongoing maintenance and energy consumption	Moderate operational expenses	Low maintenance and energy requirements

5.13 Benchmarking SBR (Sequential Batch Reactor) technologies

SBR technology offers a flexible and efficient wastewater treatment approach. However, various configurations and operational modifications exist within the SBR umbrella. Here's a breakdown comparing some prominent versions:

Factors for Comparison:

- **Treatment Efficiency:** Measured by BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) removal rates.
- **Nutrient Removal:** The capability to remove nitrogen and phosphorus, increasingly crucial for stricter regulations.
- **Footprint:** Land area required for the treatment system.
- **Operational Complexity:** Level of automation and operator skill required.
- **Sludge Management:** Methods for handling and disposing of excess sludge produced.

Exhibit 5.18: Advanced Sequencing Batch Reactor (SBR) Technologies Comparison (1000 MLD Plant)

TECHNOLOGY	TREATMENT EFFICIENCY (BOD / COD) %	NUTRIENT REMOVAL	FOOTPRINT (HA)*	OPERATIONAL COMPLEXITY	SLUDGE MANAGEMENT (TYPICAL)
Conventional SBR	BOD: 85–90 COD: 90–95	Moderate (N & P require additional processes)	8–12	Moderate	Requires periodic wasting (around 5-10% of treated effluent)
Modified Ludzack–Ettinger (MLE)	BOD: 85–90 COD: 90–95	High for Nitrogen; Low for Phosphorus	8–12	Moderate	Similar to conventional SBR (periodic wasting)

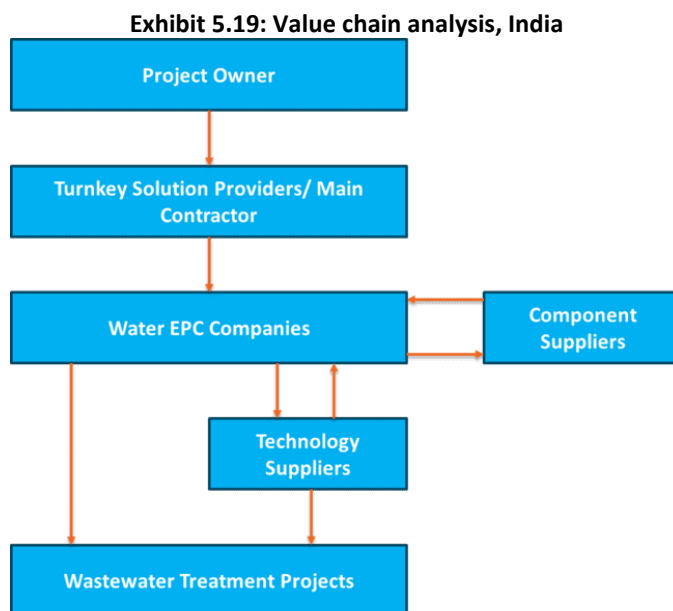
TECHNOLOGY	TREATMENT EFFICIENCY (BOD / COD) %	NUTRIENT REMOVAL	FOOTPRINT (HA)*	OPERATIONAL COMPLEXITY	SLUDGE MANAGEMENT (TYPICAL)
ICEAS	BOD: 85–90 COD: 90–95	Moderate (partial biological N removal possible)	8–12	Moderate	Similar to conventional SBR (periodic wasting)
C-Tech (Cyclic Activated Sludge)	BOD: 90–95 COD: 95–98	High (Nitrogen & Phosphorus removal)	5–8	High (Automated operation)	Requires periodic wasting (around 2-5% of treated effluent)

Note: Values represent indicative performance ranges for comparative purposes only. Actual performance varies depending on influent characteristics, process configuration and discharge/reuse standards

5.14 Value chain analysis of the Indian wastewater treatment sector: Key stakeholders

India's wastewater treatment sector is expanding due to rising water scarcity, stricter effluent discharge regulations, and government sanitation and infrastructure initiatives. The sector's value chain involves several key stakeholders:

- **Project Owners:** Government agencies, industries, or private developers who identify the need for treatment plants, define project requirements, secure financing, and obtain permits.



Source: Frost & Sullivan analysis

- **Turnkey Solution Providers/Water EPC Companies:** They handle project design, procurement, construction, and commissioning. Some also offer operation and maintenance services. They may focus on specific aspects of a project or technology.
- **Component Suppliers:** Manufacturers and distributors of essential equipment such as pumps, valves, and clarifiers, providing critical components for treatment plants.
- **Technology Suppliers:** Companies that develop and license wastewater treatment technologies (e.g., activated sludge, MBRs, SBRs), offering expertise in design and operation.

- **Wastewater Treatment Plants:** The facilities where wastewater is treated to meet discharge standards and enable resource recovery.

Project owners work with turnkey providers or EPC companies to define project scope and select appropriate technology. These companies collaborate with technology and component suppliers to procure equipment and ensure regulatory compliance.

5.15 Competitive landscape

The Indian sewage water treatment sector is witnessing significant growth, driven by stricter environmental regulations and increasing urbanization. This growth has fostered a diverse market with a range of companies offering various services.

Exhibit 5.20: Leading Sewage Technology and Equipment Suppliers, Revenue, FY2025 and FY2026

NAME OF COMPANY	FY2025 REVENUE IN INR MILLION	FY2026 REVENUE IN INR MILLION (FULL YEAR)
SFC Environmental Technologies	6,978.6	8,036.29
Thermax	1,03,886.9	1,06,941.5
Xylem Inc.	NA	NA
Praj Industries	32,280.4	31,678.8
Alfa Laval	NA	NA
Ion Exchange	27,371.1	29,148.4

Note: Va Tech Wabag is not a close peer to SFC Environmental Technologies, as a major portion of their revenue comes from EPC

5.16 Leading industrial wastewater treatment solution

Technology landscape:

- **Sequencing Batch Reactor (SBR):** This technology is widely used for the treatment of sewage due to its ability to achieve efficient treatment with lower sludge volume and potentially lower energy consumption compared to other technologies. The table given below offers ballpark estimates for the Indian sewage water treatment sector.

Exhibit 5.21: Market share of leading solutions with technology market share estimates

SEWAGE WATER TREATMENT TECHNOLOGY	ESTIMATED MARKET SHARE (%)	ESTIMATED MARKET SHARE IN INCREMENTAL TREATMENT CAPACITY FY2021 – FY2025 (%)
Sequencing Batch Reactor (SBR)	30-35%	~60%
Others	65-70%	~40%

- “Others” includes Activated Sludge Process (ASP), Membrane Bioreactor (MBR), Moving Bed Biofilm Reactor (MBBR), Upflow Anaerobic Sludge Blanket (UASB), Extended Aeration (EA), Fluidized Aerobic Bed Reactor (FAB), Oxidation Ponds, Waste Stabilization Ponds, Aerated Lagoons, Trickling Filters, Bio-Towers, Electro-Coagulation, hybrid configurations, and nature-based systems such as root-zone treatment.

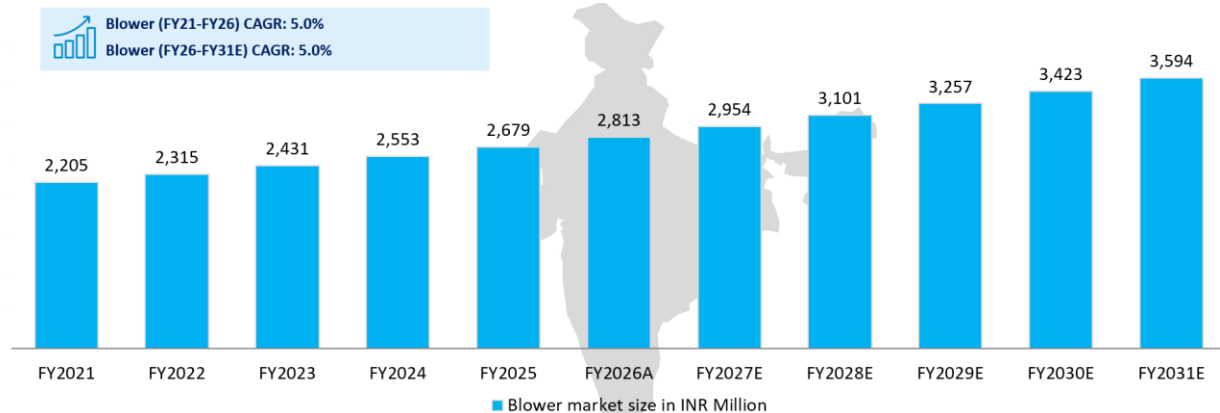
5.17 Overview of Blowers and Fibre Disc Filters

Efficient wastewater treatment is crucial for environmental protection and public health. Municipal STPs play a vital role in treating sewage before discharging it into water bodies. Blowers and disc filters are two key components of modern STPs, each contributing significantly to the treatment process.

Blowers:

- **Function:** Blowers provide the essential air supply for the biological treatment process in STPs. This aeration process allows bacteria to break down organic matter present in the sewage.

Exhibit 5.22: Market size of blowers in India, in INR million, FY2021 - FY2031E



Source: Primary interactions, Frost & Sullivan knowledge repository and analysis

Note: In terms of cost breakdown, blowers are estimated to contribute approximately 5% to 8% of the total STP capital cost.

- **Types:** There are various types of blowers used in STPs, including positive displacement blowers and centrifugal blowers. The choice depends on factors like required airflow, pressure, and energy efficiency.
- **Benefits in STPs:** Efficient aeration is critical for maintaining healthy bacterial populations and optimising treatment. Blowers ensure adequate oxygen supply, leading to improved effluent quality and reduced odour problems.

Disc Filters:

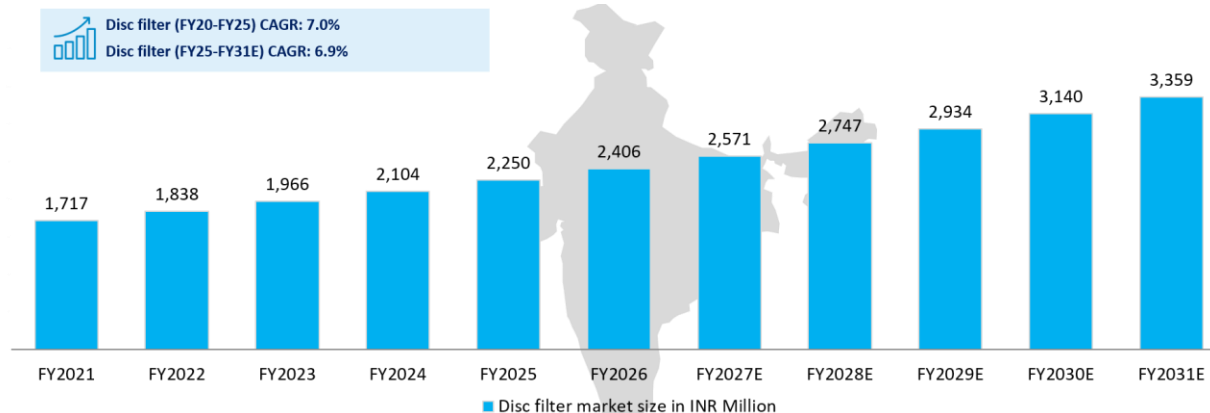
- **Function:** Disc filters are advanced filtration systems used in STPs for separating solids from the treated wastewater.
- **Components:** It consists of a series of discs that rotate partially submerged in the wastewater. Solids get captured between the discs, and the rotation helps remove them for further processing.
- **Benefits in STPs:** Disc filters offer several advantages over conventional filtration systems like sand filters. They have a smaller footprint, require less maintenance, and provide superior effluent quality with lower solids content.

Combined Application in Municipal STPs:

Blowers and disc filters work together in STPs to achieve efficient wastewater treatment:

- **Blowers provide aeration:** This creates an oxygen-rich environment for bacteria to break down organic pollutants in the sewage.

Exhibit 5.23: Market size of disc filters in India, in INR million, FY2021 - FY2031E



Source: Primary interactions, Frost & Sullivan knowledge repository and analysis

- **Disc filters remove solids:** After biological treatment, disc filters effectively remove any remaining solids from the treated wastewater, ensuring it meets the required discharge standards.

Note: In terms of cost breakdown, disc filters are estimated to contribute approximately 5% to 8% of the total STP capital cost.

A. Expanding the Reach: Applications of Blowers and Disc Filters Beyond Municipal STPs

While blowers and disc filters play a critical role in municipal Sewage Treatment Plants (STPs), their capabilities extend far beyond treating wastewater from households. These technologies offer efficient solutions for various other segments with similar treatment requirements.

- **Industrial Wastewater Treatment:** Industries like textiles, chemicals, and food processing use blowers for aeration and disc filters to remove pollutants and solids for compliant discharge.
- **Aquaculture:** Blowers maintain oxygen levels, and disc filters remove waste, ensuring a clean environment for aquatic life.
- **Food & Beverage Processing:** Blowers break down organic matter, while disc filters manage residual solids for wastewater treatment.
- **Other Applications:** These technologies support water reuse, environmental remediation, and wastewater treatment in pulp & paper processing.

5.18 Market presence and strategic focus of SFC Environmental Technologies

SFC has catered to a customer base across diverse end markets with footprints across various geographies, including Europe, the Middle East, Africa, and Southeast Asia. Contributing to this global growth, SFC has implemented many large-scale wastewater treatment plants utilizing SBR/C-TECH technology around the world, making it one of the leading integrated environmental companies.

The municipal wastewater treatment market features prominent players like SFC Environmental Technologies, which provides efficient technologies and comprehensive engineering solutions in the field of wastewater treatment. The Company mainly provides technology for wastewater treatment (predominantly STPs) plant projects. With 728 installations in the WWT segment, as of July 31, 2026,

particularly in Sewage Treatment Plants (“STPs”), SFC hold over 80% market share in Sequencing Batch Reactor (“SBR”) technology, a key wastewater treatment method in India. SFC's technologies facilitate the treatment of 17511.11 million litres per day (MLD) of wastewater as of July 31, 2026.

SFC's relevant industry experience, technical expertise, product portfolio driven by manufacturing capabilities and exclusive tie-ups, and market presence position the company well to capitalize on the upsurge in the tertiary wastewater treatment (TWW) market. The entire value chain is addressed, from upgrading existing wastewater treatment plants to meet stricter regulations and enhancing effluent quality, to building new treatment facilities, especially in areas experiencing rapid growth. The Company provides advanced treatment of sewage and effluents using C-Tech solutions.

SFC currently produces its ultrafiltration membrane, C-MEM™, at its Czech facility, which is used for tertiary wastewater treatment. The Company recently entered into an exclusive collaboration agreement with a leading ultrafiltration technology company for the distribution of its UF membranes in tertiary wastewater treatment projects in India. This forward integration enables the Company to offer a complete suite of water treatment solutions, from initial sewage treatment to advanced tertiary processes, thereby enhancing its value proposition and market reach.

Additionally, the Company markets and sells Fibre Disc Filters (FDF) in India, procured from a South Korean company through an exclusive agreement. FDF is an industrial filtration technology that enables the treatment of water for reuse purposes. SFC also provides equipment and solutions for sewage sludge management – a potential source of additional value through resource recovery.

This comprehensive approach, encompassing design, manufacturing, installation, and potential operation and maintenance, makes SFC a vital partner in unlocking the immense economic potential of treated wastewater reuse in India.

6. WASTEWATER RECYCLING & REUSE - TERTIARY TREATMENT

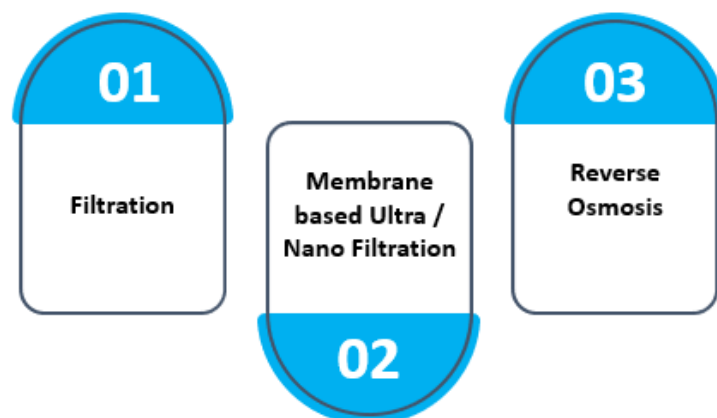
Tertiary treatment (Wastewater Recycling & Reuse), also known as advanced wastewater treatment, refers to the final stage in wastewater processing where remaining suspended solids, nutrients, pathogens, and dissolved contaminants are removed to produce high-quality effluent. This treated water can then be reused for irrigation, industrial processes, or even potable applications, depending on the treatment level.

6.1 Key Technologies India and Global – Filtration, Membrane based Ultra / Nano Filtration, RO (Reverse Osmosis)

A. Filtration Systems

Global: Filtration is widely used in tertiary treatment for removing fine suspended solids and turbidity. Common technologies include:

- Sand filters
- Dual-media filters
- Disk filters
- Micro and ultra-fine screens

Exhibit 6.1: Key Technologies, Tertiary Treatment

Source: Frost and Sullivan Analysis

Filtration is often combined with coagulants or flocculants to enhance solids removal. In developed countries, especially in Europe and the U.S., filtration is integrated as a polishing step in municipal treatment plants before disinfection or reuse.

India: In India, filtration systems are commonly used in industrial ETPs and STPs (Sewage Treatment Plants), especially in Tier-1 cities. Compact filtration units are also gaining popularity in decentralized wastewater systems.

B. Membrane

Membrane-based technologies are central to modern tertiary treatment, offering high removal efficiency for solids, bacteria, and dissolved organics.

Global

- UF (Ultra Filtration): Used as a pre-treatment for reverse osmosis or final polishing.
- NF (Nano Filtration) and MF (Micro Filtration): Applied in nutrient and pathogen removal.
- MBRs (Membrane Bioreactors): Combine biological treatment with membrane filtration for compact, high-quality effluent.

These systems are widely used in municipal reuse schemes, industrial ZLD systems, and potable reuse in water-scarce regions like California, Singapore, and the Middle East.

India: In India, MBRs and UF systems are increasingly used in commercial and residential STPs, as well as for industrial wastewater recycling in sectors like textiles, pharmaceuticals, and food processing. Adoption is driven by regulatory ZLD mandates and rising freshwater costs.

C. Reverse Osmosis

Global: RO (Reverse Osmosis) systems are widely used for:

- Desalination
- High-purity water production
- ZLD applications (by recovering water and concentrating waste)

In tertiary treatment, RO is often the final step after filtration and UF to remove dissolved salts, heavy metals, and micropollutants. It is essential in water-scarce regions and industries with stringent discharge norms.

India: India has seen a significant rise in RO usage, particularly in industrial wastewater reuse and treated sewage reuse in cooling towers, with cities like Chennai and Bengaluru setting up large-scale RO tertiary treatment plants for reuse in industries.

6.2 Market Size in India and Global

The global Tertiary Treatment market was valued at USD 1.15 Bn in CY2020 and grew to USD 1.40 Bn in CY2024. It is projected to reach USD 1.94 Bn in CY2026E and is forecasted to expand significantly to USD 4.34 Bn by CY2031F, registering a robust CAGR of 17.47% from CY2026E to CY2031F. This rapid growth is driven by increasing global focus on advanced wastewater treatment, stricter environmental regulations, and rising demand for high-quality reclaimed water across industries and municipalities. Technological advancements and sustainable water reuse initiatives are further accelerating market expansion, especially in water-stressed and rapidly urbanizing regions.

Exhibit 6.2: Tertiary Treatment Market (In USD Billion), Global, CY2020 – CY2031E

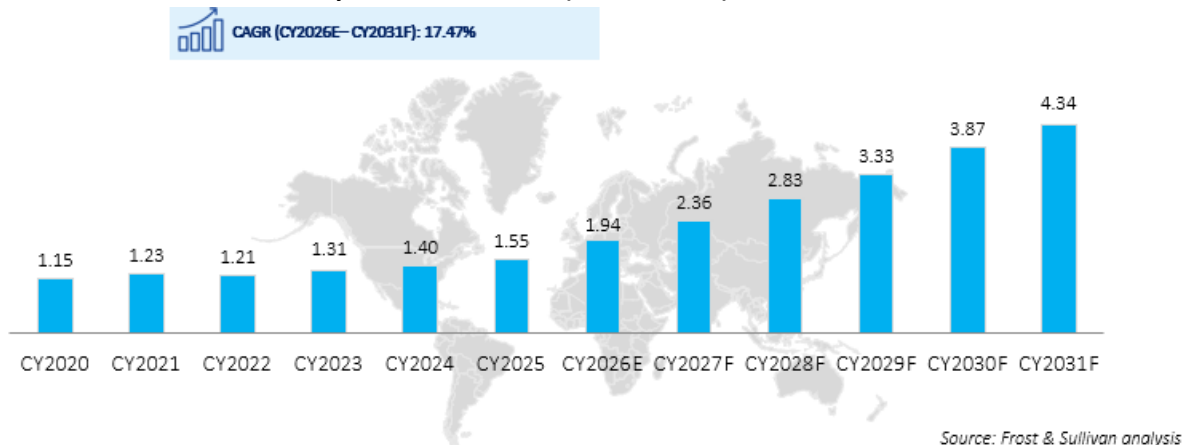
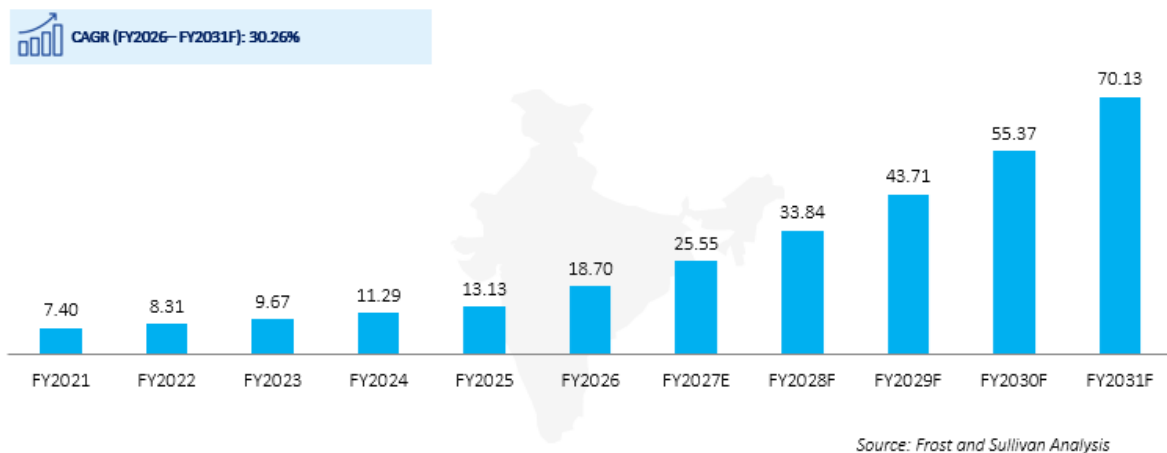


Exhibit 6.3: Tertiary Treatment Market (In INR Billion), India, FY2021 – FY2031F



The Indian Tertiary Treatment market was valued at INR 7.40 Bn in FY2021 and grew to INR 18.70 Bn in FY2026. It is expected to reach INR 25.55 Bn in FY2027 and is projected to rise sharply to INR 70.13 Bn by

FY2031F, registering a strong CAGR of 30.26% between FY2026 and FY2031F. This rapid growth is driven by increasing urbanization, water scarcity, and stricter government regulations on wastewater discharge. The push for sustainable water reuse in industrial and municipal sectors, along with investments in advanced treatment technologies, is propelling the demand for tertiary treatment solutions across the country.

A. Future growth prospects: Driven by urban water scarcity, regulatory mandates, and sustainability goals

The WRR segment is expected to witness significant growth, driven by increasing water scarcity and government initiatives focused on water conservation in India.

Urban Water Scarcity: Rising urban populations and industrial growth have intensified water demand, leading to acute shortages in many cities. Traditional water sources are under stress, and climate change is compounding the problem through irregular rainfall and declining groundwater levels. Tertiary treatment allows wastewater to be safely reused for non-potable applications such as industrial cooling, landscaping, irrigation, and even groundwater recharge. Cities like Chennai, Bengaluru, Singapore, and Los Angeles have embraced tertiary treatment as a reliable strategy for water security and resilience.

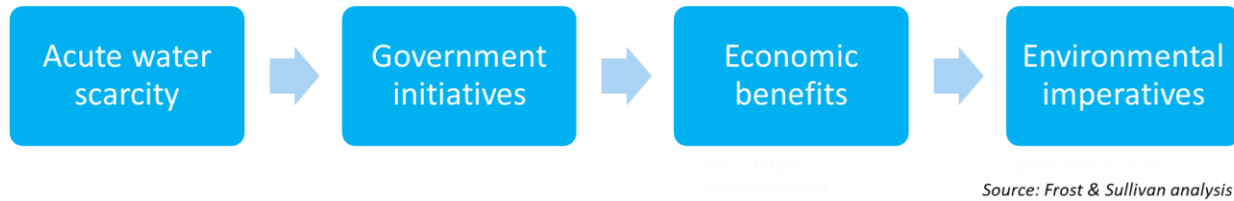
Regulatory Mandates: Governments are enforcing stricter effluent discharge norms and encouraging water reuse. In India, the CPCB and NGT (National Green Tribunal) mandate tertiary treatment in STPs and industrial ETPs, particularly under ZLD regulations. Globally, agencies like the U.S. EPA and European Union are tightening standards for nutrient removal and water reuse, prompting widespread adoption of membrane, filtration, and UV technologies.

Governments are tightening wastewater-discharge, nutrient-removal and emerging-contaminant requirements while increasingly promoting fit-for-purpose water reuse. In India, CPCB and SPCB standards, consent conditions, environmental clearances and NGT directions determine the required level of treatment; tertiary treatment and ZLD apply particularly to specified industrial sectors, sensitive receiving environments and reuse applications rather than universally to all STPs and ETPs. In 2026, India's regulatory direction increasingly links treatment compliance with safe reuse, monitoring and circular-water planning under AMRUT 2.0, NMCG initiatives and new state reuse policies. Globally, the EU's revised Urban Wastewater Treatment Directive is strengthening nitrogen, phosphorus and micropollutant controls⁹, while the US EPA's Water Reuse Action Plan 2.0¹⁰ is supporting coordinated expansion of water reuse. These developments are increasing demand for membrane filtration, biological nutrient removal, disinfection and UV technologies, but the appropriate technology remains dependent on the required effluent quality and intended end use.

Sustainability and ESG (Sustainable Development Goals) Goals: Tertiary treatment supports UN SDGs, including clean water (SDG 6) and climate action (SDG 13). It helps organizations meet Environmental, Social, and Governance (ESG) commitments by reducing freshwater dependency, lowering pollution, and enabling circular water use.

⁹ <https://eur-lex.europa.eu/EN/legal-content/summary/urban-wastewater-treatment-from-2027.html>

¹⁰ <https://www.epa.gov/waterreuse/water-reuse-action-plan-20>

Exhibit 6.4: Growth drivers for treated wastewater reuse in India**Exhibit 6.5: Enablers for Successful Treated Wastewater Reuse in India**

6.3 Reuse of Sewage Water

Considering the growing volume of untreated sewage, it is essential to view sewage as a valuable resource that can be processed based on end-use requirements and utilized for non-potable applications and industrial operations. In recent years, several Urban Local Bodies (ULBs) across India have prioritized the reuse of treated wastewater, implementing initiatives that promote its use in horticulture, irrigation, non-contact water bodies, cleaning operations, and various industrial processes.

The following are notable examples of wastewater reuse in India:

- i. The Government of Punjab introduced the *State Treated Wastewater Policy 2017* to encourage the recycling and non-potable reuse of treated sewage. To date, the Department of Soil and Water Conservation has completed 47 projects, utilizing approximately 243.3 MLD of treated wastewater from sewage treatment plants (STPs). These efforts involve the installation of underground pipelines for irrigation, covering 7,652 hectares (DECC, 2020).
- ii. The Indian Agricultural Research Institute (IARI), Karnal, has conducted research on sewage-based agriculture and developed irrigation practices specifically for tree plantations irrigated with treated wastewater.
- iii. The Government of Karnataka has mandated that only tertiary treated sewage should be used for non-potable activities such as landscaping in parks, resorts, and golf courses.
- iv. In major metros like Delhi, Mumbai, Bengaluru, and Chennai, treated greywater is being reused for toilet flushing in several condominiums and high-rise residential buildings, primarily under pilot programs.
- v. Since as early as 1991, industries in India have been purchasing and reprocessing secondary treated sewage for cooling water make-up, with examples including Madras Refineries, Madras Fertilizers, GMR Vasavi Power Plant in Chennai, as well as Rashtriya Chemicals and Fertilizers in Maharashtra, and more recently, the Indira Gandhi International Airport in Delhi and Mumbai International Airport.
- vi. Maharashtra State Power Generation Company Limited (MAHAGENCO) has been actively involved in wastewater reuse initiatives in India, recognizing the need to conserve freshwater resources. Its wastewater reuse journey began with investment in a 130 MLD Sewage Treatment Plant to treat sewage

from Nagpur Municipal Corporation, enabling the supply of 110 MLD of treated wastewater to Koradi Thermal Power Station (TPS).

This was followed by the implementation of a 190 MLD Wastewater Reuse Project at Koradi TPS and Khaperkheda TPS, **described as India's first and largest wastewater reuse project implemented under the Public-Private Partnership (PPP) model**. The project involves tertiary treatment of secondary municipal wastewater to meet industrial-grade water quality standards and incorporates advanced technologies such as Fiber Disc Filtration (FDF), Ultrafiltration (UF), and Reverse Osmosis (RO) to ensure a consistent supply of high-quality treated water for cooling tower make-up and other plant operations.

Exhibit 6.6: Potential applications for TWW reuse in India

CATEGORY	APPLICATION	DETAILS
Rethinking Agriculture: Sustainable Irrigation	Precision Irrigation	Utilises drip irrigation and fertigation to deliver treated wastewater directly to roots, maximising water use efficiency and benefiting high-value crops like fruits and vegetables.
	Aquaponics	Integrates aquaculture and hydroponics; treated wastewater nourishes fish, and nutrient-rich water fertilizes plants, creating a sustainable, closed-loop system.
	Bioremediation & Phytoremediation	Utilises treated wastewater to irrigate tree plantations or constructed wetlands, acting as biofilters to remove pollutants and enhance biodiversity.
A Circular Water Economy	Non-potable Urban Applications	Applies treated wastewater for toilet flushing, street cleaning, and landscape irrigation, reducing freshwater reliance in cities.
	Industrial Process Water	Substitutes freshwater with treated wastewater for cooling and boiler feed in industries, especially in water-stressed zones.
	Urban Aquifer Recharge	Recharges groundwater by injecting advanced treated wastewater into aquifers, securing water resources for future use.
Embracing Innovation	Construction Industry	Uses treated wastewater for dust suppression, concrete curing, and mixing, reducing potable water usage in construction.
	Energy Production	Employs treated wastewater in cooling towers of thermal power plants, conserving freshwater resources.
	Sanitation and Hygiene	Provides treated wastewater for sanitation in urban slums and peri-urban areas, coupled with hygiene education to improve public health.

6.4 Administrative Reforms and Policy Guidelines

Niti Aayog has called for to consider Water as a commodity rather than as a public good due to the fact that market mechanisms would work best when it is considered as a commodity which can be purchased or sold WRC (Water Reuse Certificates) are conceptualized as market-based instruments that recognize and promote the reuse of treated wastewater for non-potable purposes. These certificates can be issued to utilities, municipalities, or industries that demonstrate measurable reuse of treated water, enabling them to trade or offset water usage within compliance frameworks. The aim is to encourage water-efficient practices, reduce freshwater withdrawal, and build a circular economy around urban water system. Though still in early stages of development, WRCs hold the potential to function similarly to Renewable Energy Certificates, facilitating a structured approach to incentivizing large-scale wastewater reuse.

The reuse of treated wastewater is increasingly being recognized as a reliable and sustainable solution to meet the high-water demand of thermal power plants. This approach not only reduces dependency on freshwater sources but also supports the circular economy and enhances water security in water-stressed regions. A notable example is the city of Nagpur, which is progressing towards becoming India's first city to reuse over 90% of its wastewater — a significant portion of which is being supplied to thermal power stations for cooling and other industrial purposes. This model demonstrates how treated water reuse is powering the operational success of thermal power plants, while also offering substantial growth potential for replication across the country as thermal plants seek cost-effective and sustainable water sources.

6.5 Policy-led Interventions

Policy frameworks at both global and national levels are increasingly emphasizing the need for sustainable wastewater management and reuse:

- Sustainable Development Goal (SDG) 6.3 specifically targets wastewater, aiming to halve the proportion of untreated wastewater and significantly increase recycling and safe reuse by 2030. This global mandate sets the direction for countries like India to adopt integrated wastewater reuse strategies as part of their water sustainability agenda.
- India is advancing toward this goal through initiatives promoting the Safe Reuse of Treated Wastewater (SRTW). These efforts focus on ensuring that reused water meets prescribed quality standards and is safely applied in sectors such as agriculture, landscaping, industrial processes, and non-potable urban uses. By embedding SRTW principles into urban water policies, states and urban local bodies are working toward enhancing water resilience, reducing freshwater dependency, and creating economic value from waste.
- During 2026, India moved from national-level guidance toward enforceable state implementation, with Andhra Pradesh¹¹, Odisha¹² and Uttar Pradesh¹³ introducing quantified reuse targets, phased ULB coverage and city-level action planning. This makes SRTW more operational by linking water-quality compliance with reuse markets, pricing, monitoring and distribution systems.

6.6 Policy and legal regulations framework for UWM (urban wastewater management)

- The vision expressed in the National Framework on the Safe Reuse of Treated Water, 2021 is – *“widespread and safe reuse of treated used water in India that reduces the pressure on scarce freshwater resources, reduces pollution of the environment and risks to public health, and achieves socio-economic benefits by adopting a sustainable circular economy approach”* (MoJS, 2020) and accordingly requisite recommendations are made in the framework.
- The National Water Mission promotes the recycling of wastewater for meeting water needs of urban areas. The Tariff Policy, 2016 by Ministry of Power mandates the thermal power plants located within

¹¹ <https://www.newindianexpress.com/amp/story/states/andhra-pradesh/2026/Jun/26/conservation-andhra-pradesh-government-approves-policy-on-reuse-of-treated-used-water>

¹² <https://timesofindia.indiatimes.com/city/bhubaneswar/odisha-notifies-policy-on-reuse-of-treated-used-water/articleshow/130589081.cms>

¹³ <https://timesofindia.indiatimes.com/city/lucknow/uttar-pradesh-embarks-on-transformative-path-towards-water-security/articleshow/129786313.cms>

50 km radius of a sewage treatment plant of an urban local body to mandatorily use treated urban waste. The Service Level Benchmarks of the Ministry of Housing and Urban Affairs (MoHUA) mandate the extent of reuse and recycling of sewage in urban areas as 20%.

- The National Water Quality Monitoring Programme of India, through its network of SPCBs, advises central and State governments on prevention, control, and abatement of water pollution and sets standards on water quality in streams and wells. The Guidelines of National Building Code 2016, emphasise the reuse of treated sewage and sullage in commercial or residential multistoried complexes for flushing of toilets, horticulture and fire-fighting purposes. It also suggests separate storage tanks and separate distribution pipes.
- AMRUT 2.0 (running FY2021-22 to FY2025-26, indicative outlay ~₹2,77,000 crore)¹⁴ continues to anchor the national reuse push, targeting 20% of city water demand and 40% of industrial water demand from recycled water at the state level¹⁵; as of 2026 the mission had developed roughly 6,000 MLD of sewage treatment capacity, with 1,210 MLD already created and provision for reuse of 907 MLD of treated sewage¹⁶. Its 'Jal Hi Amrit' sub-component continues to give incentive-based funding to states for STP upgrades and reuse infrastructure (e.g. Jammu & Kashmir secured ₹10.50 crore in incentives as of mid-2026)¹⁷. At the state level, Odisha notified a new 'Policy on Reuse of Treated Used Water 2026' in April 2026, mandating 100% wastewater treatment by 2030 and 50% reuse by 2036, aligning with the National Framework on Safe Reuse of Treated Water.¹⁸

Exhibit 6.7: Existing state-level and national policies for reuse of TWW

STATE/LEVEL	POLICY NAME	KEY HIGHLIGHTS
West Bengal	Treated Wastewater Reuse Policy of Urban West Bengal (June 2020)	Promotes sustainable water management by reducing freshwater dependence. Reforms span planning, finance, technology, and institutional frameworks. Remains in force and relevant.
Gujarat	Policy for Reuse of Treated Wastewater (May 2018)	Targets 70% reuse by 2025 and 100% by 2030. Focus on industrial and municipal reuse. Still active; recent state reviews reaffirm commitment.
Karnataka	Urban Wastewater Reuse Policy (Dec 2017)	Encourages reuse in agriculture and urban applications to address water scarcity. No significant revision but remains in effect.
Jharkhand	Wastewater Policy (2017)	Stresses role of ULBs in phased reuse; views treated water as a renewable resource. Still applicable, though no major implementation scale-up yet.
Madhya Pradesh	Wastewater Recycle & FSM Policy (2017)	Promotes reuse for parks and urban green belts. Policy remains in place with limited urban expansion updates.

¹⁴ https://www.pmindia.gov.in/en/news_updates/cabinet-approves-the-atal-mission-for-rejuvenation-and-urban-transformation-amrut-2-0-till-2025-26/

¹⁵ https://amrut.mohua.gov.in/uploads/AMRUT_2.0_Operational_Guidelines.pdf

¹⁶ https://www.pmindia.gov.in/en/news_updates/cabinet-approves-the-atal-mission-for-rejuvenation-and-urban-transformation-amrut-2-0-till-2025-26/

¹⁷ <https://www.jagran.com/jammu-and-kashmir/jammu-jammu-kashmir-receives-10-crores-incentive-under-amrut-scheme-sewage-treatment-plants-to-undergo-transformation-40284276.html>

¹⁸ https://www.business-standard.com/india-news/odisha-unveils-new-policy-to-reuse-treated-water-targets-50-by-2036-126042900005_1.html

Andhra Pradesh	Policy on Wastewater Reuse and Recycling for ULBs	Encourages treated wastewater in industrial and irrigation use. Still relevant and referenced in AMRUT-related guidelines.
Rajasthan	State Sewerage and Wastewater Policy (2016)	Supports reuse aligned with WHO guidelines for agriculture. Policy remains in place; PPP reuse projects underway.
Punjab	Treated Wastewater Policy (2017)	Prioritizes reuse in agriculture based on water quality and crop type. No major revisions but still officially valid.
Tamil Nadu	Treated Wastewater Reuse Policy	Encourages MoUs between ULBs and industries/agriculture users for secondary treated water. Implementation progressing via Chennai Smart City initiatives.
Jammu & Kashmir	Wastewater Reuse Policy (2017)	Drafted before reorganization into UTs; still serves as baseline. UT-level updates expected.
Chhattisgarh	Wastewater Recycle and Reuse Policy	Promotes non-potable reuse across sectors; focuses on balancing domestic, industrial, and agricultural needs. Active and integrated into state sanitation projects.
Haryana	Treated Wastewater Reuse Policy (2019)	Reuse hierarchy prioritizes high-demand users (power, industry). Agriculture only after all other uses. Policy is operational and actively tracked under Jal Jeevan Mission.
Maharashtra	State Water Policy (no separate reuse policy)	Mandates reuse of 80% of domestic water. MPCB standards apply. Implementation is patchy but policy remains valid. No separate TWW policy yet.
Uttarakhand	Policy on Safe Reuse of Treated Water, 2026	Notified in 2026. Establishes a formal framework for industrial use, construction, irrigation of parks and green spaces, toilet flushing and other non-potable urban applications, with quality standards, institutional roles and financial provisions ¹⁹
Uttar Pradesh	Safe Reuse of Treated Water Policy, 2026	Cabinet-approved in March 2026. Targets 50% safe reuse by 2030 and 100% by 2035 where STPs and collection systems are operational. It also provides phased targets for areas where STPs are absent or non-operational, alongside city-level reuse planning. ²⁰
Odisha	Policy on Reuse of Treated Used Water of Urban Odisha, 2026	Notified in April 2026. Targets 100% collection, conveyance and treatment by 2030, at least 20% reuse by 2030 and at least 50% reuse by 2036. In cities with functional sewerage and STPs, 20% reuse is to be achieved within six months. ²¹
National	National Framework for Safe Reuse of TWW (Nov 2022)	Developed by NMCG & NITI Aayog. Provides guiding principles for safe, circular reuse. Still current and increasingly cited in Smart Cities and AMRUT 2.0 projects.

Exhibit 6.8: Key Major global and Indian solution providers and technology innovators

COMPANY NAME	HEAD QUARTERS/ORIGIN	YEAR OF INCORPORATION	TECHNOLOGY
--------------	-------------------------	--------------------------	------------

¹⁹ <https://www.pib.gov.in/PressReleaseDetail.aspx?PRID=2241229®=3&lang=1>

²⁰ <https://www.downtoearth.org.in/water/uttar-pradesh-to-adapt-ambitious-water-reuse-policy-with-cse-providing-crucial-technical-support>

²¹ https://www.business-standard.com/india-news/odisha-unveils-new-policy-to-reuse-treated-water-targets-50-by-2036-126042900005_1.html

Veolia	Aubervilliers, France	1853	physicochemical phosphate removal, activated carbon filtration, and ozone disinfection
Clean Water Technology	Gardena, USA	1996	Fully skid mounted systems, HMI – human mechanical interface panels
Mitawater Technologies	Siziano, Italy	1971	Free-fiber filtration systems, Sand Filtration, Cloth Filtration, Reverse Osmosis etc.
Acciona	Madrid, Spain	1931	Digitalization and Smart water management, Reverse Osmosis, Electrochemical technologies etc.
DUPONT	Wilmington, Delaware, United States	1802	<u>Minimal liquid discharge (MLD), DuPont™ AmberLite™ ion exchange resins, Nanofiltration (NF) membranes ultrafiltration (SUF), Close Circuit Reverse Osmosis (CCRO), Membrane Bioreactor Systems (MBR), Membrane Aerated Biofilm Reactor (MABR)</u>
Ion Exchange	Mumbai, India	1964	Disinfection by chlorine or ozone followed by filtration through granular media or activated carbon filters.
Thermax	Pune, India	1966	Water recycling, Waste heat energy, Emission control, Cooling from heat waste etc.
Alfa Laval	Lund, Sweden	1883	AS-H Iso-Disc Cloth Media filter, Membrane bioreactor (MBR) system, Hollow sheet technology ²²

With its portfolio of advanced membrane technologies, Dupont is well recognized global player in wastewater recycle and reuse sector..

7. OPPORTUNITY LANDSCAPE OF INDIA'S MUNICIPAL SOLID WASTE MANAGEMENT MARKET

7.1 Overview of Indian Municipal Solid Waste management market

The municipal solid waste management sector in India has evolved with rapid urbanization, rising waste generation, and increasing emphasis on scientific waste collection, segregation, processing, and disposal. Government initiatives, particularly the Swachh Bharat Mission, have supported the development of waste management infrastructure and increased the focus on improving waste collection, processing,

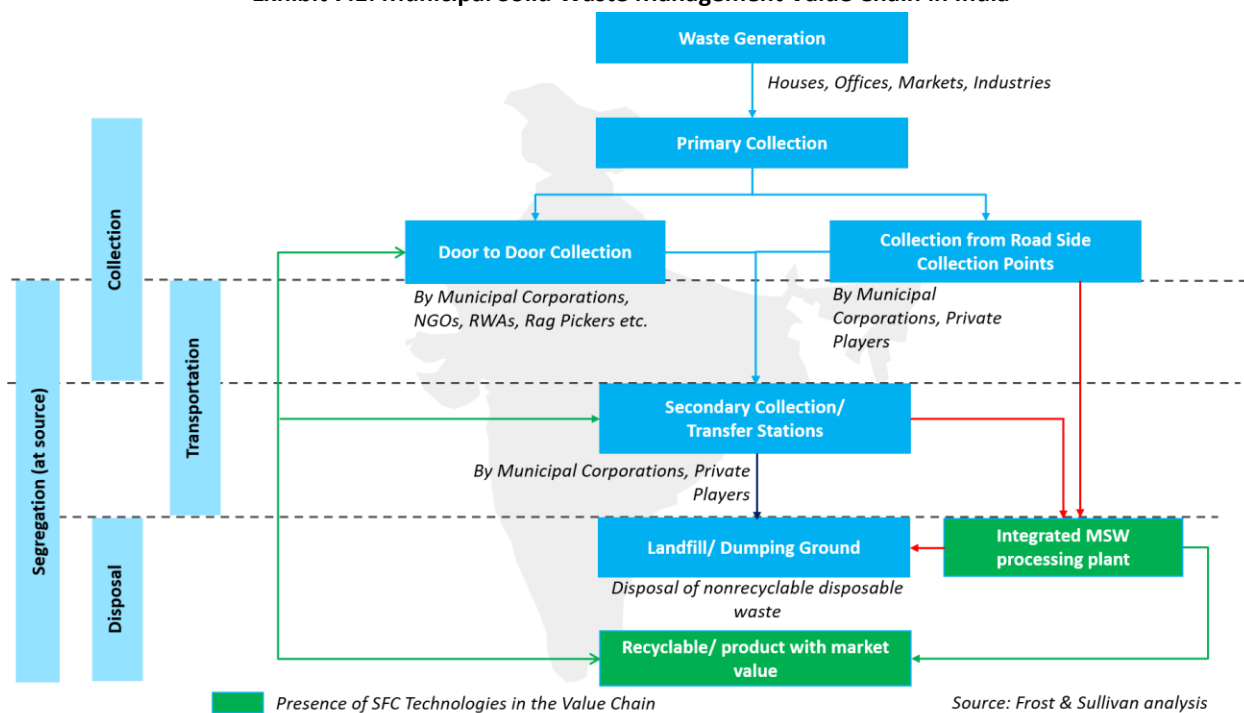
²² <https://www.alfalaval.in/industries/water-waste-treatment/industrial-water-and-waste-treatment/tertiary-treatment/>

resource recovery, and reducing dependence on open dumping and landfilling. The sector is further transitioning toward a more structured and circular waste management framework, supported by the Solid Waste Management Rules, 2026, which place greater emphasis on source segregation, accountability, resource recovery, and environmentally sound processing of municipal solid waste. These developments are expected to support continued demand for integrated waste management solutions across collection, segregation, recycling, organic waste treatment, refuse-derived fuel, waste-to-energy, and other resource recovery applications.

7.2 Municipal Solid Waste management value chain in India

The Municipal Solid Waste (MSW) management value chain begins with waste generation by households, commercial establishments, institutions, and other urban sources, followed by source segregation, collection, and transportation.

Exhibit 7.1: Municipal Solid Waste Management Value Chain in India



Collected waste is transferred to material recovery facilities or processing facilities, where recyclable materials are recovered, organic waste is processed through composting or bio-methanation, and the non-recyclable combustible fraction can be processed into refuse-derived fuel or used for waste-to-energy applications. Only inert and non-recoverable residual waste is directed to scientific landfills. Municipal bodies, private waste management companies, recyclers, technology providers, and other service providers participate across different stages of the value chain.

7.3 Solid waste generation and processing across various states in India

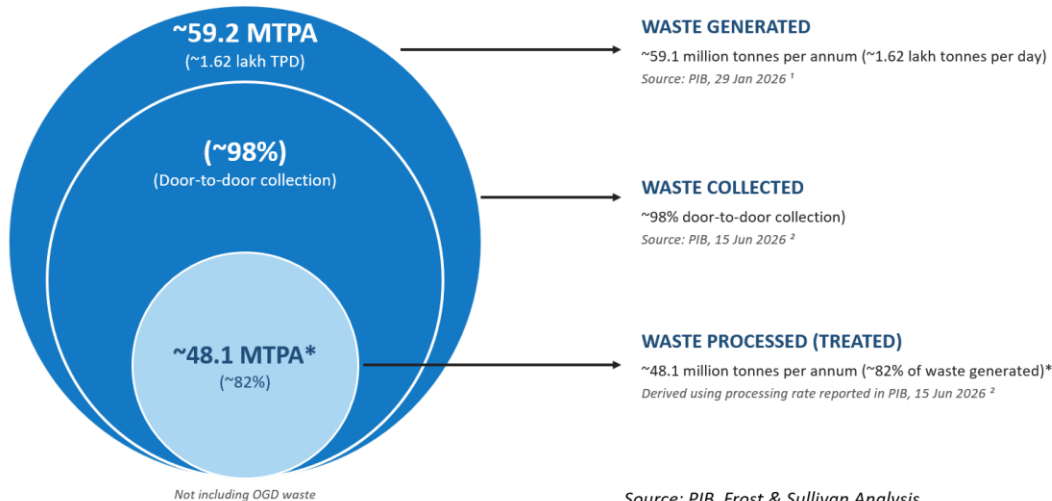
India generates approximately 59.2 million tonnes per annum (MTPA) of municipal solid waste, based on the latest Government of India data reporting urban municipal solid waste generation of 162,162 tonnes

per day (TPD) as of January 2026. Of this, approximately 48.1 MTPA is processed, based on reported processing of 131,837 TPD.²³

The Swachh Bharat Mission-Urban (SBM-U), launched in October 2014, has focused on source segregation, door-to-door collection and scientific management of municipal solid waste, including processing and remediation of legacy dumpsites. As of 2026, the Government of India reports that urban waste processing has increased to approximately 82%, compared with 16% in 2014, while door-to-door waste collection has reached 98%.²⁴

The Government of India has also reported continued progress in the remediation of legacy waste dumpsites. In 2025, 459 dumpsites across 438 cities achieved complete remediation, taking the cumulative number of fully remediated dumpsites to 1,138 across 1,048 cities.²⁵

Exhibit 7.2: Waste generation, collection, and treatment volume, Tons per Annum (TPA), India



* ~48.5 MTPA is derived by applying the processing rate of 82% to total waste generated (~59.1 MTPA).

Notes: TPA = Tonnes per Annum; TPD = Tonnes per Day; MTPA = Million Tonnes per Annum; OGD = Oil and Gas Drilling.

¹ Source: Press Information Bureau (PIB), Government of India, 29 January 2026 –

² Source: Press Information Bureau (PIB), Government of India, 15 June 2026 – “Ease of Living: India’s Journey of Inclusive Progress.”

The Swachh Bharat Mission–Urban (SBM-U), launched in October 2014, continues to drive India's transition towards scientific municipal solid waste management through source segregation, door-to-door collection, scientific processing, remediation of legacy dumpsites and the development of garbage-free cities. As of 2026, urban waste processing has increased to 82%, compared with 16% in 2014, while door-to-door waste collection coverage has reached 98%, reflecting significant improvements in urban waste management infrastructure.²⁶ The Government of India projects municipal solid waste generation to reach approximately 165 million tonnes per annum (MTPA) by 2030 and 436 MTPA by 2050, driven by continued urbanisation, population growth and rising consumption levels.²⁷

²³ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2220345®=1&lang=1>

²⁴ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2273017®=48&lang=1>

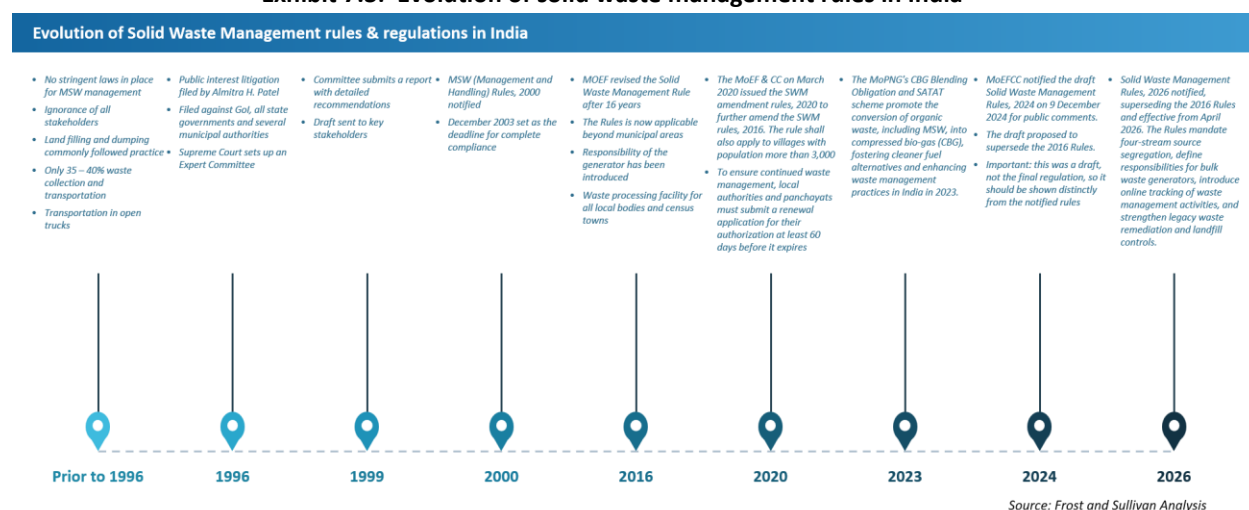
²⁵ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2221171&utm>

²⁶ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2270144&utm>

²⁷ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2221171&utm>

7.4 Evolution of solid waste management rules and regulations in India

Exhibit 7.3: Evolution of solid waste management rules in India ^{28 29}



7.5 Salient features of Solid Waste Management Rules, 2026

The Solid Waste Management Rules, 2026, notified by the Ministry of Environment, Forest and Climate Change under the Government of India, came into effect from 1 April 2026, superseding the Solid Waste Management Rules, 2016. The Rules mandate four-stream segregation at source into wet, dry, sanitary and special-care waste, and strengthen accountability across waste generators and other stakeholders. Bulk Waste Generators (BWGs) are required to register and ensure environmentally sound management of the waste generated by them, including appropriate processing of wet waste.³⁰

The 2026 Rules also introduce a centralised online tracking system covering waste collection, transportation, processing and disposal, and provide for environmental compensation based on the Polluter Pays principle for specified non-compliances. The Rules further promote a circular economy approach, with greater emphasis on waste reduction, reuse, recycling and resource recovery, while strengthening provisions for scientific disposal and legacy waste remediation.³¹

FEATURES	DESCRIPTION	REASONS AND LIKELY IMPLICATION
SEGREGATION OF MUNICIPAL SOLID WASTE	Mandates segregation at source into wet, dry, sanitary and special care waste. Source: Government of India, PIB, January 2026	Improves segregation, resource recovery and treatment efficiency, while reducing residual waste for disposal.
EXTENDED RESPONSIBILITY FOR BULK WASTE GENERATORS	Introduces Extended Bulk Waste Generator Responsibility (EBWGR) for environmentally sound management of waste generated by	Increases accountability of large waste generators and supports demand for decentralised and

²⁸ <https://moef.gov.in/orders/update?archive=1&utm>

²⁹ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2246814&lang=1®=3&utm>

³⁰ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2219676&lang=1®=3&utm>

³¹ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2219676&lang=1®=3&utm>

	bulk waste generators. Source: Government of India, PIB, January 2026	professional waste-management services.
ONLINE TRACKING AND MONITORING	Introduces a centralised online portal for tracking collection, transportation, processing and disposal. Source: Government of India, PIB, March 2026	Improves regulatory oversight, transparency and traceability across the waste-management chain.
ENVIRONMENTAL COMPENSATION	Provides for environmental compensation based on the Polluter Pays principle for specified non-compliances. Source: Government of India, PIB, January 2026	Strengthens compliance and creates financial incentives for responsible waste management.
RESOURCE RECOVERY AND RDF UTILIZATION	Promotes RDF utilisation, with fuel substitution for specified industrial units increasing from 5% to 15% over six years. Source: Government of India, PIB, March 2026	Supports resource recovery and diversion of suitable waste from landfills.
LEGACY WASTE REMEDIATION AND SCIENTIFIC DISPOSAL	Strengthens provisions for legacy waste remediation and scientific disposal of residual waste. Source: Government of India, PIB, March 2026	Supports investment in dumpsite remediation and scientific disposal infrastructure.

7.6 Prominent technologies for energy generation from Municipal solid wastes

FEATURES	DESCRIPTION	EQUIPMENT USED FOR POWER GENERATION
Anaerobic Digestion / Bio-methanation	Organic waste is biologically decomposed in the absence of oxygen to produce biogas, which can be used for heat and power generation or upgraded to compressed biogas (CBG).	Biogas engine / gas engine; gas turbine; steam turbine
Combustion / Incineration	Suitable combustible waste is thermally treated to recover energy. Heat generated during combustion is used to produce steam, which can subsequently be used for power generation.	Boiler; steam turbine
Densification / Pelletization / Refuse Derived Fuel (RDF)	Non-recyclable, high-calorific dry waste is processed through sorting, shredding and drying to produce RDF, which can be used as a substitute for conventional solid fuels in industrial applications and waste-to-energy plants.	Boiler; steam turbine

Solid waste through multiple pathways. Wet waste is required to be composted or processed through bio-methanation, while high-calorific, non-recyclable dry waste can be processed into Refuse Derived Fuel (RDF) for use in industrial and waste-to-energy applications. The Rules provide for an increase in RDF fuel substitution from 5% to 15% over a six-year period for specified industrial units, including cement plants and waste-to-energy plants using solid fuel. ³²

The continued focus on source segregation, bio-methanation and RDF utilisation is expected to support further development of energy recovery from MSW, while reducing the quantity of waste requiring landfill disposal.

³² <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2219676&lang=1®=3&utm>

7.7 Overall potential of energy generation from Municipal Solid Waste in India

With its expanding population and rapid urbanisation, India has experienced a significant rise in municipal solid waste (MSW), creating increasing opportunities for energy recovery from waste. The Ministry of New and Renewable Energy (MNRE), Government of India, has estimated the total energy generation potential from urban and industrial organic waste in India at approximately 5,690 MW, including 1,247 MW from urban solid waste.

Exhibit 7.4: Energy generation potential from Urban and Industrial organic waste in India

Sl No.	Sectors	Energy potential – MW
1	Urban Solid Waste	1247
2	Cattle farm (solid waste)	862
3	Distillery (liquid waste)	781
4	Vegetable Raw(solid waste)	579
5	Poultry (solid waste)	462
6	Urban Liquid waste	375
7	Slaughterhouse (liquid waste)	263
8	Paper (liquid waste)	254
9	Fruit Raw (solid waste)	203
10	Sugar press mud (solid waste)	200
11.a	Others (Solid Waste)*	100
11.b	Others (Liquid Waste)*	364
		5,690

Note: Million Tonnes per Annum (MTPA)

Source: MNRE and Frost and Sullivan Analysis

7.8 Installed capacity of Waste to Energy plants in India and historical growth

The WTE sector in India has gained increasing attention over the past 7–8 years due to growing challenges related to waste management and the need for energy recovery from waste. Installed WTE capacity in the country increased from 138.3 MW in FY2018 to 877.4 MW in FY2026, representing an increase of more than six times.³³

These WTE plants comprise both grid-connected and off-grid projects and utilise urban, industrial and other waste streams for energy recovery. As of 31 March 2026, the installed capacity comprised 324.24 MW of grid-connected capacity and 553.12 MW of off-grid capacity.³⁴

The continued development of WTE capacity is supported by the Government's focus on energy recovery from waste through technologies including incineration, gasification, pyrolysis and biomethanation. MNRE's Waste to Energy Programme supports projects for recovery of energy in the form of biogas, Bio-CNG, power and producer or syngas from urban, industrial and agricultural wastes and residues.

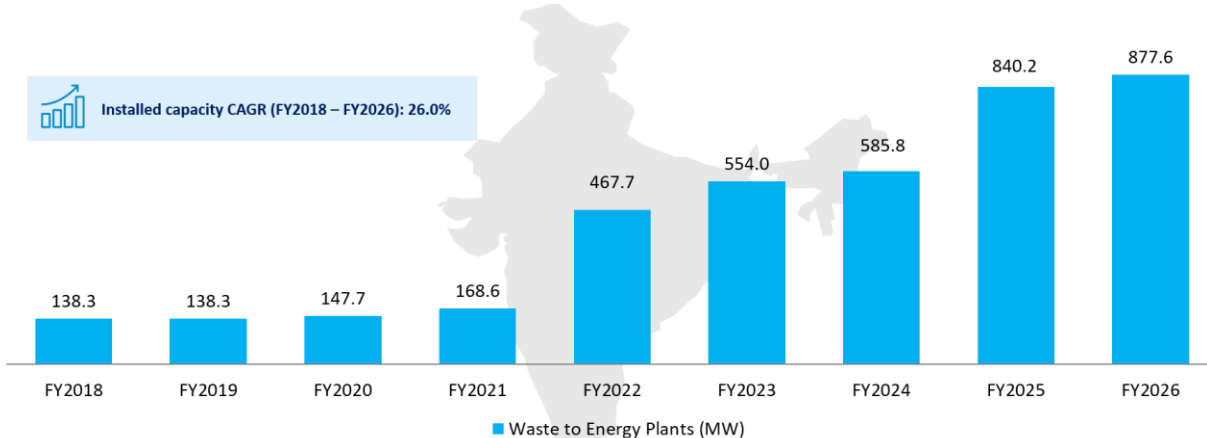
WTE facilities can contribute to reducing the volume of waste requiring landfill disposal while recovering energy from suitable waste streams. Continued development of waste processing infrastructure, together

³³ <https://mnre.gov.in/en/physical-progress/?utm>

³⁴ <https://mnre.gov.in/en/physical-progress/?utm>

with increasing source segregation and resource recovery, is expected to support further growth of the WTE sector in India.

Exhibit 7.5: Cumulative installed capacity of Waste to Energy plants in India, in MW, FY2018 – FY2026



Source: CEA, Frost & Sullivan analysis

7.9 Leading developers of Waste to Energy plants in India and their portfolio

The Indian Waste-to-Energy (WtE) market is fragmented, with key players including SFC Environmental Technologies, RE Sustainability, JITF Urban Infrastructure, Abellon Clean Energy, and Antony Lara Renewable Energy. These companies do processing, and recycling of waste and few of them also do collection and transportation. Out of them, RE Sustainability, JITF, and Abellon focus solely on incineration. While majority of companies use incineration to produce electricity from wastes, SFC Environmental Technologies use bio-methanation technology to produce Biogas/ electricity, avoiding harmful emissions and ash. SFC Environmental Technologies is among the select few players who have leveraged global technology in the MSW space and transformed it to be suitable for Indian needs. The key features of its MSW plant at North Goa are as under:

- Ability to achieve biogas yield more than the industry average. The Company has achieved an average biogas yield of more than 150 Nm³/ton of organic waste in the North Goa Plant in the last financial year, higher than the industry average of 80-100 Nm³/ton.
- By converting the digestate formed after the fermentation of organic fraction into high-quality compost, the process improves the marketability and price realization of the compost produced.
- The Company has capability to recover higher proportion of recyclables than the industry average through its proprietary municipal solid waste processes.
- Balance waste in the dry fraction (after recovery of recyclables), often referred to as refused derived fuel ("RDF"), has a calorific value approximately between 3,000 to 3,500 Kcal/kg, making it a viable alternate fuel source for energy production or as a fuel (as replacement to coal) in cement plants.

SFC is among the market leaders in the MSW space basis their operational results and comprehensive solutions. The company currently runs a 250 TPD Municipal Waste to Biogas plant in North Goa and a 125 TPD plant in South Goa. Operating continuously for over 10 years, SFC's plant at Saligao, North Goa holds the distinction of being one of the longest-operating integrated SWT-based biogas plants in India.

The plant deploys the Company's proprietary OREX technology. OREX is SFC's proprietary innovation, designed to efficiently separate biodegradable organics from inorganic materials and lignocellulosic fibres

from mixed municipal waste. OREX automatically segregates mixed municipal waste into organic (wet) and inorganic (dry) fractions in a single step reducing the need for manual oversight, translating into lower ongoing operational costs and promotion of reuse.

OREX is a multi-stage system designed to extract maximum organics from the mixed waste and preparation of de-gritted organic slurry for downstream digesters resulting into homogenous pulped slurry having >98% biodegradable material, largely free of contaminants and non-biodegradable fractions which enhance the bio-methanization process inside digesters. This technology is particularly adept at processing the typical municipal solid waste found in India, which characteristically includes a diverse mix of bio-waste, inerts, textiles, glass, wood, metal, rubber, plastic, paper, and miscellaneous items.

Exhibit 7.6: Profile of leading Waste to Energy project developers in India, FY2026

Company Name	Year of incorporation	Waste C&T	Waste Processing Technology			Waste Handling Capacity (TPD)	WTE Capacity (MW)	States where operational
			CBG/Bio-methanation	Incineration	Inorganic waste recycling			
SFC Environmental Technologies	2005	✗	✓	✗	✓	350	2.17	South and North Goa
RE Sustainability	1994	✓	✗	✓	✓	13,500	48	19 locations across India
Ecogreen Energy	2011	✓	✗	✓	✓	4,500	55 (proposed)	MP, UP, Haryana
JITF Urban Infrastructure	2007	✓	✗	✓	✓	~2,000	16	Delhi, Punjab
Abellon CleanEnergy	2008	✓	✗	✓	✓	3,100	Current - 45 Upcoming - 65	Gujarat
Antony Lara Renewable Energy	2018	✓	✗	✓	✓	1,000	14	Maharashtra, UP

Note: (SFC Data - Waste Handling capacity - 350 TPD, with an additional handling capacity of 75 TPD resulting in our aggregate treatment capacity of up to 425 TPD)

Source: Annual Report, Frost & Sullivan Research and analysis

The organic fraction, high in biodegradable matter and moisture, enhances the bio-methanation process. The inorganic fraction, or refuse-derived fuel (RDF), includes materials like plastics and paper. After removing metals and heavy materials, RDF is refined into high-quality fuel with a calorific value of 3,000 to 3,500 Kcal/kg. This underscores the company's reliability, trustworthiness, and ability to consistently deliver value, solidifying the company's position as a preferred partner in the industry. The company benefits from a strong brand reputation that has been cultivated over more than 20 years of industry presence.

7.10 Key growth drivers of WTE sector in India

A. Increasing waste generation and waste management expected to drive the market

India's continued urbanisation and population growth are increasing municipal solid waste generation, creating a need for greater waste processing and resource recovery infrastructure. The Government of India reported urban municipal solid waste generation of 162,162 tonnes per day (TPD) in January 2026, of which 131,837 TPD was processed. The continued focus on source segregation, scientific processing

and remediation of legacy waste is expected to support demand for waste-management and waste-to-energy infrastructure.³⁵

B. Government initiatives and policies to strengthen Waste to Energy Programme

The Government of India has supported waste-to-energy projects through the National Bioenergy Programme, under which the Waste-to-Energy Programme provided Central Financial Assistance for projects producing biogas, Bio-CNG and power from urban, industrial, agricultural wastes/residues and municipal solid waste. Phase I of the National Bioenergy Programme was implemented from April 2021 to March 2026 with an outlay of INR 858 crore.³⁶

The Government has also introduced the GOBARdhan National Circular Bioenergy Scheme, approved in August 2026 with a total outlay of INR 23,731 crore for FY2026-27 to FY2035-36. The scheme includes municipal organic waste among its feedstocks and aims to scale up compressed biogas production through assured offtake, capital assistance, pipeline connectivity and access to finance.³⁷

C. Need to Reduce Dependence on Landfills

Landfilling requires significant land and can create environmental concerns when waste is not scientifically managed. The Solid Waste Management Rules, 2026 strengthen source segregation, resource recovery, scientific processing and legacy waste remediation, supporting the diversion of suitable waste from disposal and increasing the role of waste processing and energy recovery.

D. Energy Demand and Renewable Energy Goals

Waste-to-energy provides an additional pathway for recovering energy from waste and contributes to diversification of India's non-fossil energy mix. The Government of India is working towards 500 GW of installed electricity capacity from non-fossil sources by 2030; as of 31 March 2026, 283.46 GW of non-fossil capacity had been installed.³⁸

E. Technological Advancements

The Government's Waste-to-Energy Programme recognizes multiple technology pathways, including biomethanation, combustion, gasification and pyrolysis, enabling energy recovery from different types of waste and supporting the development of technologies suited to varying waste characteristics.³⁹

F. Public-Private Partnerships (PPPs)

The development of waste-to-energy and waste-processing infrastructure provides opportunities for private-sector participation across project development, technology deployment and plant operations. Government support through waste-to-energy and bioenergy programmes, together with the increasing focus on scientific waste processing, is expected to support continued private investment in the sector.

7.11 List of notable, successful, and currently operating WTE plants in India

Waste-to-energy technologies convert suitable waste streams into electricity, heat or fuel through processes such as combustion, gasification and anaerobic digestion. These technologies provide an

³⁵ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2223720&lang=2®=48&utm>

³⁶ <https://mnre.gov.in/en/bio-energy-overview/?utm>

³⁷ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2295480&lang=1®=48&utm>

³⁸ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2250039&lang=1®=3&utm>

³⁹ <https://mnre.gov.in/en/bio-energy-overview/?utm>

alternative pathway for managing waste while recovering energy and reducing the volume of waste requiring disposal. The Government of India continues to recognise waste-to-energy as a pathway for energy recovery from urban, industrial and municipal solid waste through its waste-to-energy programme.⁴⁰

Waste-to-energy facilities can also enable recovery of recyclable materials and other resources from waste streams before energy recovery, supporting resource recovery and reducing dependence on landfill disposal.

Exhibit 7.7: List of notable, successful, and currently operating WTE plants* in India

City	Commencement Year	Location	Capacity (MW)	Developer
North + South Goa	2014	Saligao and Cacora	1.37 + 0.8	SFC Environmental Technologies
Delhi	2016	Narela-Bawana	24.0	Ramky Enviro Engineers
Hyderabad	2012	Jawaharnagar	19.8	Ramky Enviro Engineers
Delhi	2012	Okhla	~23.0	Jindal ITF
Delhi	2016	Ghazipur	12.0	IL&FS – EverSource Capital
Jabalpur	2018	Kathonda	11.5	Essel Infra
Hyderabad	2018	Bibinagar	11.0	RDF Power Projects Limited
Solapur	2013	Not Known	4.0	Organic Recycling Systems
Shimla	2017	Bhariyal	1.7	Elephant Energy
Rajkot	2022	Gujarat	14.9	Abellon Clean Energy

Source: Frost & Sullivan research and analysis

* Also includes electricity generation through bio-methanation route

7.12 Environmental issues and operational challenges

A. Low calorific value of solid waste in India due to improper segregation

In India, mixed waste has a calorific value of around 1,500 kcal/kg, insufficient for power generation compared to coal's 8,000 kcal/kg. Biodegradable waste, high in moisture, is more suited for composting. Segregated and dried non-recyclable waste has a higher calorific value of 2,800 to 3,500 kcal/kg, suitable for power generation. Proper segregation, ideally at the source, is crucial for meeting this calorific requirement.

B. High costs of energy production

Power generation from waste costs about INR 7-8 per unit, while traditional sources like coal and solar provide power at INR 3-4 per unit. To be competitive, waste-to-energy power prices need to be halved. Despite this, the primary goal of waste-to-energy plants is improving health, hygiene, and environmental conditions. Developers should receive adequate compensation through justified tariffs, and subsidies for capital expenditure could boost the sector. Operational costs can be offset by selling CBG and recyclables.

C. Improper assessments and unfavorable on-ground conditions

Many waste-to-energy projects face challenges due to poor assessments, unrealistic projections, and on-site issues. Waste volumes fluctuate due to seasonal changes, rainfall, and transient populations. These projects should use only non-recyclable dry waste, about 25% of total waste, which must be segregated to ensure effective energy generation. Successful operation depends on efficient waste collection,

⁴⁰ <https://mnre.gov.in/en/bio-energy-overview/?utm>

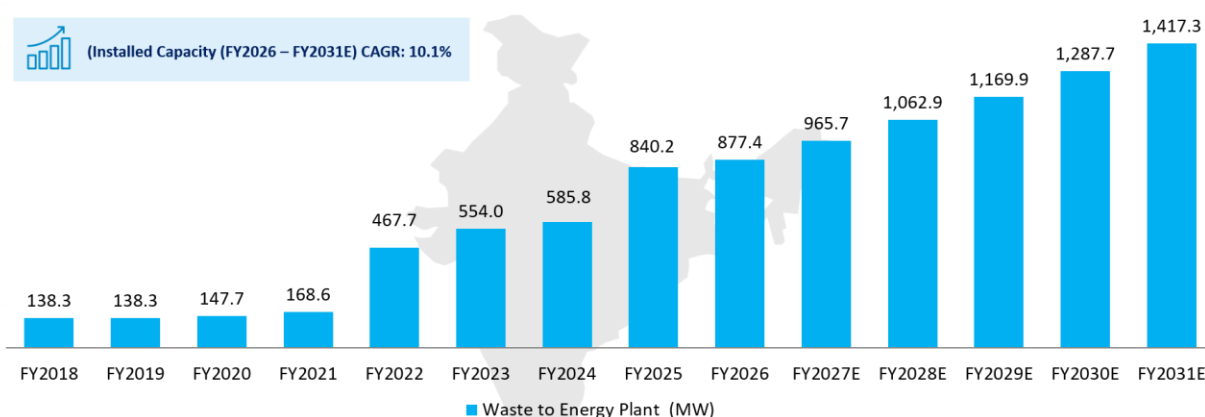
segregation, and processing. Issues at processing plants can increase moisture and reduce calorific value, affecting power generation efficiency.

7.13 Expected in installed capacity of WTE plants in the country

Based on discussions with stakeholders and ongoing projects in the country, installed capacity of WTE projects in India is expected to continue increasing. The installed capacity of WTE projects reached approximately 877.4 MW in FY2026, compared with 840.2 MW in FY2025, based on the latest data from the Ministry of New and Renewable Energy (MNRE).

Based on the existing project pipeline and expected capacity additions, installed WTE capacity is estimated to reach approximately 1,287.7 MW by FY2030E, implying a CAGR of approximately 10.1% between FY2026 and FY2030E. Extending the same growth trajectory, installed WTE capacity is estimated to reach approximately 1,417.3 MW by FY2031E.

Exhibit 7.8: Growth forecast of WTE plants in India, MW, FY2018 – FY2031E



Source: Stakeholder Consultations, CEA, and Frost and Sullivan Analysis

7.14 Revenue potential from MSW (CBG, Electricity, Compost, and Recyclables)

Municipal Solid Waste (MSW) offers multiple revenue opportunities through the recovery and sale of Compressed Biogas (CBG), electricity, compost and recyclable materials. Based on the latest MSW generation, collection and processing levels and the corresponding assumptions for waste conversion, energy recovery and realisation from recovered products, the revenue potential from these MSW-related businesses is estimated at approximately INR 217.4 billion in FY2026. The revenue potential is estimated to increase to approximately INR 329.2 billion by FY2031E, representing a CAGR of approximately 8.7% during FY2026–FY2031E.

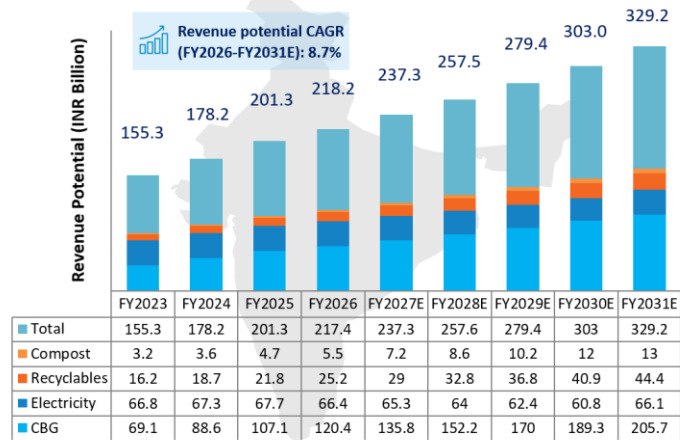
The underlying opportunity is supported by continued growth in waste generation and improvements in waste processing. The Government of India reported urban MSW generation of 162,162 TPD and processing of 131,837 TPD in January 2026. Continued improvements in collection, source segregation and scientific processing are expected to increase the availability of waste for energy and resource recovery.⁴¹

⁴¹ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2273017&lang=1®=1&utm>

Exhibit 7.9: Revenue potential from MSW related businesses, India, INR billion, FY2023-FY2031E

Key assumptions for calculation of potential revenue:

Parameters	FY2026	FY2031E
MSW Generation (TPD)	162,162	195,500*
MSW collection %	98%	100%
MSW treatment %	82%	95%
Wet waste as % of waste collected	50%	50%
CBG volume (Nm ³ per TPD)	100	120
CBG price including GST (Rs./Kg)	57	75
Compost as % of wet waste	6%	7%
Compost price (Rs./Kg)	2.0	3.0
Recyclables as % of dry waste	10%	15%
Recyclables price (Rs./kg)	6.0	8.0
MW / 100 TPD RDF	2	2
Electricity price (Rs./kWh)	7.5	7.5



Source: Stakeholder Consultations, Frost and Sullivan Analysis

7.15 List of announced, planning, and under-construction projects

Sl. No.	Municipal Corporation	Location	Capacity (MSW TPD)	Current Status	Developer
1	Tinsukia Municipal Board	Tinsukia, Assam	125	Under Construction	Oil India Limited
2	Bhubaneswar Municipal Corporation	Bhubaneswar, Odisha	300	Under Construction	Oil India Limited
3	The Greater Noida Industrial Development Authority	Astauli, Uttar Pradesh	300	Under Construction	Reliance Bioenergy Limited
4	Pimpri-Chinchwad Municipal Corporation	Moshi, Pune, Maharashtra	375	Tender floated / under evaluation; award not yet made	Not Appointed
5	Brihanmumbai Municipal Corporation	Mankhurd / Deonar, Mumbai, Maharashtra	350	Phase 1 : Concession agreement signed (350 TPD)	Mahanagar Gas Limited
6	Jorhat Municipal Board	Jorhat, Assam	125	Under Construction	Oil India Limited
7	Sambalpur Municipal Corporation	Sambalpur, Odisha	200	Under Tendering	Oil India Limited
8	Cuttack Municipal Corporation	Cuttack, Odisha	200	Under Tendering	Oil India Limited

9	Agartala Municipal Corporation	Agartala, Tripura	160	Under Construction	Oil India Limited
10	Greater Bengaluru Authority	Bengaluru, Karnataka	300	Under Tendering	GAIL Limited
11	Gorakhpur Nagar Nigam	Gorakhpur, Uttar Pradesh	200	Under Tendering	Indian Oil
12	Municipal Corporation of Delhi (MCD)	Delhi	800 (2 Projects)	MOU signed between Oil India's subsidiary and MCD	Oil India Limited's subsidiary
13	Municipalities of Gurugram, Faridabad, Hisar and Ambala	Gurugram, Faridabad, Hisar and Ambala (Haryana)	5000 (4 projects)	MOU signed between Oil India's subsidiary and Municipalities	Oil India Limited's subsidiary

The future of Waste-to-Energy in India is expected to remain promising, supported by increasing waste generation, greater emphasis on scientific waste processing, technological advancements and continued policy support. The sector is increasingly moving beyond electricity generation to include biogas, Bio-CNG, resource recovery and RDF utilisation, enabling greater value recovery from different waste streams. The Solid Waste Management Rules, 2026 further strengthen source segregation, scientific processing, resource recovery and reduction of waste sent to landfill, while Government programmes continue to support energy recovery from urban and organic waste.

As waste management and energy requirements continue to grow, WtE can help address the dual challenges of waste disposal and energy recovery. Advances in biomethanation, combustion, gasification and other waste-processing technologies, together with improved segregation and feedstock management, are expected to support greater efficiency and wider adoption of WtE solutions. The continued development of these technologies and the integration of waste management with resource and energy recovery will play an increasingly important role in India's transition towards a more circular and resource-efficient waste management system.

8. OPPORTUNITY LANDSCAPE OF INDIA'S BIOGAS MARKET

8.1 Role of Biogas in India's CNG/PNG ecosystem

India's energy landscape is shifting towards cleaner alternatives, with biogas emerging as a key player in enhancing the CNG and PNG ecosystem. Once considered waste, biogas, rich in methane, is now valued as a renewable resource. By converting organic matter into clean fuel, biogas can be integrated into existing CNG and PNG infrastructure, reducing reliance on imported fossil fuels and supporting a sustainable energy future for India.

A. Biogas as a biofuel in India's decarbonization journey

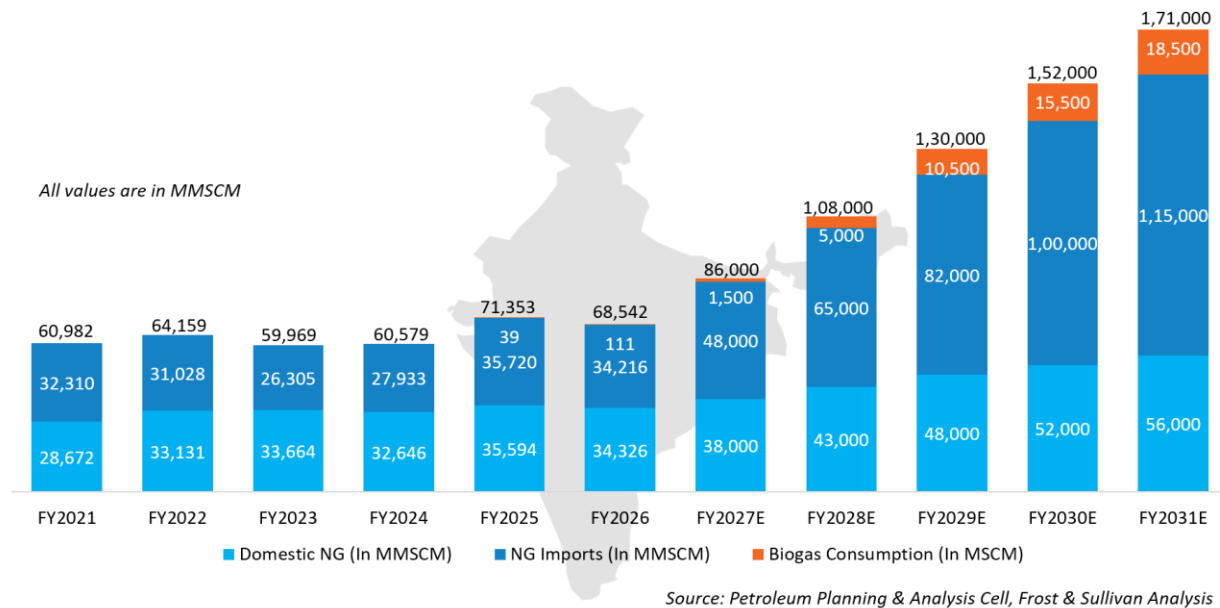
India's shift towards renewable energy is critical for reducing carbon emissions. Biogas plays a key role with its potential to cut fossil fuel use by 6% by 2030. It contributes to emission reduction through

methane mitigation, circular economy practices (using digestate as a natural fertilizer), clean energy substitution, and the use of biogenic CO₂ for renewable processes.

B. Biogas can help in reducing India's LNG import

Biogas is set to significantly reduce India's reliance on imported LNG, with consumption projected to rise to 18,500 MMSCM by FY2031E, potentially saving substantial import costs. Compressed Biogas (CBG) could decrease natural gas consumption by 13.5–14.0% by FY2030E.

Exhibit 8.1: Biogas domestic gas volume, imports, and consumption, FY2021 – FY2031E

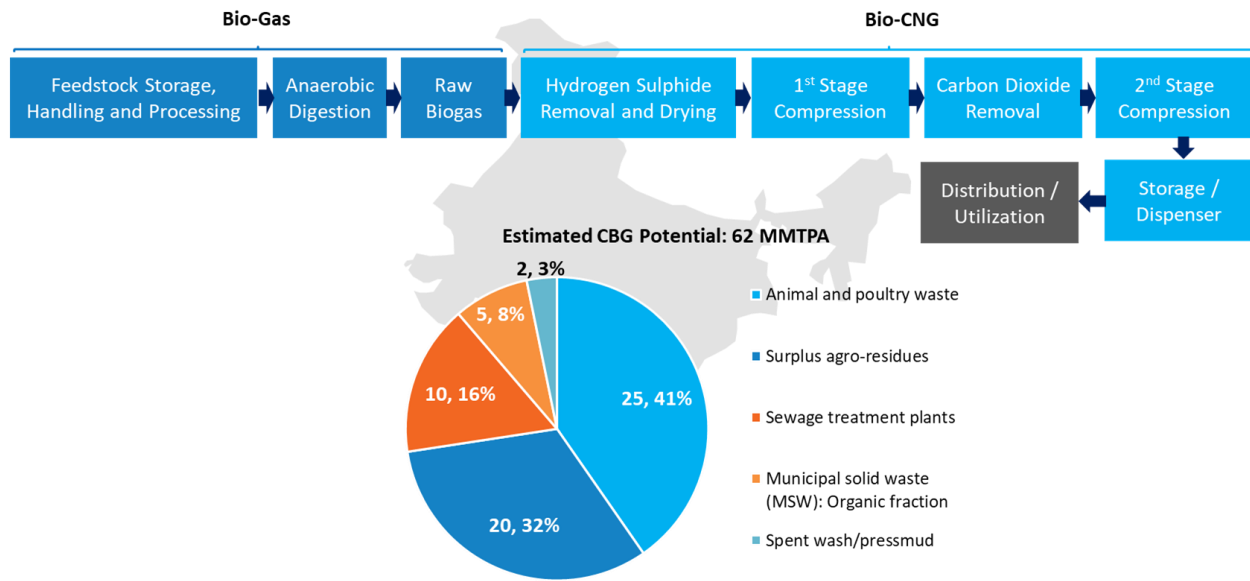


C. Reduce pollution and its effects that are generated from burning biomass

Biomass burning is a major source of air pollution and greenhouse gases, contributing to thousands of premature deaths annually, especially in North India. Converting crop residues into biogas can address this issue, and government initiatives like co-firing biomass in power plants have already reduced CO₂ emissions by 1.2 Lakh Metric Tons.

8.2 Potential for Bio-CNG generation in the country from Agro-waste

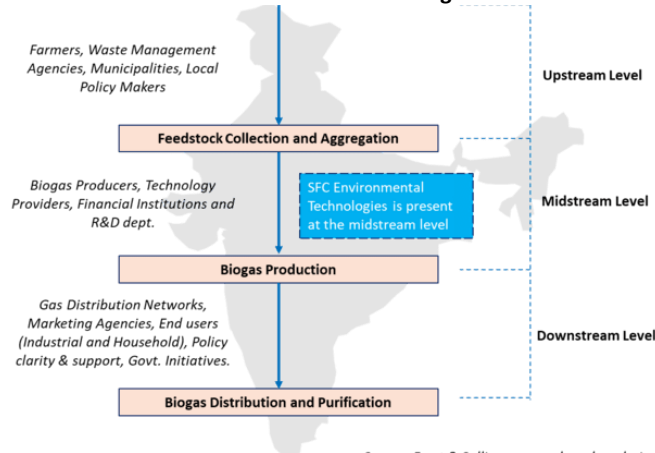
India's diverse biogas feedstocks include animal waste, agricultural residue, municipal solid waste (MSW), and sewage sludge, with a total Compressed Biogas (CBG) potential of 62 MMTA.

Exhibit 8.2: Bio-CNG generation potential from various feedstocks

Source: Petroleum Research, Vol 7, Issue 3; Frost & Sullivan Analysis

8.3 Value Chain of Indian Biogas Market

The Indian biogas market includes feedstock collection, processing, production, and distribution. Key players are government bodies, state departments, cooperatives, private firms, and renewable energy agencies. Biogas is vital for energy security, entrepreneurship, and local economies.

Exhibit 8.3: Value chain of biogas market

Source: Frost & Sullivan research and analysis

The Indian government supports the sector with financial aid for biomass machinery and mandates CBG blending in City Gas Distribution pipelines from FY2026, driving demand for biogas production technologies.

SFC Environmental Technologies Ltd. being a provider of such technology used in midstream level of biogas production is one of the leading integrated municipal solid waste-based biogas developer in India and is poised to be a key beneficiary of government initiative of blending of biogas. Operating continuously for over 10 years, SFC's plant at Saligao, North Goa holds the unique distinction of longest operating integrated MSW based biogas plant in India.

Exhibit 8.4: Roles and responsibilities of key stakeholders

STAKEHOLDER	ROLES	RESPONSIBILITIES
Government Agencies (e.g., MNRE) and Policy Makers	Policy Formulation and Promotion	Formulate and implement policies, provide financial assistance, promote biogas use, and create a conducive environment for the biogas industry
Training and Development Centers (e.g., BDTCs) and Educational Institutions	Training and Development	Provide training, development programs, and research for biogas production
Promotional Bodies (e.g., KVIC, NDDDB)	Promotion	Promote biogas plants among rural communities and the use of waste for biogas production
Biogas Producers and Companies	Production and Distribution	Involved in various stages of the biogas value chain, from feedstock collection, processing, production, to distribution
Distribution Entities (e.g., OMCs)	Distribution	Distribute biogas using their infrastructure and network
Technology Suppliers	Technical Support	Provide technical support, specialized equipment, and solutions for biogas production
Financial Agencies	Financial Support	Provide financial backing, approve loans for biogas projects, and invest in the biogas sector

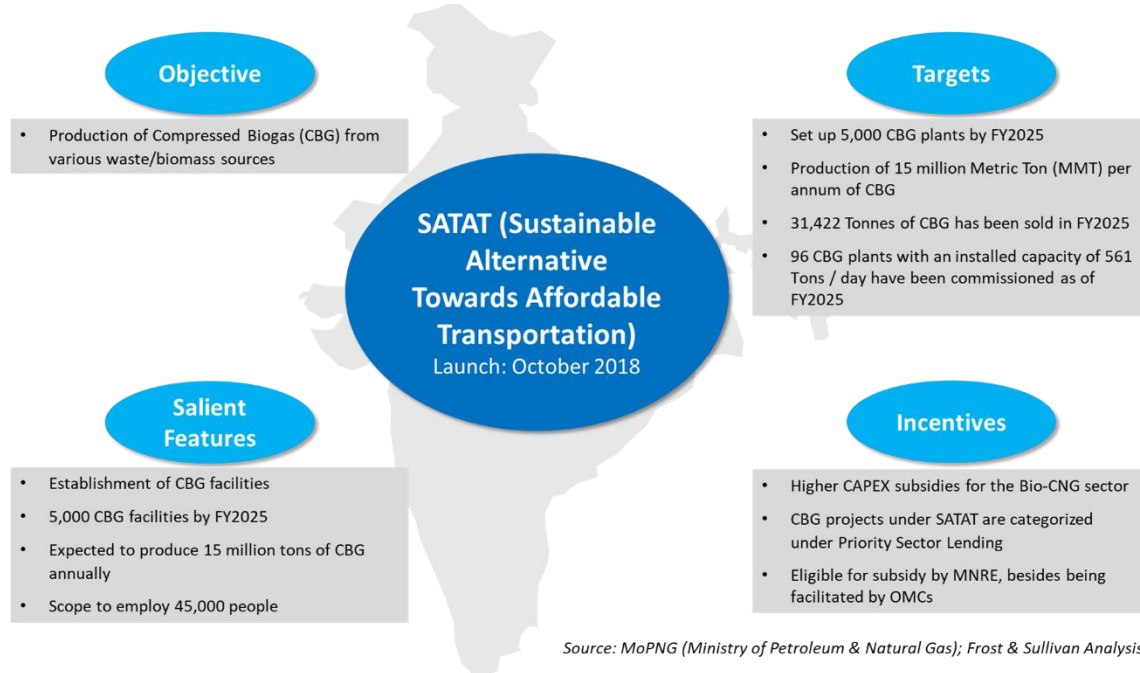
8.4 Government policies driving the growth of the Indian CBG sector

Following are various government initiatives to promote consumption of CBG in the country:

- **National Bio Energy Programme:** Launched by the MNRE on 2nd November 2022, this program aims to promote power, biogas/BioCNG, and briquette/pellet production with a budget of INR 17 billion (Phase 1: INR 8.6 billion). It supports the use of surplus biomass from rural areas, providing additional income for rural households.
- **Sustainable Alternative Towards Affordable Transportation (SATAT):** This initiative promotes the production of CBG from waste/biomass, aiming to reduce reliance on fossil fuels and air pollution from crop stubble burning. It is expected to produce 15 million tonnes of gas, reducing the CNG bill by 40%.
- **PM-PRANAM Scheme:** A proposed program to reduce chemical fertilizer use by promoting bio and organic fertilizers. It aims to reduce the subsidy burden on chemical fertilizers and encourage states to adopt alternatives.
- **Financial Assistance for Biomass Aggregation Machinery:** This scheme supports CBG producers in purchasing machinery for biomass aggregation, facilitating CBG production and overcoming funding challenges.
- **CBG Blending Obligation (CBO):** In India, the compressed biogas ("CBG") blending obligation mandates oil marketing companies to blend CBG into their fuel infrastructure. The mandatory blending obligation will begin in FY 2025-26, starting at 1% and gradually increasing to 5% from FY

2028-29 onwards. This initiative mandates OGMCs to set up projects for CBG production from organic waste and biomass.

Exhibit 8.5: SATAT Scheme, targets, salient features and incentives



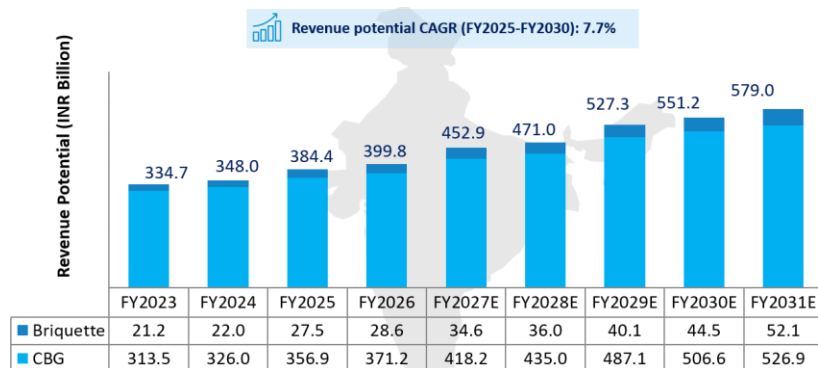
8.5 Revenue potential from Surplus Agro Residue and Press Mud (CBG and Briquettes)

Both Compressed Biogas and Briquettes can be produced from Surplus Agro Residue and Pressmud – the current availability of these two feedstocks has been estimated at approximately. 150 MT and 20 MT, respectively.

Exhibit 8.6: Revenue potential from Surplus Agro Residue and Press Mud, India, INR billion, FY2023-FY2031

Note / Assumptions:

- The revenue potential has been calculated based on only two feedstocks – Surplus Agro Residue and Pressmud.
- Even though annual CBG potential of the above-mentioned feedstocks are 20 MMTPA & 2 MMTPA, considering realistic availability, the revenue has been calculated at 25%
- CBG price is expected to increase from INR 60 / Kg in FY2026 to INR 70 / Kg in FY2031E
- Briquette's sale (quantity) has been considered as 10% of feedstock considering the mix of feedstock and marketability
- Briquette price for FY2025 has been considered as INR 6 / Kg which is expected to increase to INR 9/ Kg by FY2031E



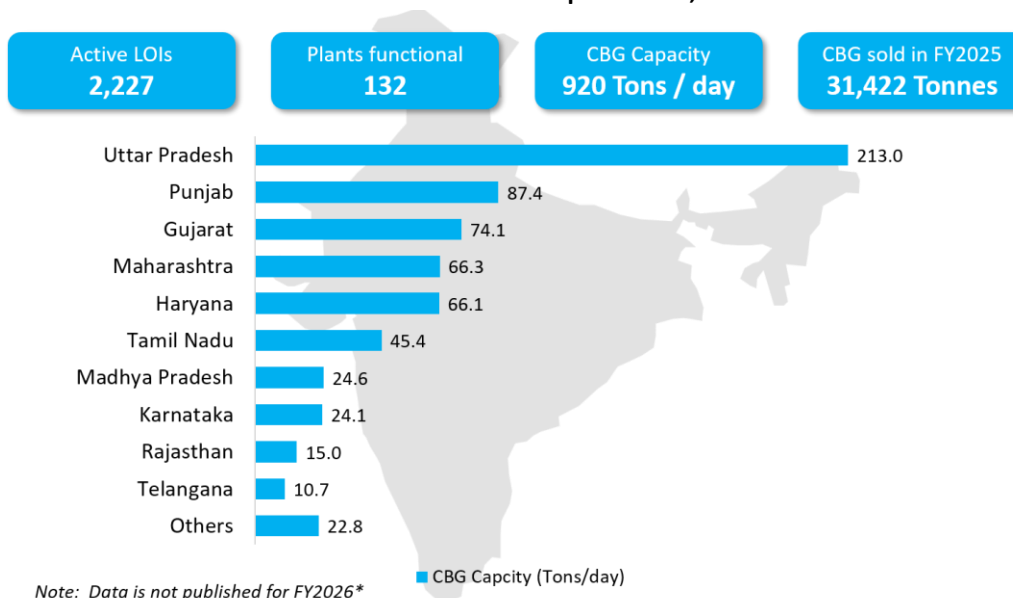
Source: Stakeholder Consultations, Frost and Sullivan Analysis

For the purpose of this calculation, it has been assumed that only 25% of the feedstock would realistically be available for CBG and Briquette production – this is in line with assumptions considered for the SATAT scheme. Basis these assumptions, revenue potential from the above-mentioned businesses in FY2023 were INR 313.5 billion that increased to INR 371.2 billion in FY2025. The potential is likely to increase to INR 526.9 billion by FY2031, growing at a CAGR of 7.7%.

8.6 Current state of CBG production in India

According to the information available on SATAT and GOBARDhan portal of Government of India, there are 96 functional CBG plants in India as on FY2025 with a cumulate CBG production capacity of 561 Tons / day.

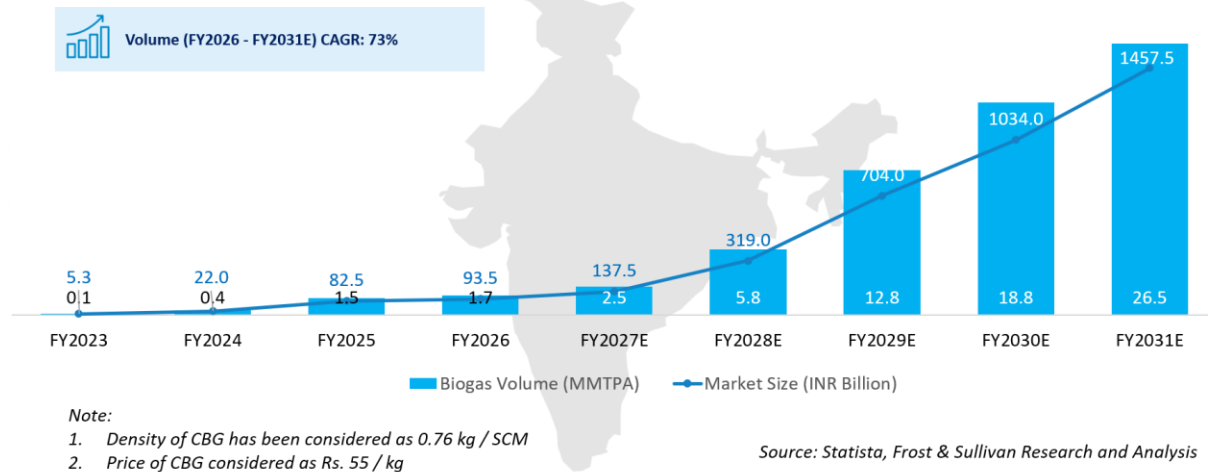
Exhibit 8.7: Status of CBG production, India



Besides, there are 2,227 active Letters of Intent (LOI) for setting up similar plants and in FY2025, 31,422 tonnes of CBG have been sold in the country. The above chart indicates approximately 2.5 times increase from 38 CBG plants, 225 Tons/day capacity at the end of October 2022. Advancements in technology have made the production of CBG more efficient and cost-effective, further boosting market growth. Some of the renowned producers of CBG at present are Verbio India (33 TPD), Lakhimpur Kheri RNG (21.2 TPD), Jakraya Sugar (20 TPD), Reliance Bio Energy (20 TPD), Reliance Industries (20 TPD), Inodore Clean Energy (17 TPD), Sangrur RNG (14.8 TPD), Patiala RNG (14.8 TPD), Circle CBG India (14.6 TPD), HPCL (14.3 TPD), Bharat Biogas Energy (14.0 TPD) etc.

8.7 Current size of Indian Biogas Market and its growth

Government programmes and supportive policies are expected to drive exponential growth in India's CBG sector. According to the GOBARDhan portal, the sector has a growing pipeline of operational, completed, under-construction and planned CBG plants, with project commissioning expected to accelerate in the coming years. Frost & Sullivan estimates that CBG production in India reached 1.7 MMTPA in FY2026A and could increase to 26.5 MMTPA by FY2031E, driven by increasing plant commissioning, rising CBG blending obligations and improving offtake and infrastructure support. At a CBG price of INR 55/kg, the market value is estimated to increase from INR 93.5 billion in FY2026A to INR 1,457.5 billion by FY2031E, representing a ~73% CAGR. The government's increasing focus on CBG production, including financial support for biomass aggregation and pipeline connectivity, is expected to improve project economics and support capacity additions. For instance, HPCL's Budaun CBG plant, with an investment of INR 1,330 million, processes 100 MTPD of rice straw to produce 14 MTPD of CBG and 65 MTPD of solid manure, demonstrating the potential for CBG projects to simultaneously address agricultural waste management, emissions reduction and rural employment.

Exhibit 8.8: Growth of Indian CBG market, in MMTPA and INR billion, FY2023 – FY2031E

8.8 Growth drivers and restraints of the Indian CBG market

The growth of the Indian CBG sector is fueled by several factors that include supportive government, an abundant supply of organic waste, and a growing awareness about environmental sustainability. This could pave the way for a thriving CBG sector for the country.

Exhibit 8.9: Key drivers for the growth of Indian Biogas Market

SL. NO.	FACTORS	SHORT-TERM IMPACT	LONG-TERM IMPACT
1.	Mandatory blending of 5% CBG from waste into the CGD network by FY2029	This will stimulate demand for CBG in the CGD sector. It will promote production and consumption of CBG in the country.	The CBG Blending Obligation (CBO) will encourage significant investment and facilitate establishment of numerous CBG projects. It will lead to import substitution for Liquefied Natural Gas (LNG), saving in foreign exchange, and promoting circular economy.
2.	Increasing awareness towards environmental sustainability	Immediate increase in demand for biogas solutions.	Sustained growth as more people adopts renewable energy solutions.
3.	Government initiatives promoting renewable energy	Increased funding and support for biogas projects.	Creation of a favorable policy environment for renewable energy.
4.	Rising adoption of renewable resources	Increased market demand for biogas.	Shift towards renewable energy sources, reducing dependence on fossil fuels.
5.	Increasing installation of energy sources	Growth in the biogas industry due to increased installations.	Widespread adoption and normalization of biogas as a primary energy source.
6.	Increasing utilization of wastes	More efficient use of waste materials, boosting biogas production.	Establishment of waste-to-energy as a standard practice, contributing to a circular economy.

However, the sector is also affected with a few present-day challenges that have been listed below:

Exhibit 8.10: Restraints hindering the growth of the Indian CBG Market

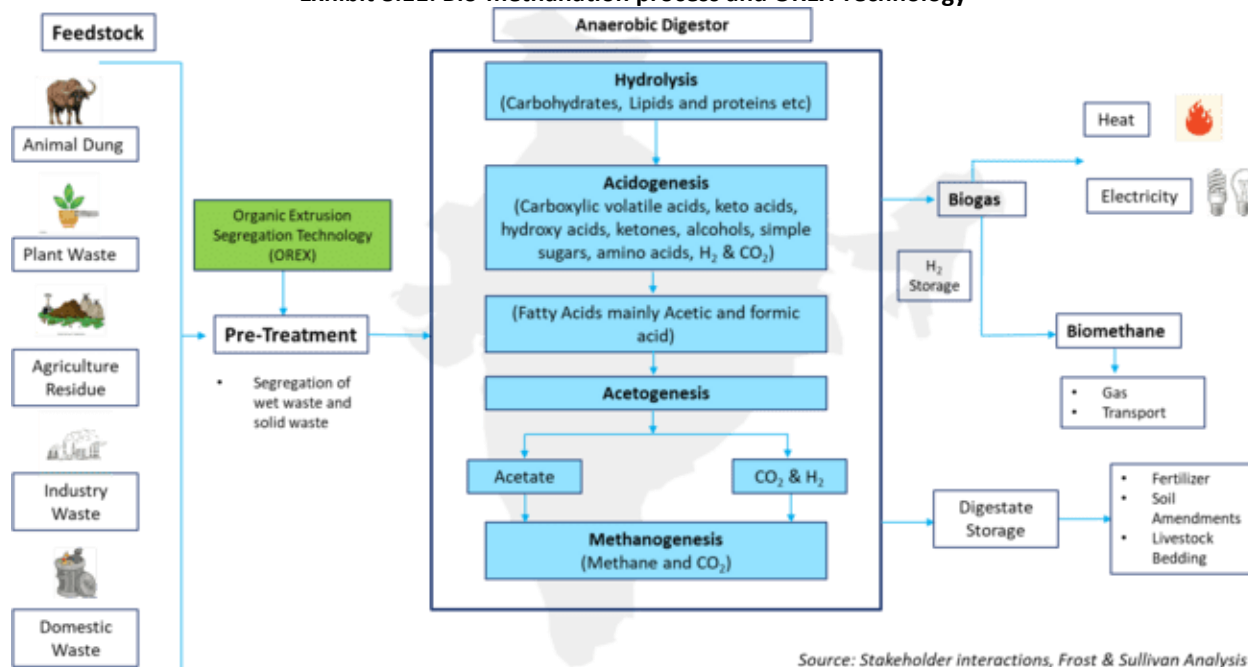
SL. NO.	FACTORS	SHORT-TERM IMPACT	LONG-TERM IMPACT
1.	High capital expenditure	Potential deterrent for new entrants due to high initial costs.	Consolidation of the market, with larger players dominating.
2.	Supply chain related bottlenecks / availability of feedstocks	Limited availability or fluctuations in the supply of feedstock could lead to delays or cancellations of ongoing projects and is a major operational challenge	Potential long-term disruptions in the supply chain, affecting future projects.

8.9 Bio-methanation process and OREX as an Organic waste pre-treatment technology

Bio-methanation is a process that converts hydrogen (H₂) and carbon dioxide (CO₂) into methane (CH₄) through several key stages:

- **Hydrolysis:** Complex organic compounds are broken down into simpler molecules by bacteria, preparing them for further processing.
- **Acidogenic Fermentation:** These simpler molecules are further broken down, producing volatile fatty acids (VFAs) like acetic acid.
- **Hydrogen-Producing Acetogenesis:** VFAs are converted into hydrogen (H₂) and carbon dioxide (CO₂), essential for methane production.
- **Methanogenesis:** Methanogens use H₂ and CO₂ to produce methane (CH₄).
- OREX technology enhances this process by efficiently segregating municipal waste into organic and inorganic fractions.

Exhibit 8.11: Bio-methanation process and OREX Technology



Source: Stakeholder interactions, Frost & Sullivan Analysis

The organic fraction, rich in moisture and organic matter, is used for bio-methanation, while the inorganic fraction is converted into high-quality Refuse Derived Fuel (RDF). This technology has capability to yield more than 150 Nm³ of biogas per ton of organic waste, higher than the industry average of 80-100 Nm³ per ton.

8.10 Plans of OMCs/CGD companies to enter Indian Biogas Market

Oil Marketing Companies (OMCs) and City Gas Distribution (CGD) Companies are entering the Indian biogas market, driven by the rising demand for clean energy and the government's biogas production targets. With their extensive infrastructure, OMCs and CGDCs are expected to boost the sector's growth, advancing India's energy security and sustainability goals.

In this evolving market, SFC Environmental Technologies Group have a clear edge over Original Equipment Manufacturers (OEMs). SFC's expertise in waste-to-energy solutions, strong regulatory relationships, and proven technologies make them well-suited to lead in biogas production and distribution. Collaborating with OMCs and CGD Companies, established players like SFC can accelerate market penetration and promote sustainable energy practices across India, reinforcing the nation's shift towards a greener future.

Exhibit 8.12: OMC (Oil Marketing Companies) and CGD Companies and their interest in Indian Compressed Biogas Market

OMC	PLAN
Oil India Ltd.	OIL Green Energy Ltd. (OGEL), a wholly owned subsidiary of Oil India Limited (OIL), a Maharatna Central Public Sector Enterprise under the Ministry of Petroleum & Natural Gas, and Hindustan Waste Treatment Pvt. Ltd. (HWT), a wholly owned subsidiary of SFC Environmental Technologies Ltd., have signed a Joint Venture Agreement (JVA) to collaborate in the development of integrated bioenergy and sustainable waste management projects in India. The partnership envisages formation of a 50:50 joint venture company to pursue opportunities in compressed biogas (CBG), waste-to-energy and allied sustainable infrastructure projects aligned with India's clean energy transition and circular economy objectives.
Oil and Natural Gas Corporation Ltd. (ONGC)	ONGC's Board has given in principle approval for formation of a joint venture to establish 15 waste-based compressed biogas (CBG) plants across India with two experienced companies: SFC and EverEnviro Resource Management Pvt. Ltd.
Indraprastha Gas Ltd. (IGL)	IGL entered into a Joint Venture Agreement Hindustan Waste Treatment Private Limited (a subsidiary of SFC) for setting up of Compressed Biogas Plant/Biofuel Projects.
GAIL (India) Limited	GAIL (India) Ltd. plans to set up around 26 Bio CNG plants over the next two to three years, both as producers as well as joint venture partners with raw material suppliers or biogas producers. The company has issued an Expression of Interest across India, for companies qualifying with certain

	parameters to form joint ventures for raw materials such as paddy straw, municipal solid waste and sugar.
Mahanagar Gas Ltd. (MGL)	MGL is expected to invest over INR 600 Crores in constructing and operationalizing 1000 Ton per day segregated organic municipal solid waste (MSW) based compressed biogas plant at Deonar, Mumbai.
Indian Oil Corporation Limited (IOCL)	IOCL has shown interest in the SATAT initiative and is planning to procure CBG from potential entrepreneurs.
Bharat Petroleum Corporation Limited (BPCL)	BPCL is also part of the SATAT initiative and is planning to set up CBG plants across the country.
Hindustan Petroleum Corporation Limited (HPCL)	HPCL is planning to offer a delivered price for procurement of CBG, with additional incentives based on the delivery distance and current CNG market price.
Reliance Industries Limited (RIL)	RIL plans to set up more than 50 compressed biogas (CBG) plants in the next two years at a cost of over INR 50 billion. They have already set up two CBG demo units at its refinery facility in Jamnagar and commissioned the first commercial-scale CBG plant at Barabanki in Uttar Pradesh.
Essar Oil	Essar Oil has shown interest in the SATAT initiative and is planning to procure CBG from potential entrepreneurs.
Nayara Energy	Nayara Energy is also part of the SATAT initiative and is planning to set up CBG plants across the country.

Source: Frost & Sullivan research

8.11 Municipal Wet Waste to Biogas generation and selling as CNG/PNG

Municipal wet waste, such as food scraps and yard trimmings, can be converted into biogas through shredding, mixing with water, and anaerobic digestion, producing methane and carbon dioxide. This biogas can be purified to create Compressed Natural Gas (CNG) or Piped Natural Gas (PNG). The Ministry of New and Renewable Energy supports Waste to Energy projects for Biogas, Bio-CNG, and Power from various wastes. For example, a plant processing 20 tons of fruit and vegetable waste daily can yield about 2,400 m³ of Bio-CNG. Key factors for successful conversion include waste availability, collection costs, and digester facilities.

8.12 Leading Biogas Technology Suppliers

The Indian biogas market is dynamic, with key biogas technology suppliers shaping its trajectory. In the table above, we spotlight the leading biogas technology suppliers operating within India. These companies contribute significantly to the nation's sustainable energy objectives by advancing biogas adoption, waste-to-energy initiatives, and environmental stewardship.

Exhibit 8.13: Leading MSW treatment companies providing Waste to Energy (WTE) Solutions

COMPANY	PRODUCTS / SOLUTIONS	DESCRIPTION
SFC Environmental Technologies	Technology solutions for solid waste treatment comprising design, engineering, turnkey solutions and O&M	SFC provides solutions for Solid Waste Treatment, including project development, design and engineering, equipment supply, construction and commissioning, and long-term operation and maintenance. SFC also offer turnkey solutions through an engineering, procurement and construction ("EPC") model. SFC's principal technology is OREX, which is their proprietary technology, designed to separate biodegradable organics from inorganic materials and lignocellulosic fibres from mixed municipal wastes.
Ecogreen Energy	Waste Collection & Transportation, Waste Processing & Treatment, Waste to Energy, Construction & Demolition Waste Management	Ecogreen Energy is a waste management and waste-to-energy company in India. It provides door to door waste collection service, transportation of waste to plant sites where the waste is segregated and then converted into organic compost, electricity, and RDF (Refuse Derived Fuel).
Antony Lara Renewable Energy	Waste-to-Energy	The company focuses on comprehensive operations of collection, transportation, treatment and disposal of municipal solid waste.
Abellon Clean Energy	Waste to Energy, Extended Producer Responsibility, Biomass Heat & Transport, EPC3	Abellon Clean Energy is an integrated sustainable energy solutions provider. The company's primary business is energy generation from waste. The company has entered into a technical agreement with Germany's Agrafarm Group for setting up biogas plants across India. In the first phase, the company will set up biogas plants in Gujarat and later, on a pan-India basis, with technical support from Agrafarm Group.

8.13 Threats and challenges to SFC Technologies and its products and services

A. Challenges specific to the End user industry

Municipal Authorities: Ageing infrastructure, inadequate collection systems, and weak enforcement of industrial pre-treatment are major challenges, leading to pollution. Upgrading infrastructure, enhancing waste collection, and enforcing stricter regulations are needed.

Households and Residential Communities: Inefficient waste management stems from poor source segregation, mixing recyclables, food scraps, and non-biodegradables. Encouraging waste segregation and promoting composting are vital for improved management.

Industries: High installation and maintenance costs deter biogas adoption. Limited awareness of financial benefits and technology also hampers uptake. Government incentives and awareness programs can boost adoption.

Challenges specific to SFC Environmental Technologies

SFC Environmental Technologies faces standard industry risks, including competition from both established and new players, and economic fluctuations affecting project budgets and investment. Domestic market uncertainties and changes in government policies, such as levies or exemptions on

imported materials, can impact sales and profit margins. For example, fluctuations in steel or plastic prices and changes in government subsidies may influence project costs and demand for SFC's solutions

9. AGRO WASTE TO BIOGAS MARKET IN INDIA

9.1 Introduction

A. Agro-Waste (crop residues, husks, straw, stubble, sugarcane bagasse, press mud, etc.)

Agro-waste, or agricultural waste, refers to the by-products and residues generated from various agricultural activities, including crop cultivation, harvesting, and processing. It encompasses a wide range of organic materials that are typically not the main products but are left behind after harvesting or processing crops. Common types of Agro-waste include crop residues like stalks, stems, and leaves that remain in the field post-harvest; trash (such as sugarcane trash, soybean thrash and castor thrash) straw (especially from cereals like wheat, maize and rice); and stubble, the short stalks left after cutting crops.

Agro-industrial processing produces other forms of waste. Sugarcane bagasse, the fibrous residue left after extracting juice from sugarcane, and press mud, a by-product of sugar processing, corn cobs after taking out the corn, chikori shells are key examples. These materials are often underutilized or discarded, leading to environmental challenges such as open burning or improper dumping. Despite being considered waste, these materials are rich in cellulose and organic matter, making them valuable for bioenergy, composting, and other sustainable applications. Efficient management and recycling of Agro-waste not only reduce environmental pollution but also promote circular economy practices in agriculture, contributing to energy generation, soil health, and sustainable rural development.

B. Potential for energy generation - Compressed Biogas (CBG) and Biomethane:

Agro-waste holds significant potential for renewable energy generation, particularly in the form of CBG (Compressed Biogas) and biomethane. These gases are produced through anaerobic digestion, where microorganisms break down organic Agro-waste in the absence of oxygen, generating biogas that can be upgraded to biomethane or compressed into CBG for use as fuel. The CBG thus produced has similar properties to CNG (Compressed Natural Gas) and can be used in transport, industry, or reticulated system (piped gas for homes). Moreover, the digestate (by-product) serves as a nutrient-rich biofertilizer, closing the agricultural loop.

C. Although Market quantification is limited, policy interest and pilot-level activity are growing:

Although the quantification of the Agro-waste biogas market remains limited due to fragmented data and varying collection efficiencies, there is a growing policy interest and pilot-level activity in this sector. The diverse nature and seasonal availability of Agro-waste make it challenging to develop precise market estimates, but the untapped potential is widely acknowledged. Governments and stakeholders are increasingly recognizing Agro-waste as a strategic resource for clean energy, particularly for producing biogas, CBG, and biomethane. Initiatives such as India's SATAT (Sustainable Alternative Towards Affordable Transportation) scheme are encouraging public and private players to invest in CBG plants using agricultural residues like press mud, straw, and sugarcane bagasse.

Several pilot projects and decentralized biogas units are being set up across rural areas to demonstrate the viability of Agro-waste as feedstock. These efforts aim to create scalable models for waste-to-energy conversion, improve rural energy access, and reduce reliance on fossil fuels. While commercial deployment is still in its early stages, increased funding, technological support, and regulatory incentives

are expected to drive the growth of the Agro-waste biogas sector in the coming years, aligning with broader climate and energy security goals.

9.2 Policy & Regulatory Support

India's government has implemented a series of forward-looking policies and programs to promote the conversion of agricultural waste into biogas and CBG. These efforts aim to address environmental issues like crop burning, improve rural energy access, create green jobs, and reduce dependence on imported fossil fuels. The following are the most significant schemes and mechanisms currently in place

A. SATAT initiative (Sustainable Alternative Towards Affordable Transportation) by MoPNG (Ministry of Petroleum and Natural Gas) (2018)

The SATAT initiative, launched in 2018 by the (MoPNG), is a flagship program aimed at boosting the production and usage of CBG in India. The initiative originally set a target of establishing 5,000 CBG plants by 2023–24, which has since been extended to allow for greater participation and execution. The goal is to utilize abundant agricultural residues and organic waste—such as crop stubble, cattle dung, and press mud—to produce CBG. The produced CBG is intended to be used as a cleaner, renewable automotive fuel and can also be injected into the existing CGD (City Gas Distribution) network as a substitute for natural gas. The SATAT initiative is market-driven and provides long-term offtake security through LOIs (Letters of Intent) from OMCs (Oil Marketing Companies) such as IOCL (Indian Oil corporation Limited), BPCL (Bharat Petroleum Corporation Limited), and HPCL (Hindustan Petroleum Corporation Limited), encouraging private investment in biogas infrastructure.

B. National Bio-Energy Programme (2022–2026) by MNRE (Ministry of New and Renewable Energy)

The National Bio-Energy Programme (2022–2026), introduced by the MNRE, serves as an umbrella scheme to promote energy generation from various biomass sources, including Agro-waste. This program provides financial and technical support for a wide range of waste-to-energy projects. It includes three major components: the Waste to Energy Programme, the Biogas Programme, and the Biomass Programme. Specifically, the scheme supports the construction of biogas and biomethanation plants that use agricultural residues such as sugarcane press mud, paddy straw, maize cobs, and cotton stalks. CFA (Central Financial Assistance) is offered to qualified developers based on project capacity and technology type. The program is designed to encourage both small-scale rural biogas plants and large-scale commercial CBG units, contributing to energy access, environmental sustainability, and rural economic development.

Phase-I of the National Bioenergy Programme was valid from 1 April 2021 to 31 March 2026⁴². MNRE stopped accepting new Biomass and Waste-to-Energy applications after 31 December 2025⁴³, pending approval of the Phase-II budget and guidelines. Separately, MNRE issued revised Biomass Programme guidelines on 27 June 2025 that simplified compliance by replacing the earlier 16-hours-per-day performance-testing framework with a continuous 10-hour test for specified subsidy eligibility. The revision also allowed pellet producers in Delhi, Punjab, Haryana and NCR districts of Rajasthan and Uttar

⁴² <https://biourja.mnre.gov.in/about-the-programme>

⁴³ <https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2022/12/2022122292.pdf>

Pradesh to choose between MNRE and CPCB support schemes, supporting ease of doing business and efforts to reduce stubble burning⁴⁴.

C. BPA (Biogas Purchase Agreements): Indian Oil, BPCL, HPCL inviting long-term offtake contracts

BPAs are being offered by major Oil Marketing Companies—IOCL, BPCL, and HPCL. These agreements provide long-term purchase commitments to biogas producers, ensuring a steady market for CBG. This procurement support reduces revenue uncertainty for plant operators and improves the bankability of projects. Under these agreements, CBG producers are assured offtake at pre-agreed prices, enabling them to secure financing more easily. The inclusion of biogas into the national fuel mix underlines the government's commitment to building a robust green gas infrastructure.

As of January 2026, India had commissioned 132 CBG plants under SATAT with cumulative output of ~920 tonnes/day, with more capacity under construction⁴⁵. Offtake has shifted from voluntary to mandatory: the National Biofuels Coordination Committee approved a phased CBG Blending Obligation (CBO) for City Gas Distribution entities — 1% in FY2025-26, 3% in FY2026-27, 4% in FY2027-28, and 5% from FY2028-29⁴⁶ expected to catalyse ~Rs 37,500 crore of investment and ~750 CBG projects by FY2028-29⁴⁷. In August 2026, the Government approved the GOBARdhan scheme (Rs 23,731 crore outlay), offering capital assistance of up to Rs 2 crore per tonne/day of installed CBG capacity plus pipeline-connectivity support, MSME credit guarantees and a district-level Ecosystem Challenge Fund⁴⁸. The Union Budget 2026-27 exempted central excise duty on the CBG portion of blended CNG, and the CBG procurement price formula was revised in May 2025 (base raised from 80% to ~85% of average price), taking effect at ~₹1,478/mmBtu from June 2025⁴⁹. Subsequently, the GOBARdhan Scheme (August 2026) introduced a government-backed administered price of ₹2,110 per Metric Million British Thermal Unit (MMBTU), equivalent to ₹105 per kilogram of CBG, ensuring stable and remunerative pricing.

9.3 Drivers and Opportunities

A. Agro-residue burning and air pollution

One of the most critical environmental challenges in India is crop residue burning, particularly in the states of Punjab and Haryana. After harvesting paddy, farmers burn the leftover stubble in their fields to quickly prepare for the next crop (usually wheat). This practice contributes heavily to air pollution, including toxic smog that blankets the NCR (National Capital Region) each winter. Agro-waste biogas projects offer a practical solution by monetizing crop residues, such as paddy straw and wheat stubble, turning them into valuable fuel (CBG). This reduces the incentive to burn and offers farmers an alternative income stream, while helping to curb severe public health and environmental impacts.

B. Rural energy access and decentralized solutions:

⁴⁴https://biourja.mnre.gov.in/public/downloadables/scheme/Revision_of_Guidelines_Biomass_Program_27_06_2025.pdf

⁴⁵<https://www.energetica-india.net/news/india-commissions-132-cbg-plants-under-satat-output-hits-920-tonnes-per-day>

⁴⁶ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2295738®=6&lang=1>

⁴⁷ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1979705®=48&lang=2>

⁴⁸ <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2295480®=48&lang=1>

⁴⁹<https://powerline.net.in/2025/08/18/harnessing-biomass-cbg-sector-gains-momentum-but-challenges-remain/>

Many rural and semi-urban regions in India still face energy access challenges, including irregular electricity and limited access to clean cooking fuel. Biogas and CBG units, especially decentralized and modular systems, can be installed near agricultural hubs or villages where Agro-waste is abundantly available. These systems provide localized energy solutions for cooking, heating, or even small-scale power generation.

C. Circular economy – converting farm waste to fuel, manure, and income:

Agro-waste biogas fits squarely within the principles of a circular economy, where waste streams are repurposed into useful resources. In this model:

Farm waste (such as sugarcane press mud, maize stalks, banana waste, and cotton residue) is converted into renewable fuel (CBG). The emerging technologies like dual fuel retro fitment (Diesel +CBG injection in the diesel CI engines) will enable farmers and sugar factories to drive their diesel driven tractors and vehicles to operate with 65% substitution of diesel marking an important initiative in circular economy.

The process also produces digestate, a by-product that serves as an organic fertilizer, enriching soil and reducing the need for synthetic chemicals.

Farmers can earn income by supplying crop residues to biogas plants or even participate as stakeholders in local projects.

This closed-loop system boosts agricultural productivity, improves soil health, and creates new rural business models, turning pollution sources into economic opportunities.

D. Government push for import substitution of CNG/LNG:

India imports a significant portion of its energy, including CNG and LNG (Liquefied Natural Gas), which impacts the country's foreign exchange reserves and energy security. CBG is chemically similar to CNG and can be used interchangeably in transport and industrial applications. By promoting domestic production of CBG from Agro-waste, the government aims to reduce reliance on imported fuels.

E. Carbon credits and ESG commitments by large firms:

As the global focus on sustainability and decarbonization intensifies, large corporations in India are under increasing pressure to meet ESG criteria. Biogas and CBG projects help companies lower their carbon footprints, qualify for carbon credits, and fulfill net-zero goals. Under the Sustainable Alternative Towards Affordable Transportation (SATAT) initiative, India plans to establish 5,000 CBG plants by 2030, targeting an annual production capacity of 15 million tonnes. This expansion is expected to yield around 15,000 tonnes of CBG daily, displacing nearly 14,000 tonnes of fossil-based natural gas each day and reducing methane-equivalent carbon emissions by approximately 20 million tonnes CO₂e per year.⁵⁰

F. Potential integration with captive gas use in industries:

Industries with continuous thermal energy or gas needs — such as distilleries, sugar mills, paper manufacturing, and food processing — can directly integrate CBG plants with their operations.

9.4 Project Activity and Early Commercial Examples

Several pilot and commercial projects have emerged, demonstrating the practical potential and growing interest in Agro-waste-based biogas and CBG production. These projects, often supported by government

⁵⁰ https://www.globalmethane.org/documents/CBG_Report_%20January%202025.pdf

initiatives and private investments, highlight how diverse feedstocks and innovative business models are being harnessed to build a sustainable bioenergy sector.

- Leading OMCs like IOCL, BPCL, and HPCL have played a significant role by issuing LOIs to numerous developers and entrepreneurs for the purchase of CBG. These LOIs serve as long-term agreements ensuring offtake of CBG, providing financial certainty and encouraging investments in setting up CBG plants. This demand assurance has helped catalyze several pilot and commercial biogas projects across the country.
- Among the emerging players driving innovation and deployment in this space are startups like GPS Renewables and EverEnviro. These companies specialize in biogas technology, project development, and providing end-to-end solutions for Agro-waste to CBG conversion. Additionally, industry associations such as the Indian Biogas Association have been instrumental in fostering collaboration, knowledge-sharing, and advocacy for the biogas sector, helping startups and existing players navigate policy frameworks and market opportunities.
- IOC and GPS Renewables' joint venture secured financing for nine 15-TPD paddy-straw-based plants across Uttar Pradesh, Chhattisgarh, Andhra Pradesh and Haryana, targeted for commissioning by 2026⁵¹. In August 2026, an IOCL-linked 200-TPD Gorakhpur plant began receiving dedicated O&M support; it uses paddy straw, press mud and cattle dung to produce CBG and organic manure⁵². These projects demonstrate the commercial use of rice residue and sugar-industry waste, while the wider 2026 pipeline includes wheat straw, maize residues, cotton stalks, fruit and vegetable waste, municipal organic waste and other agro-industrial feedstocks.
- Use cases:
 - **Sugarcane press mud to biogas:** In the sugar industry, press mud, a by-product from sugar extraction—is rich in organic material and well-suited for anaerobic digestion. Converting press mud into biogas helps sugar mills reduce waste disposal costs and generate renewable energy.
 - **Paddy straw and wheat stubble:** Common agricultural residues in northern states like Punjab, Haryana, and Uttar Pradesh, these materials are increasingly diverted from burning to biogas production, helping address air pollution while producing fuel.
 - **Cotton stalks in Maharashtra:** Cotton farming generates large volumes of stalks post-harvest, which are often underutilized. Biogas projects using cotton stalks offer farmers an additional revenue stream and reduce environmental impact.
 - **Maize cobs, banana peels, and other residues:** Various other crop residues and organic waste from horticulture and food processing are also being used as feedstock, showcasing the adaptability of biogas technology to diverse Agro-waste streams.

9.5 Challenges and Barriers

A. High capex and long payback periods:

One of the most significant hurdles is the high capital expenditure required to set up a CBG plant. Biogas projects—especially those using agricultural residues—require substantial investment in feedstock handling systems, anaerobic digesters, gas purification units, compression infrastructure, and storage. In

⁵¹ <https://www.mercomindia.com/ioc-gps-renewables-jv-secures-%E2%82%B98-36-billion-loan-biogas-plants>

⁵² <https://bioenergytimes.com/orcl-subsidiary-wins-rs-15-46-crore-iocl-om-contract-for-gorakhpur-cbg-plant/>

addition, these projects often face long payback periods, particularly when operated at small or medium scales. Without concessional finance or performance-linked incentives, this can discourage private players, especially rural entrepreneurs or farmer cooperatives, from entering the market.

B. Challenges in the aggregation, storage, and logistics of Agro-waste:

Aggregation, storage, and logistics of Agro-waste, which is often decentralized, bulky, and seasonally available. Farmers produce different types of biomasses at different times of the year, and collecting enough uniform feedstock to ensure consistent plant operation is difficult. Transportation costs for low-density materials like straw or stalks are high, and spoilage during storage is common, especially during the monsoon season.

C. Inconsistent supply chain and feedstock moisture content:

Biogas production efficiency is sensitive to the composition and quality of the feedstock. Variations in organic content, high moisture levels, or contamination can reduce gas yields or damage equipment. Maintaining a stable supply chain of clean, appropriately processed Agro-waste is crucial for plant efficiency and reliability.

D. Limited awareness and skilled manpower in rural areas:

Biogas plants require regular monitoring, process control, and maintenance. However, many rural areas lack trained technicians or operators familiar with anaerobic digestion and gas purification processes. This results in suboptimal plant performance, operational downtime, and in some cases, project failure.

E. Delay in policy implementation, land acquisition, and regulatory clearances:

Although central government schemes like SATAT and the National Bio-Energy Programme are well-conceived, bureaucratic delays at the state and district levels often impede timely execution. Acquiring land for plant setup, securing environmental permissions, and connecting to grid or transport infrastructure can be time-consuming and unpredictable.

9.6 Outlook and Conclusion

Among the various bioenergy technologies in India—such as bioethanol, biodiesel, biomass gasification, and traditional biogas—CBG from Agro-waste stands out as a particularly fast-moving segment. This is primarily due to strong and sustained government policy support, particularly the SATAT initiative and the National Bio-Energy Programme, which provide a clear roadmap, financial incentives, and market linkages for project developers.

A promising medium-term opportunity lies in strategically co-locating CBG plants with Agro-processing zones such as sugar mills, rice mills, food processing hubs, and Agri-industrial parks. These facilities generate large volumes of consistent, localized Agro-waste such as sugarcane press mud, paddy husk, maize cobs, and fruit/vegetable residues, which can serve as ready feedstock for biogas plants. Co-locating reduces transportation costs and logistical complexity, while also ensuring year-round feedstock availability. Moreover, Agro-processing clusters typically require significant thermal or electrical energy, offering a built-in demand for the biogas or biomethane produced. Such captive consumption models can improve project economics and reduce the payback period.

While progress is accelerating, achieving nationwide scale in Agro-waste-based CBG will likely require 10 to 15 years, given the sector's complex value chain and infrastructure requirements. Large-scale deployment will depend on overcoming current challenges related to capital investment, feedstock

logistics, technology standardization, and regulatory alignment across states. Crucially, the role of OMCs as anchor buyers under the SATAT scheme will remain vital. Their long-term offtake agreements provide price stability and commercial viability for CBG producers. As more CBG is blended into India's transport and industrial fuel mix, OMCs can facilitate grid integration and distribution. In parallel, carbon markets and sustainability-linked finance mechanisms—such as green bonds, ESG-linked loans, and carbon offset revenues—will become increasingly important. These tools will help unlock lower-cost capital and improve project returns, especially as corporate demand for green energy rises. As India's climate commitments intensify and energy demand grows, Agro-waste CBG is poised to become a key component of the national clean energy strategy. With the right policy, market, and financing frameworks in place, the sector is well-positioned to scale sustainably over the next decade and beyond.

10. SOLAR SLUDGE DRYING SYSTEM

10.1 Industry Overview India and Global - Historical evolution, adoption trends, and typical applications

A. Historical Evolution

Early Global Development (1980s–2000s)

Origin in Europe: The concept of using solar energy to dry sewage sludge emerged prominently in Europe during the late 1980s and early 1990s. Germany and Austria were at the forefront of this innovation, driven by increasingly stringent environmental regulations, including restrictions on landfilling untreated or minimally treated sludge.

Technology Pioneers: As technology evolved, systems became more sophisticated with the incorporation of:

- **Green House:** Transparent Green House made up of Polycarbonate sheets to entrap heat from solar radiations to facilitate evaporation of moisture from sludge.
- **Sludge tillers/ turners:** Mechanized devices that agitate the sludge periodically to improve airflow and evaporation.
- **Forced ventilation:** Fans to enhance air exchange and control humidity inside the structure.
- **Temperature regulation:** Basic sensors to monitor and optimize the drying environment.

This evolution helped overcome challenges such as uneven drying, odor management, and weather dependence.

Global Expansion and Technological Advancements (2000s–2010s)

Adoption Across Climates: By the early 2000s, successful European installations sparked interest globally. Countries in Southern Europe, North America, and eventually the Middle East and Asia began implementing solar sludge drying systems. Each region adapted the technology based on climatic conditions, sludge characteristics, and policy environments.

Hybrid Innovations: A significant innovation during this period was the development of hybrid systems, combining solar energy with auxiliary heating sources such as:

- Biogas from anaerobic digestion

- Waste heat from industrial processes
- Solar-thermal collectors

Evolution in India (2010s–Present)

Traditional Roots: India has a long tradition of using sun drying for agricultural products and organic waste, including sludge. In rural and semi-urban areas, sludge from septic tanks or small treatment units was often spread in open drying beds or fields, allowing natural evaporation. However, this method was labor-intensive, space-consuming, and often resulted in odor and hygiene issues.

-Modern Adoption

The 2010s saw a transformation in India's approach to sludge management, driven by major developments, as a result, solar sludge drying began to be integrated into FSTPs (Faecal Sludge Treatment Plants) and ETPs (Effluent Treatment Plants) across urban and peri-urban India. These systems offered a cost-effective and scalable solution for municipalities and industries seeking low-energy sludge treatment.

B. Adoption trends

Global Adoption Trends:

- Adoption is particularly strong in regions with abundant sunlight, such as Asia-Pacific (notably India and China), Africa, and South America. These regions benefit from both environmental conditions and government incentives promoting renewable energy.
- Commercial applications dominate the market due to higher volume requirements in industrial settings, but there is also rapid growth in the individual and small-scale user segments.
- Technological innovation is a key trend, including the integration of smart controls, hybrid systems (combining solar with other renewables), and improved design for efficiency and user-friendliness.
- The adoption is expanding in pharmaceuticals and textiles due to the demand for controlled, cost-effective, and environmentally friendly drying processes.
- Regulatory support, rising energy costs, and increased awareness of sustainability are significant catalysts for adoption worldwide.

Indian Adoption Trends:

- India is one of the leading markets for solar sludge drying systems, supported by rapid industrialization, and strong government policies incentivizing renewable energy adoption.
- The commercial segment, including municipal wastewater treatment and industries, is particularly active, with businesses attracted by the low operational costs and environmental benefits of solar drying.
- Government initiatives and subsidies have significantly boosted adoption, making solar dryers a cost-effective alternative to traditional drying methods in regions with high solar irradiance. The Indian government, through MoHUA, has issued advisories promoting the use of solar greenhouse dryers for safe and efficient treatment and reuse of sewage sludge. These advisories include technical designs and cost details for solar sludge dryers, aiming to improve the quality of biosolids, reduce drying time, and promote safe disposal and reuse practices. The initiative is part of a broader push to achieve

sustainable sanitation and environmental goals, including the Sustainable Development Goals (SDGs)⁵³

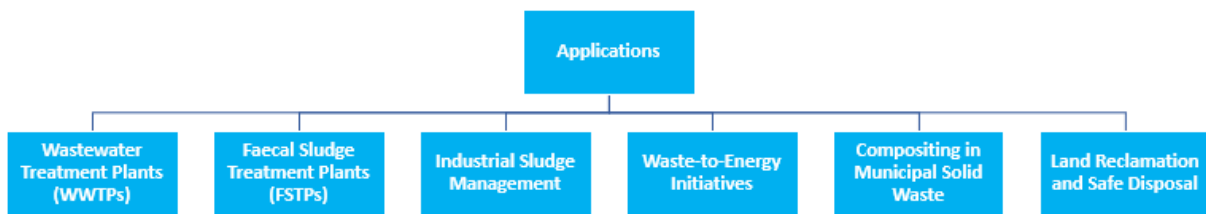
- India's solar dryer market is also characterized by scalability, accommodating both small and large-scale operations, and by increasing sophistication in commercial installations, such as automated control systems and higher hygiene standards.
- The market is expected to continue expanding rapidly, fueled by the need for efficient post-harvest management, and the push for sustainable industrial practices.

C. Applications

WWTPs (Wastewater Treatment Plants)

- Solar sludge drying is widely used to treat sludge generated from municipal and industrial wastewater treatment plants.
- The primary goals are to reduce sludge volume, lower disposal costs, and improve handling by converting wet sludge into a dry, stable product.
- The process also helps in pathogen reduction and stabilization of organic and inorganic contaminants, making the end product safer for further use or disposal.

Exhibit 10.1: Applications, Solar Sludge Dryer



Source: Frost and Sullivan Analysis

FSTPs (Faecal Sludge Treatment Plants)

- Solar drying is increasingly adopted for faecal sludge management, particularly in regions with high solar irradiance and limited access to conventional energy sources.
- The technology reduces the volume and pathogen content of faecal sludge, producing a dry material that can be safely disposed of or repurposed as fertilizer or fuel.

Industrial Sludge Management

- Solar drying systems are used for chemical and industrial sludge, including those from pharmaceuticals, and other manufacturing sectors.
- The process is especially valuable where contaminants (e.g., heavy metals, antibiotics) make traditional disposal methods problematic, and where energy efficiency is a priority.

Waste-to-Energy Initiatives

⁵³<https://www.newindianexpress.com/nation/2025/Jan/27/government-suggests-ways-to-treat-reuse-sewage-sludge>

- Dried sludge with high calorific value (up to 9–12 MJ/kg) can serve as a renewable fuel source, supporting local energy production and reducing reliance on fossil fuels. This energy recovery is gaining traction as energy prices rise and the demand for CO₂-neutral fuels increases.

Compositing in Municipal Solid Waste Plant

- Sludge generated from the treatment of organic municipal solid waste can be processed into high-quality compost, contributing to sustainable soil management, reducing the burden on landfills and increasing in circular economy practices.

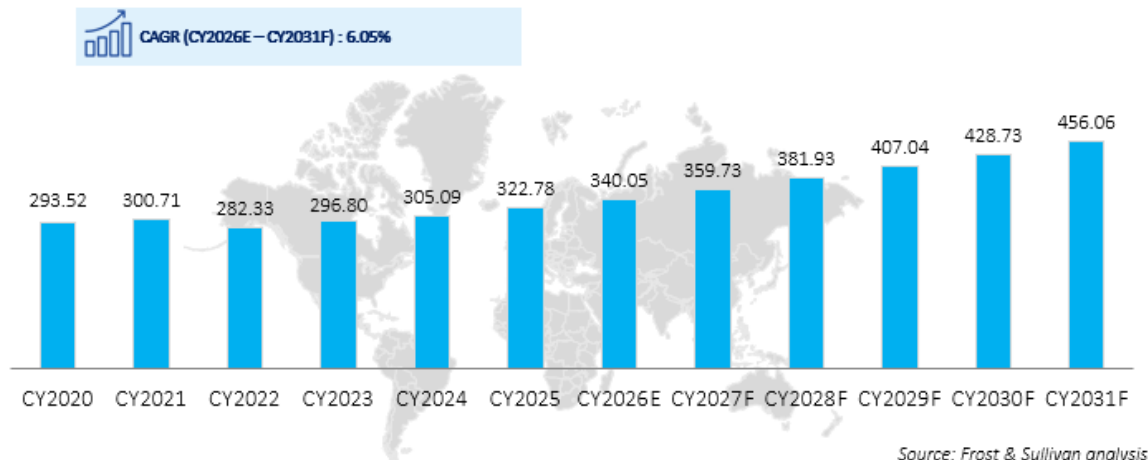
Land Reclamation and Safe Disposal

- In cases where reuse is not feasible, solar-dried sludge is easier and safer to transport and dispose of in landfills or for land reclamation projects due to its reduced volume and stabilized nature.

10.2 Market Size India and Global - Current and projected market size

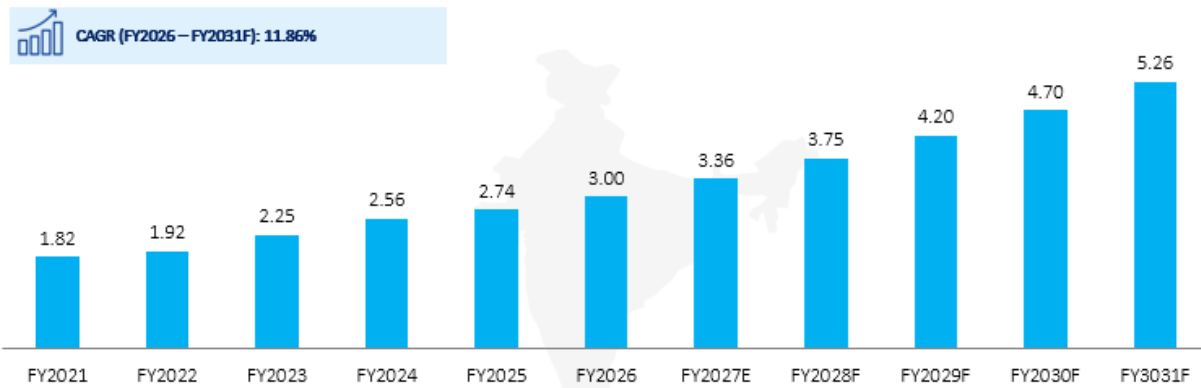
The global Solar Sludge Dryer market was valued at USD 293.52 Mn in CY2020 and grew to USD 305.09 million in CY2024. It is estimated to reach USD 340.05 Mn in CY2026E and is forecasted to grow to USD 456.06 Mn by CY2031F, registering a CAGR of 6.05% from CY2026E to CY2031F. This growth is driven by increasing environmental awareness, regulatory push for sustainable waste treatment, and rising adoption of energy-efficient drying technologies. Emerging markets, particularly in Asia-Pacific, are expected to contribute significantly to future demand due to infrastructure development and industrial expansion.

Exhibit 10.2: Solar Sludge Dryer Market (In USD Million), Global, CY2020 – CY2031F



The Indian Solar Sludge Dryer market was valued at INR 1.82 Bn in FY2021 and grew to INR 2.74 Bn by FY2025. It reached INR 3.00 Bn in FY2026 and is forecasted to grow to INR 5.26 Bn by FY2031F, registering a strong CAGR of 11.86% between FY2026 and FY2031F. This growth is fueled by rising environmental concerns, government initiatives promoting sustainable waste management, and increasing adoption of energy-efficient drying solutions by municipalities and industries. With rapid urbanisation and stricter regulations on sludge disposal, solar sludge dryers are emerging as a cost-effective and eco-friendly solution across India.

Exhibit 10.3: Solar Sludge Dryer Market (In INR Billion), India, FY2021 – FY2031F



Source: Frost and Sullivan Analysis

10.3 Future growth prospects - Regulatory support and environmental drivers

A. Regulatory Support

Global Regulatory Landscape: Regulatory frameworks worldwide are increasingly supporting sustainable wastewater and sludge management, creating a favorable environment for solar sludge drying systems. In the European Union, landmark regulations like the Urban Waste Water Treatment Directive (91/271/EEC) mandate stringent treatment and safe disposal of sewage sludge. Additionally, the EU Circular Economy Action Plan encourages resource recovery, including the reuse of treated sludge as soil conditioner or fuel—applications well-suited to solar-dried sludge.

In the United States, the EPA (Environmental Protection Agency) regulates biosolids under 40 CFR Part 503, encouraging environmentally sound practices such as land application, which require sludge to meet specific pathogen and solids content standards—achievable through solar drying.

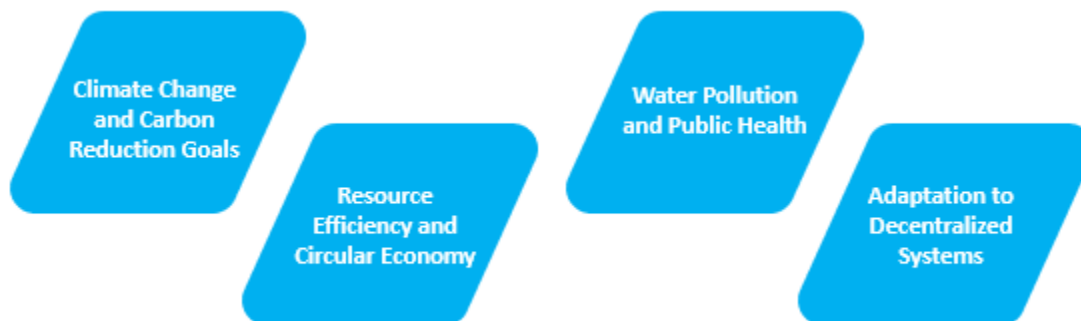
In MENA and Southeast Asia, water reuse and zero-waste policies are pushing for decentralized sludge treatment options. National governments increasingly favor low-energy, low-emission technologies that align with climate goals and water resource management.

Regulatory Drivers in India: In India, solar sludge drying is being promoted through a combination of environmental regulations and sanitation missions:

- **Swachh Bharat Abhiyan (Urban & Rural):** Emphasizes safe FSSM (Faecal Sludge and Septage management), especially in non-sewered areas.
- **NFSSM (National Faecal Sludge and Septage Management) Policy:** Encourages decentralized sludge treatment, where solar drying fits naturally.
- **ZLD (Zero Liquid Discharge) norms:** Mandated by the CPCB for industries like textiles, and chemicals, making sludge drying essential.
- **State-level Urban Development Policies:** Encourage cost-effective sludge treatment in small and medium towns through PPP models and infrastructure subsidies.

B. Environmental Drivers

Climate Change and Carbon Reduction Goals: One of the primary environmental drivers is the need to reduce GHG (Greenhouse Gas) emissions. Traditional sludge drying methods—such as thermal dryers and

Exhibit 10.4: Environmental Drivers, Solar Sludge Dryer

Source: Frost & Sullivan analysis

incineration—are energy-intensive and contribute significantly to carbon emissions. In contrast, solar sludge drying systems utilize renewable solar energy, significantly lowering operational carbon footprints. This aligns with national and international climate action plans and net-zero targets, particularly under the Paris Agreement and various NDCs (Nationally Determined Contributions).

Resource Efficiency and Circular Economy: Solar drying supports circular economy principles by converting wet sludge into a dry, stable product suitable for reuse. Dried sludge can be:

- Used as a soil conditioner in agriculture (kindly give potential market size (India or Globally) for use of dried sludge as soil conditioner)
- Co-processed in cement kilns or waste-to-energy plants (kindly give Potential market size (India or Globally) for use in cement industry)
- Safely landfilled with reduced leachate generation

This resource recovery potential reduces dependence on chemical fertilizers, offsets fossil fuel use, and diverts waste from landfills.

Water Pollution and Public Health: Untreated or improperly disposed sludge poses serious risks to groundwater and surface water quality. Even under conservative estimates, India's Sewage Treatment Plants (STPs) are currently generating approximately 104,210 tonnes of sewage sludge per day. This volume is projected to rise significantly to around 186,347 tonnes per day if the country achieves 50% wastewater treatment coverage in the near future⁵⁴. Solar drying reduces sludge volume and pathogens, supporting safe handling and disposal. This is especially important in developing countries, where wastewater infrastructure is often inadequate.

Adaptation to Decentralized Systems: As cities adopt decentralized wastewater treatment approaches, particularly in non-sewered or peri-urban areas, solar drying emerges as an ideal low-cost, low-maintenance solution with minimal environmental impact.

⁵⁴<https://www.indiawaterportal.org/health-and-sanitation/sanitation/sludge-food-food-thought#:~:text=This%20figure%20is%20expected%20to,biggest%20threats%20to%20the%20environment>

10.4 Key players/technologies - Leading companies, their offerings and Technology

Exhibit 10.5: Key Players and Technology

COMPANY NAME	HEAD QUARTERS	YEAR FOUND	TECHNOLOGY
Huber SE	Berching, Germany	1999	HUBER Sludge Turner SOLSTICE Sludge Drying and Sludge Disinfection and Reuse
Thermo-System	Esslingen, Germany	1997	Automation and Control, Sludge Manager , Sludge Tiller
Redco	Istanbul, Türkiye	2012	Solar Drying, BOBO sludge drying robot, PLC, Moving steel bridge and an adjustable rotary drum
Arges	Ankara, Turkey	1985	Solar sludge drying system, and sludge thickener
Solartiger	Gurten, Austria	2004	Hexagonal Rotating Drum, Air Scrubber and Biological filter. Biological and chemical processes
IST-Anlagenbau GmbH	Neuenburg am Rhein Germany	1994	Turning and Conveying Machine, Technology of odor elimination (Zerodor)
Arvind Envisol Ltd	Ahmedabad, India	2008	Traveling bridge mixer, Advanced low-temperature drying and dehumidification technology, advanced automatic control technology and centralized monitoring of equipment.
Thermarex	Surat, India	2020	Electric Mole, speed-controlled wall fans, central PLC equipped with ClimaControl software.
ATR Solar	Madurai, India	2002	Solar Power Tower and Solar FSTP drying, and solar green house dryers,
Aadhi Solar	Tirupur, India	2009	Air heater, Electric heater etc.

VALIANT

Entech Private Ltd. Surat, India

2023

Air scrubber, A unique air-streaming control system, combined with precision sensors⁵⁵.

IST-Anlagenbau GmbH, subsidiary of SFC Environmental Technologies Limited, is well recognised player in Solar Sludge Dryer market with more than 30 years of industry experience.

11. COMPETITIVE BENCHMARKING

Leading players in the waste management market are crucial to India's sustainability goals. Increased urbanization and industrial activities have led to higher wastewater generation, making its treatment and reuse vital for addressing water scarcity and preventing pollution. Companies specializing in wastewater treatment are advancing sustainable practices and addressing environmental challenges, paving the way for a more sustainable future.

11.1 Operational Benchmarking

A. Profile 1: SFC Environmental Technologies Pvt. Ltd.

Company Overview (Origin and Incorporation year must be included)	Established in 2005 and based in Navi Mumbai, India, SFC Environmental Technologies Ltd. is an environmental technology company offering technologies and engineering solutions in the field of wastewater treatment ("WWT") and solid waste treatment ("SWT")	
Key Technologies	- C-Tech - OREX	
Solutions Offerings	- Waste water treatment - Wastewater recycling & reuse	- Solid waste treatment - Agro waste treatment
Key Clients	- Enviro Infra Engineers Ltd. - Vishvaraj Environment Ltd. - EMS Ltd. - GVPR Engineers Ltd. - Gharpure Engineering & Constructions Pvt. Ltd.	- Ramky Infrastructures - Toshiba Water Solutions Pvt. Ltd. - HNB Engineers Pvt. Ltd. - Goa Waste Municipal Corporation

B. Profile 2: Thermax

Company Overview (Origin and Incorporation year must be included)	Founded in 1966 and headquartered in Pune, India, Thermax is an engineering company providing sustainable solutions in the areas of energy and environment. The company's reach spans over 90 countries, serving industrial and commercial clients with energy-efficient and eco-friendly operations.
--	---

⁵⁵ <https://www.valiantentech.com/solar-sludge-drying/>

Key Technologies	• Eco-friendly power • Water recycling • Waste heat energy	• Cooling and heating solutions / waste-heat utilisation • Emission control
Product Offerings	• Waste Heat Recovery • Waste-to-Energy and Biomass Solutions • Water and Waste Solutions	• Air Pollution Control Solutions • Steam Engineering and Process Heat Solutions • Cooling and Heating Solutions
Key Clients	• GAIL India • Daimler • Tata Communications	• ONGC Mangalore Refinery • JK Cement Works • Tata Sponge Iron

C. Profile 3: Praj Industries

Company Overview (Origin and Incorporation year must be included)	• Established and incorporated in 1983 and headquartered in Pune, India, Praj Industries is a global biotechnology and engineering company providing sustainable solutions across bioenergy, high-purity water, critical process equipment, breweries and industrial wastewater treatment. The company has 1,000+ customer references across 100+ countries and all six continents.	
Key Technologies	• EcoCool™ • MAXIMOL™ • PROFIT™ (Process Optimized Flexible Integrated Incineration Technology)	• RenGas™ • efinity™ • Celluniti™ • BIOSYRUP™
Product Offerings	• Bio Energy- 1G Ethanol, Bio Ethanol and Compressed Biogas • Praj Hipurity Systems - High Purity Water Solutions • Critical Process Equipment & Modular Systems	• Industrial Wastewater Treatment, ZLD & Resource Recovery • Solvent recovery system • VAS (value-added services)
Key Clients	• Incauca • Addax Petroleum • Bajaj Hindustan Ltd • Globus Spirits	• British Sugars • Seagrams • Vivergo Fuels • ThaiBev

D. Profile 4: Ion Exchange

Company Overview (Origin and Incorporation year must be included)	Established and incorporated on 6 March 1964, originally as a subsidiary of Permutit Company of the UK, and headquartered in Mumbai, India, Ion Exchange (India) Limited is a water and environment management company providing integrated solutions across water, wastewater, solid waste management and waste-to-energy. The company became wholly Indian-owned in 1985 and today serves industrial, institutional, municipal, community and household customers globally.	
Key Technologies	- Water and wastewater treatment and recycling - Membrane separation and purification - Ion exchange resins and water purification technologies - Zero Liquid Discharge (ZLD) and resource recovery - Solid waste management and waste-to-energy	
Product Offerings	- Ion Exchange Resins - Membranes – RO, UF, NF and MBR - Speciality Chemicals - Instruments & Automation	- Zero Liquid Discharge (ZLD) Systems - Industrial Wastewater Treatment and Recycling Systems - Sewage Treatment Plants (STPs)
Key Clients	- Emirates Steel - SAIL - Unilever	- Rockwool - Dabur - Ranbaxy

E. Profile 5: Xylem Water Solutions

Company Overview (Origin and Incorporation year must be included)	Established in 2011 following the spin-off of the water-related business of ITT Corporation, Xylem Water Solutions India Private Limited is part of Xylem Inc., a global water technology company. Xylem India has its technology centre and manufacturing facility in Vadodara, Gujarat, with sales offices in Bengaluru, Delhi, Mumbai and Pune. The company provides solutions across the water cycle, including water and wastewater transport, treatment, testing, monitoring, reuse and efficient water management.	
Key Technologies	- Water and Wastewater Treatment & Reuse Technologies - Energy-efficient Pumping and Water Transport Solutions - Digital Water, Monitoring & Control Technologies - Filtration, Disinfection and Biological Treatment Technologies	
Product Offerings	- Analysis, Monitoring & Control Instruments and Equipment - Communications & Data Transfer	- Filtration & Disinfection Systems - Mixing & Mixing Equipment

	- Water & Wastewater Treatment Systems - Pumps & Packaged Pump Systems	- Water Reuse & Recycling Solutions - Dewatering Solutions
Key Clients	- AC Fire pump - Bell & Gossett - Flojet - Flygt	- Godwin - Jabsco - Leopold - Lowara

F. Profile 6: Alfa Laval

Company Overview (Origin and Incorporation year must be included)	Founded in 1883 and headquartered in Lund, Sweden, Alfa Laval is a global provider of products and solutions in heat transfer, separation and fluid handling. The company serves customers across more than 100 countries and provides solutions for industries including energy, food and beverage, marine, pharmaceuticals and water and wastewater treatment. Its technologies are used to heat, cool, separate, transport and recover resources from industrial processes.	
Key Technologies	- Heat Transfer - Separation - Fluid Handling - Membrane Filtration and Water Reuse - Sludge Treatment, Dewatering and Resource Recovery	
Product Offerings	- Automatic back-flushing filters - Ballast Water Treatment Systems - Boilers - Brewery solutions - Bulk solutions	- Freshwater generation - Heat exchangers. - Heaters - Membranes - Pump control system.
Key Clients	- Arkema - Rhodia Brasil - BASF	- Lanxess - Dow Wolff Cellulosics - Balaji Amines

Exhibit 11.1: Treatment Installations and Treatment Capacity Facilitated by SFC's / Respective Peer's Technology (on Cumulative Basis)

Operational Indicator	Years	SFC Environ- mental	Thermax	Praj Industries	Ion Exchange	Xylem India	Alfa Laval
Number of treatment installations (on cumulative basis) (in numbers)*	FY 2024	577	NA	NA	NA	NA	NA
	FY 2025	639	NA	NA	NA	NA	NA
	FY 2026	705	NA	NA	NA	NA	NA
	Q1FY 26	654	NA	NA	NA	NA	NA
	Q1FY 27	724	NA	NA	NA	NA	NA
Treatment capacity in million liters per day (on	FY 2024	13,906.98	NA	NA	NA	NA	NA
	FY 2025	15,209.45	NA	NA	NA	NA	NA

cumulative basis)	FY 2026	17,144.01	NA	NA	NA	NA	NA
facilitated by SFC's /	Q1FY 26	15,381.24	NA	NA	NA	NA	NA
respective peer's	Q1FY 27	17,464.61	NA	NA	NA	NA	NA
Technology (in MLD)**							

* Number of treatment installations (on cumulative basis) (in numbers) represents the total number of wastewater treatment plant installations, on a cumulative basis, facilitated by SFC's / respective peers' technology

** Treatment capacity in million liters per day (on cumulative basis) facilitated by SFC's / respective peers' Technology (in MLD) represents the total MLD of treatment capacity for wastewater treatment plants on a cumulative basis facilitated by SFC's / respective peers' technology.

11.2 Financial benchmarking

Exhibit 11.2: Revenue from the operation, EBITDA, EBITDA Margin, PAT of key competitors, value in INR Million, FY2024 – FY2026, Q1FY2026 & Q1FY2027

Financial Indicators	Years	SFC Environmental	Thermax	Praj Industries	Ion Exchange	Xylem India	Alfa Laval
Revenue from Operations INR Million	FY2024	6,574.95	93,234.60	34,662.78	23,478.49	5,924.35	26,296.96
	FY2025	6,978.58	1,03,886.90	32,280.42	27,371.10	8,762.66	21,886.36
	FY2026	8,036.29	1,06,941.50	31,678.83	29,148.41	NA	NA
	Q1FY26	677.93	21,575.30	6,402.02	5,831.90	NA	NA
	Q1FY27	1,339.44	23,027.30	7,158.21	7,004.60	NA	NA
EBITDA in INR Million	FY2024	1,932.53	7,973.90	3,878.06	2,719.37	489.34	4,663.08
	FY2025	2,074.79	9,077.80	3,248.32	2,939.00	950.49	3,720.77
	FY2026	2,358.12	10,262.60	1,518.00	2,102.00	NA	NA
	Q1FY26	50.31	2,251.00	314.00	627.00	NA	NA
	Q1FY27	98.56	686.20	300.00	318.00	NA	NA
EBITDA Margin in %	FY2024	29.39%	8.55%	11.19%	11.58%	8.26%	17.73%
	FY2025	29.73%	8.74%	10.06%	10.74%	10.85%	17.00%
	FY2026	29.34%	9.60%	4.79%	7.21%	NA	NA
	Q1FY26	7.42%	10.43%	4.90%	10.75%	NA	NA
	Q1FY27	7.36%	2.98%	4.19%	4.54%	NA	NA
PAT in INR Million	FY2024	1,441.73	6,431.90	2,833.91	1,953.52	213.24	3,387.26
	FY2025	1,520.08	6,267.00	2,189.33	2,083.00	463.00	2,808.96
	FY2026	1,602.13	7,202.60	238.47	1,432.00	NA	NA
	Q1FY26	-2.81	1,514.50	53.40	484.40	NA	NA
	Q1FY27	14.84	217.90	116.06	30.60	NA	NA

Source: Annual Reports of Companies published in RoC, MCA; Frost & Sullivan Analysis

Revenue from Operations Y-O-Y growth is calculated as (Current year revenue – previous year revenue)/previous year revenue; EBITDA is calculated as profit before tax, depreciation and amortisation expense and finance costs less other income as per the Restated Consolidated Financial Information. EBITDA Margin is calculated as EBITDA/Revenue from Operations.

Exhibit 11.3: PAT, PAT Margin, RoCE, RoE, Net Debt of key competitors, India, FY2024 – FY2026, Q1FY2026 & Q1FY2027

Financial Indicators	Years	SFC Environmental	Thermax	Praj Industries	Ion Exchange	Xylem India	Alfa Laval
PAT Margin in %	FY2024	21.93%	6.90%	8.18%	8.32%	3.60%	12.88%
	FY2025	21.78%	6.00%	6.78%	7.61%	5.28%	12.83%
	FY2026	19.94%	6.70%	0.75%	4.91%	NA	NA
	Q1FY26	-0.41%	7.00%	0.83%	8.30%	NA	NA
	Q1FY27	1.11%	0.90%	1.62%	0.44%	NA	NA
RoCE in %	FY2024	28.56%	17.00%	31.69%	26.90%	11.74%	52.31%
	FY2025	29.29%	16.00%	24.41%	22.00%	21.38%	38.47%
	FY2026	22.21%	15.00%	5.59%	14.30%	NA	NA
	Q1FY26	0.27%	NA	NA	NA	NA	NA
	Q1FY27	0.72%	NA	NA	NA	NA	NA
RoE in %	FY2024	29.80%	15.50%	24.09%	21.06%	6.78%	40.00%
	FY2025	24.84%	13.40%	16.48%	18.70%	14.62%	28.38%
	FY2026	21.55%	13.70%	1.77%	11.20%	NA	NA
	Q1FY26	-0.04%	NA	NA	NA	NA	NA
	Q1FY27	0.18%	NA	NA	NA	NA	NA
Net Debt in INR million	FY2024	-494.49	3,015.00	NA	-4,503.16	-1,511.99	-1,609.13
	FY2025	-523.45	5,637.40	NA	-1,627.80	-1,901.98	-1,801.95
	FY2026	388.16	11,624.60	NA	-442.66	NA	NA
	Q1FY26	-646.71	NA	NA	NA	NA	NA
	Q1FY27	644.54	NA	NA	NA	NA	NA

Source: Annual Reports of Companies published in RoC, MCA; Frost & Sullivan Analysis

PAT Margin is calculated as PAT/Revenue from Operations. RoCE is calculated as a percentage of earnings before interest and taxes (EBIT) / total equity plus total borrowings plus deferred tax liabilities minus deferred tax assets as per the Restated Consolidated Financial Information. EBIT is calculated as profit before tax and share of profit of joint ventures / associate plus finance costs. RoE is calculated as total profit after tax for the year divided by average total equity. Net Debt is calculated as (Long-Term borrowings + Short-Term borrowings) – (Cash & Cash Equivalents + Bank Balance Other than Cash and Cash Equivalents).

Exhibit 11.4: Net worth, Debt to Equity, Fixed Asset Turnover Ratio, Cash Conversion Cycle, Total Order Book, FY2024 – FY2026, Q1FY2026 & Q1FY2027

Financial Indicators	Years	SFC Environmental	Thermax	Praj Industries	Ion Exchange	Xylem India	Alfa Laval
Networth in INR million	FY2024	5,342.96	44,398.00	12,744.70	10,179.07	2,937.97	9,390.15
	FY2025	6,486.82	49,370.00	13,817.67	12,078.80	3,395.21	10,403.64
	FY2026	8,041.73	55,499.70	13,091.26	13,390.25	NA	NA
	Q1FY26	6,475.14	NA	NA	NA	NA	NA
	Q1FY27	8,054.88	NA	NA	NA	NA	NA
Debt to Equity	FY2024	-0.09	0.07	-0.03	-0.40	-0.51	-0.17
	FY2025	-0.08	0.11	-0.13	-0.10	-0.56	-0.17
	FY2026	0.05	0.21	-0.16	0.10	NA	NA
	Q1FY26	-0.10	NA	NA	NA	NA	NA
	Q1FY27	0.08	NA	NA	NA	NA	NA
Fixed Asset Turnover Ratio	FY2024	13.25	3.80	10.77	9.94	4.61	10.39
	FY2025	10.85	3.05	7.56	8.69	14.67	6.86
	FY2026	12.07	2.37	11.30	5.75	NA	NA
	Q1FY26	0.99	NA	NA	NA	NA	NA
	Q1FY27	2.08	NA	NA	NA	NA	NA
Cash Conversion Cycle in days	FY2024	156	NA	NA	NA	105	75
	FY2025	232	NA	NA	NA	252	103
	FY2026	242	NA	NA	NA	NA	NA
	Q1FY26	636	NA	NA	NA	NA	NA
	Q1FY27	411	NA	NA	NA	NA	NA
Total Order Book in INR million	FY2024	7,852.34	1,01,110.00	38,550.00	35,460.00	NA	NA
	FY2025	5,603.86	1,06,930.00	42,930.00	27,620.30	NA	NA
	FY2026	15,745.21	1,36,040.00	43,050.00	26,433.00	NA	NA
	Q1FY26	10,736.44	1,13,760.00	44,480.00	26,640.00	NA	NA
	Q1FY27	15,700.65	1,40,450.00	45,890.00	24,730.00	NA	NA

Source: Annual Reports of Companies published in RoC, MCA; Frost & Sullivan Analysis

Net worth is calculated as total equity less non-controlling interest; Debt to Equity ratio is calculated as Net Debt/Total Equity; Fixed asset turnover ratio is calculated as revenue from operations divided by average property, plant and equipment; Cash conversion cycle is calculated as sum of inventory days and trade receivable days, subtracted by trade payable days.

ANNEXURE

Exhibit: Inventory of Sewage Treatment plants in the country, by States, FY2021⁵⁶

SR.NO	STATE	SEWAGE GENERATION (IN MLD)	NUMBER OF OPERATIONAL STPs*	INSTALLED TREATMENT CAPACITY (IN MLD)
1	Andaman and Nicobar Island	23	-	0
2	Andhra Pradesh	2,882	37	833
3	Arunachal Pradesh	62	-	0
4	Assam	809	-	0
5	Bihar	2,276	0	10
6	Chandigarh	188	6	293
7	Chhattisgarh	1,203	3	73
8	Dadra & Nagar Haveli	67	3	24
9	Goa	176	9	66
10	Gujarat	5,013	68	3,378
11	Haryana	1,816	155	1,880
12	Himachal Pradesh	116	59	136
13	Jammu & Kashmir	665	12	218
14	Jharkhand	1,510	2	22
15	Karnataka	4,458	100	2,712
16	Kerala	4,256	5	120
17	Lakshadweep	13	-	0
18	Madhya Pradesh	3,646	45	1,839
19	Maharashtra	9,107	130	6,890
20	Manipur	168	0	0
21	Meghalaya	112	0	0
22	Mizoram	103	0	10
23	Nagaland	135	0	0
24	NCT of Delhi	3,330	35	2,896
25	Orissa	1,282	4	378
26	Pondicherry	161	3	56
27	Punjab	1,889	96	1,781
28	Rajasthan	3,185	56	1,086
29	Sikkim	52	6	20
30	Tamil Nadu	6,421	63	1,492
31	Telangana	2,660	27	901
32	Tripura	237	1	8
33	Uttar Pradesh	8,263	92	3,374
34	Uttarakhand	627	52	448
35	West Bengal	5,457	24	897
Total		72,368	1,093	31,841

Note: This is the most recent, published, government and credible source available published in March 2021

**Includes functional STPs only*

⁵⁶

<https://cpcb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMTiYOF8xNjE1MTk2MzlyX21lZGlhcGhvdG85NTY0LnBkZg==>

Exhibit: Technology-wise Break-up of STPs in various States, by installed capacity in MLD, FY2021⁵⁷

STATE	TECHNOLOGY								
	ASP	EA	FAB	MBBR	OP	SBR	UASB	WSP	OTHERS
Andhra Pradesh	321	20	3	39	57	17	130	31	235
Bihar	150	0	0	0	0	327	0	0	154
Chandigarh	5	0	0	136	0	107	45	0	0
Chhattisgarh	73	0	0	0	0	0	0	0	0
Dadra Nagar Haveli	0	0	0	0	0	24	0	0	0
Goa	0	0	0	0	0	103	0	0	1
Gujarat	1,254	60	0	175	46	1,285	491	0	67
Haryana	297	0	0	447	14	754	368	0	0
Himachal Pradesh	155	0	0	0	0	0	0	0	0
Jammu & Kashmir	9	0	3	3	0	10	1	0	0
Jharkhand	0	0	0	0	0	1	0	0	11
Karnataka	667	166	20	35	85	1,079	63	61	536
Kerala	112	0	0	0	0	0	0	0	8
Madhya Pradesh	120	0	0	0	0	358	0	178	1,268
Maharashtra	930	146	1	826	36	2,452	240	0	5,188
Mizoram	0	0	0	0	0	10	0	0	0
NCT Delhi	2,575	69	3	0	0	245	0	0	4
Odisha	100	0	0	0	0	183	0	35	60
Puducherry	0	0	0	0	0	20	36	0	3
Punjab	207	0	13	165	0	838	501	54	3
Rajasthan	445	0	0	10	30	428	33	137	112
Sikkim	0	0	20	2	0	2	0	0	6
Telangana	85	13	0	133	24	105	541	0	0
Tamil Nadu	1,011	0	6	0	6	319	9	112	29
Tripura	0	0	0	0	0	8	0	0	0
Uttar Pradesh	681	0	122	14	101	1,176	1,095	27	158
Uttarakhand	0	0	0	20	0	351	1	0	143
West Bengal	191	0	41	0	63	392	0	160	355
Total	9,492	474	244	2,034	462	10,647	3,563	795	8,957

Note: This is the most recent, published, government and credible source available published in March 2021

⁵⁷ Source:

<https://cpwb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMTlyOF8xNjE1MTk2MzlyX21lZGlhcGhvdG85NTY0LnBkZg==>

Exhibit: Technology-wise Break-up of STPs in various States, by operational number of STPs, FY2021

STATE	TECHNOLOGY								
	ASP	EA	FAB	MBBR	OP	SBR	UASB	WSP	OTHERS
Andhra Pradesh	7	2	2	10	2	2	5	3	4
Chandigarh	1	0	0	1	0	3	1	0	0
Chhattisgarh	3	0	0	0	0	0	0	0	0
Dadra Nagar Haveli	0	0	0	0	0	3	0	0	0
Goa	0	0	0	0	0	5	0	0	4
Gujarat	14	3	0	5	8	24	7	0	8
Haryana	7	0	0	83	4	49	10	0	0
Himachal Pradesh	59	0	0	0	0	0	0	0	0
Jammu & Kashmir	4	0	3	1	0	4	0	0	0
Jharkhand	0	0	0	0	0	1	0	0	1
Karnataka	12	9	1	1	10	24	2	8	30
Kerala	2	0	0	0	0	0	0	0	1
Madhya Pradesh	4	0	0	0	0	6	0	7	28
Maharashtra	18	2	1	24	2	52	6	0	25
NCT Delhi	25	4	1	0	0	4	0	0	1
Odisha	0	0	0	0	0	0	0	2	2
Puducherry	0	0	0	0	0	1	2	0	0
Punjab	4	0	1	24	0	42	7	16	1
Rajasthan	13	0		2	2	22	4	9	5
Sikkim	0	0	3	0	0	0	0	0	2
Telangana	10	3	0	8	0	3	3	0	0
Tamil Nadu	49	0	1	0	1	5	1	2	4
Tripura	0	0	0	0	0	1	0	0	0
Uttar Pradesh	19	0	3	3	11	31	24	2	6
Uttarakhand	0	0	0	6	0	32	1	0	13
West Bengal	8	0	2	0	6	1	0	2	5
Total	259	23	18	168	46	315	73	51	140

Note: This is the most recent, published, government and credible source available published in March 2021

Legend: ASP- Activated Sludge Process, EA- Electrocoagulation, FAB - Forward Activated Sludge, MBBR - Moving Bed Biofilm Reactor, OP - Oxidation Pond, SBR - Sequencing Batch Reactor, UASB - Upflow Anaerobic Sludge Blanket, WSP - Waste Stabilization Pond