Crisil
Intelligence

Assessment of the water and wastewater sector in India

September 2025

by S&P Global

Crisil Intelligence

Contents

1. Macroeconomic overview

India's macroeconomic indicators

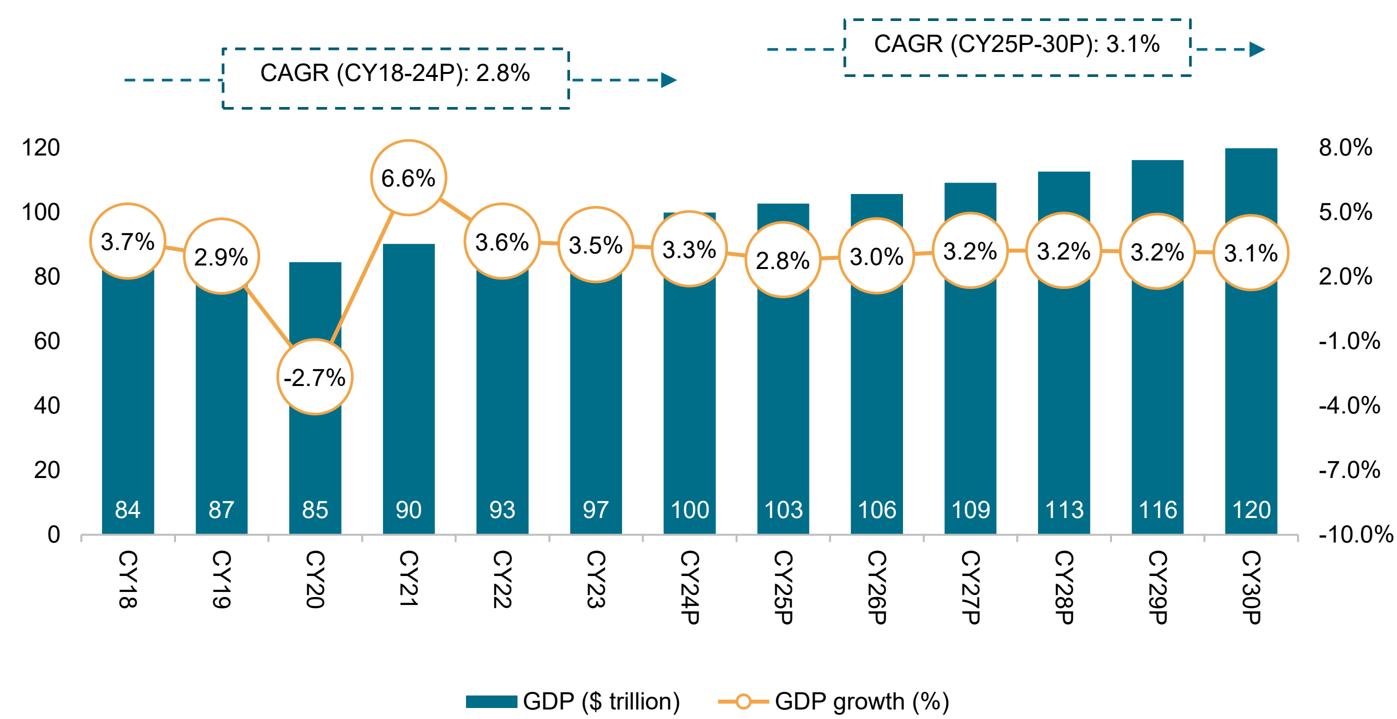
Global GDP is estimated to grow at 3.3% in CY 2025 and CY 2026 amid moderating inflation and steady growth in key economies

In its January 2025 update, the International Monetary Fund (IMF) has estimated global gross domestic product (GDP) growth at 3.2% in CY2024 and CY2025, respectively. Growth is being driven majorly by emerging and developing economies, with regional differences on account of global economic tensions and extreme weather events.

With disinflation and steady growth, the likelihood of a hard landing has receded, and risks to global growth are broadly balanced. Inflation has been falling faster than expected amid favourable global supply developments, with advanced economies leading the change. However, service inflation is holding up progress on disinflation. On the upside, faster disinflation could lead to further easing of financial conditions. That said, on the downside, commodity price spikes from geopolitical shocks or more persistent underlying inflation could prolong tight monetary conditions.

In the long term, global GDP is projected to expand at ~3.1% compound annual growth rate (CAGR) between CY2025 and CY2030 and reach $120 trillion in CY2030.

Global GDP trend and outlook (CY18-CY30P, $ trillion)



Note: E: Estimated, P: Projection
Source: IMF economic database, CRISIL Intelligence

India's GDP is expected to grow 6.8% and 6.7% in fiscals 2025 and 2026, respectively

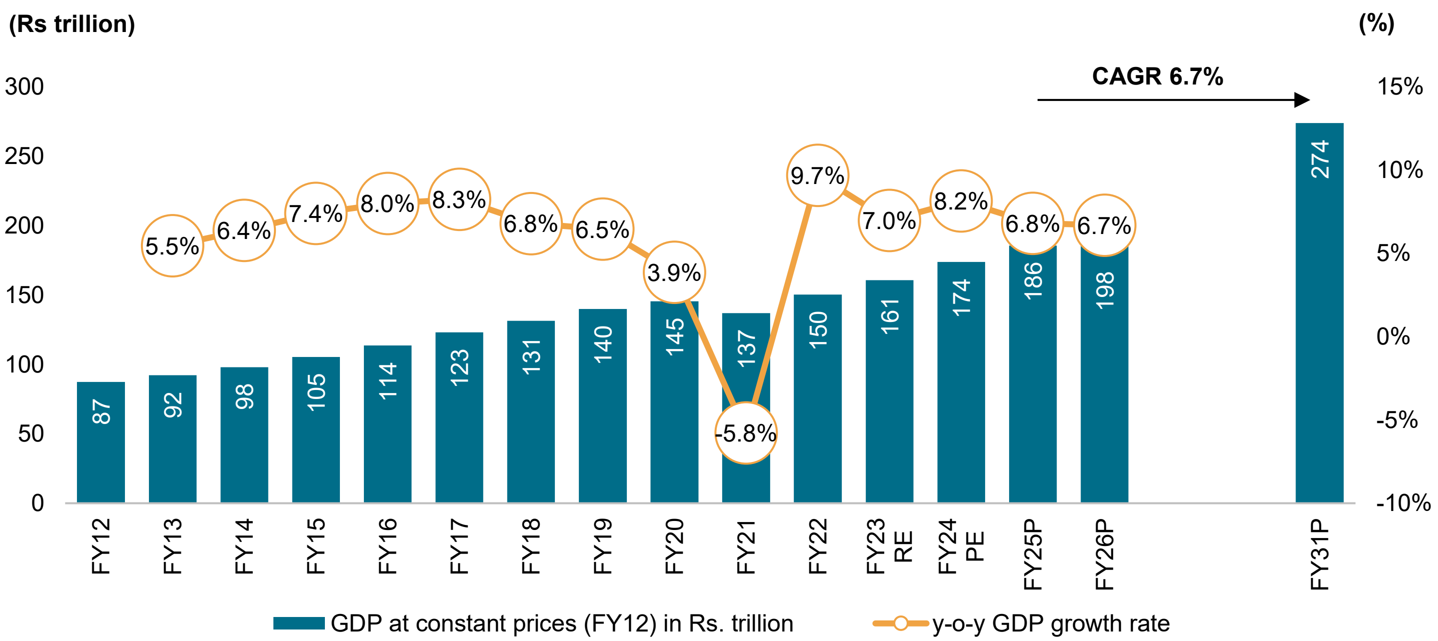
India's GDP clocked a CAGR of 5.9% between fiscals 2012 and 2024 to Rs 173.8 trillion. A large part of the lower growth rate was because of challenges heaped by the Covid-19 pandemic in fiscals 2020 and 2021. In fiscal 2022, the economy recovered with the pandemic abating and subsequent easing of restrictions and resumption in economic activity.

GDP rose 7% in fiscal 2023 on continued strong growth momentum, propelled by investments and private consumption. The share of investments in GDP was at 33.3% and that of private consumption was at 58.0%.

In its provisional annual GDP estimates for fiscal 2024, the National Statistics Office estimated India's real GDP growth at 8.2%, higher than its Second Advanced Estimate of 7.6%. Even as the agricultural economy slowed sharply following a weak monsoon, the surge in the non-agricultural economy has more than made up for it. The government's investment push, along with easing input cost pressures for industry, has also played a major role in shoring up growth. Services have been slowing owing to waning pent-up demand (post the pandemic). However, financial, real estate and professional services have powered ahead on the back of robust growth in banking and real estate.

In fiscal 2024, growth has primarily been fuelled by fixed investments, expanding a robust 9%, while private consumption growth lagged at 4%, trailing overall GDP growth. On the supply side, the manufacturing sector grew the most substantially, at ~9.9%, while the agriculture exhibited a more modest growth rate of 1.4%. These trends underscore the varied performance across sectors, highlighting the nuanced dynamics shaping India's economic landscape in fiscal 2024. Overall, India's real GDP is estimated to have grown at 8.2% in fiscal 2024 compared with 7.0% in fiscal 2023.

Real GDP growth in India (2011-12 series) – constant prices



Notes: RE – revised estimates, PE: provisional estimates, P – projection
The values are reported by the government under various stages of estimates
Actuals, estimates and projected data of GDP are provided in the bar graph
Source: Ministry of Statistics and Programme Implementation (MoSPI), CRISIL Intelligence

Comparison of India's GDP growth with global GDP and key geographies

The IMF's 3.2% on-year global GDP growth for CY2024 and 3.3% for CY2025 projection considers the current geopolitical uncertainties, increasing geoeconomic fragmentation, tighter inflation-tackling monetary policies and fiscal support withdrawal amid high debt and extreme weather conditions.

Economic review and outlook

Real GDP (on-year growth)	2019	2020	2021	2022	2023	2024P	2025P	2029P
World	**2.80%**	**-2.70%**	**6.50%**	**3.50%**	**3.30%**	**3.20%**	**3.30%**	**3.10%**
Key countries								
India	3.90%	-5.80%	9.70%	7.00%	8.20%	6.50%	6.50%	6.70%
Euro area	1.60%	-6.10%	5.90%	3.40%	0.40%	0.80%	1.00%	1.20%
Japan	-0.40%	-4.10%	2.60%	1.00%	1.50%	0.20%	1.10%	0.40%
United Kingdom (UK)	1.60%	-10.40%	8.70%	4.30%	0.30%	0.90%	1.60%	1.40%
China	6.00%	2.20%	8.40%	3.00%	5.20%	4.80%	4.60%	3.30%
United States (US)	2.50%	-2.20%	5.80%	1.90%	2.90%	2.80%	2.70%	2.10%
Key emerging and developing regions								
Emerging and developing Asia	5.20%	-0.50%	7.70%	4.40%	5.70%	5.20%	5.10%	4.50%
Middle east and central Asia	1.70%	-2.40%	4.50%	5.30%	2.00%	2.40%	3.60%	3.70%
Emerging and developing Europe	2.50%	-1.60%	7.50%	1.20%	3.30%	3.20%	2.20%	2.60%
Latin America and the Caribbean	0.20%	-7.00%	7.30%	4.20%	2.40%	2.40%	2.50%	2.40%
Sub-Saharan Africa	3.20%	-1.60%	4.70%	4.00%	3.60%	3.80%	4.20%	4.30%

P: Projected (years mentioned on the horizontal axis correspond to the calendar years for the world and countries except India; for India year 2019 refers to fiscal 2020 and so on)

Source: Crisil Intelligence, industry, IMF

However, the GDP trajectory has varied for key economies, as detailed out below:

United States

United States' (US) GDP, which expanded from 1.9% in CY2022 to only 2.9% in CY2023, would have been higher if not for high inflation and, consequently, the raising of higher interest rates by the US Federal Reserve (Fed) to cool the print, which impacted spending. The economy is expected to continue growing at a relatively benign 2.8% in CY2024 and thereafter taper to 2.7% in CY2025 with a slowdown in wage growth, continued fall in disposable incomes and accumulated savings, and the Fed's tight monetary policy. However, growth forecasts have been buoyed by stronger-than-expected core goods consumption, which has improved financial conditions.

Euro area

While the pace of growth slowdown in this region was less pronounced than in the US in CY2023, it was only a marginal 0.4% because of lower policy rates against US and NextGenerationEU bonds supporting economic activity. The CY2023 slowdown was due to a spillover from geopolitical issues in Europe, with some economies more affected, and tighter financial conditions. The price of gas, the key source for electricity and heating, rose owing to constrained availability amid high demand, leading to increased manufacturing expenses. That said, in CY2024, the IMF expects GDP growth to increase to 0.8% before rising to 1% in CY2025. But key regional economies are expected to post diverging trends. Germany's economy is likely to contract faster than expected, whereas France and Spain will likely recover a tad, helped by tourism.

Japan

Pent-up demand, surge in inbound tourism and accommodative policies, as well as rebound in auto exports pushed up the country's growth rate to 1.5% in CY2023. However, in CY2024, a negative shift in trade (ratio of export to import prices) from higher energy import prices, as well as lower consumption as price inflation outpaced wage growth, is expected to crimp growth rate to just 0.2%. It which is expected to rise slightly to 1.1% in CY2025 as domestic demand stabilises.

United Kingdom (UK)

Growth declined from 4.3% in CY2022 to 0.3% in CY2023, reflecting tighter monetary policies to curb stubbornly high inflation and the lingering impact of the terms-of-trade shock from high energy prices. That said, growth was somewhat supported by a fiscal package announced in September 2022. In CY2024, though, GDP growth is expected stay low at 0.5%.

China

In CY2021, China's GDP grew 8.4% on-year, recovering strongly from the previous year's 2.2%on-year growth, on the back of pent-up domestic demand and strong growth in exports owing to slowdown in global industrial activities. China will continue to contain its macroeconomic stimulus following a property-driven downturn, and is, therefore, expected to see 4.80% economic growth this year and 4.60% the next.

India

India has solidified its position as the world's fastest-growing major economy, with ambitious plans to achieve high middle-income status by CY2047[1]. After a pandemic-induced 5.8% contraction in 2020, India's GDP bounced back, growing 9.7%, 7.0% and 8.2% on-year in 2021, 2022 and 2023, respectively. The growth trend is expected to sustain over the next five years, with the IMF projecting an annual rate of 6-7%.

RBI's GDP projections for FY2025-26

The Reserve Bank of India has projected real GDP growth at 6.5 per cent for fiscal 2025–26, maintaining the same rate as estimated for fiscal 2024–25, following a strong expansion of 9.2 per cent in the preceding year. The quarterly projections stand at 6.5 per cent in Q1, 6.7 per cent in Q2, 6.6 per cent in Q3, and 6.3 per cent in Q4. This marks a downward revision of 20 basis points from the February estimate, reflecting heightened global volatility. Agriculture remains on a positive footing, supported by healthy reservoir levels and robust crop production, which is expected to sustain rural demand. Manufacturing is showing early signs of revival amid improved business sentiment, and the services sector continues to demonstrate resilience

[1] https://www.worldbank.org/en/country/india/overview

RBI GDP forecast for FY25-26	FY26	Q1 FY26	Q2 FY26	Q3 FY26	Q4 FY26
India	**6.5%**	**6.5%**	**6.7%**	**6.6%**	**6.3%**

On the investment side, activity is gaining pace on the back of higher capacity utilisation, continued government focus on infrastructure, and strong balance sheets of banks and corporates. Easing financial conditions have also aided this recovery. While services exports are likely to remain steady, merchandise exports could face headwinds from global uncertainties and trade disruptions. Looking ahead, the RBI has projected real GDP growth at 6.7 per cent for fiscal 2026–27, suggesting continued recovery momentum.

Overview of key fundamental growth drivers of India

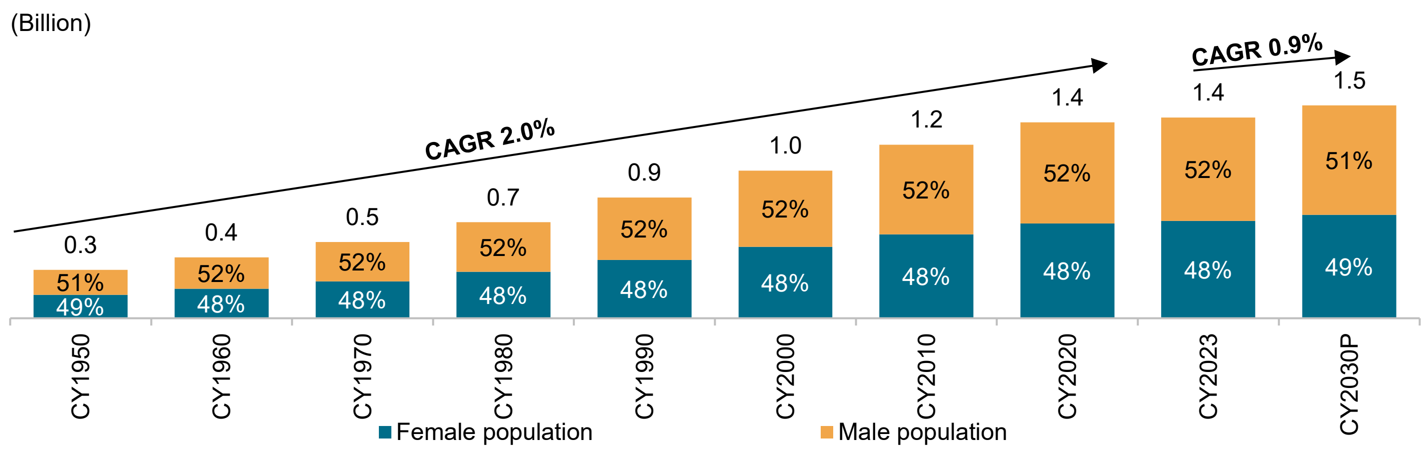
India demographic overview

Population to clock 0.9% CAGR during CY 2023-2030

India's population grew to ~1.2 billion according to Census 2011, increasing at 1.9% CAGR between CY2001 and CY2011. As of the CY2010 census, the country had ~246 million households. Additionally, as per United Nations Population Fund's (UNFPA), State of World Population Report of 2024, India's population by mid-2023 is estimated to have surpassed China by around ~2.9 million. This demographic expansion along with increasing per capita income will increase consumer spending in India.

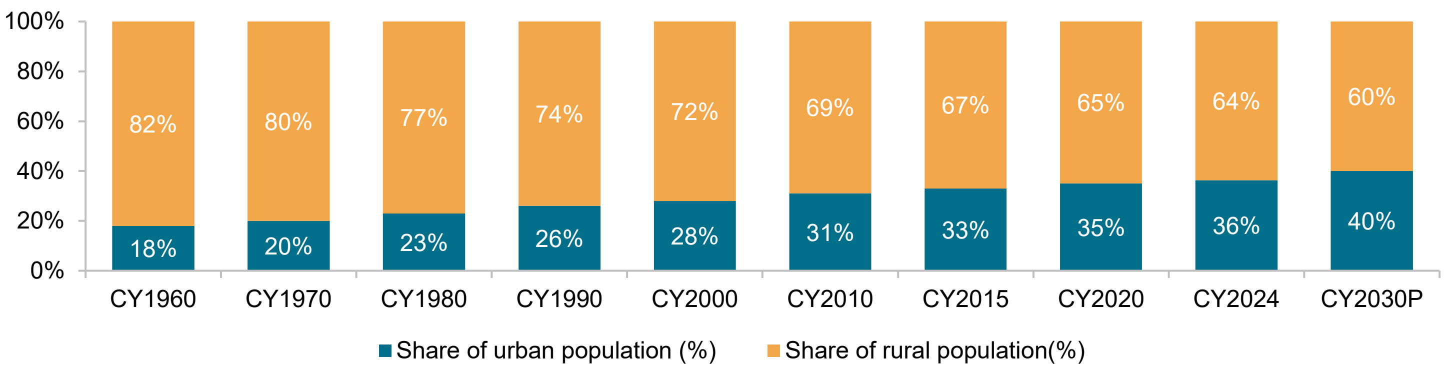
India's urban population is also expected to continue increasing on the back of economic growth. The share of the urban population is projected to increase to nearly 40% by CY2030, according to a UN report on urbanisation.

India's population growth (%)



Note: P: Projected
Population is the above chart as of January 1 and projections are based on medium fertility variant
Source: UN Department of Economic and Social Affairs, World Population Prospects 2024, CRISIL Intelligence

India's urban vs. rural population (million)



P: projected
Source: World Urbanization Prospects: The 2018 Revision, UN, Crisil Intelligence

Rising per capita Income

India's per capita income, a broad indicator of living standards, rose from Rs. 63,462 in FY12 to Rs. 106,744 in FY24, logging 4.4% CAGR. Growth was led by better job opportunities, propped up by overall GDP growth. Moreover, population growth remained stable at ~1% CAGR. Furthermore, according to FY25SAE, per capita net national income (constant prices) is estimated to have increased to Rs. 112,358; thereby registering a year-on-year growth of 5.3%.

With per capita income rising to upper middle-income category by FY31, the share of PFCE is expected to be dominant in India's GDP growth.

Per capita net national income (NNI) at constant prices

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23 FRE	FY24 PE	FY25 FAE
Per-capita NNI (Rs.)	63,462	65,538	68,572	72,805	77,659	83,003	87,586	92,133	94,420	86,034	94,054	99,404	106,744	112,358
Y-o-Y growth (%)		3.3%	4.6%	6.2%	6.7%	6.9%	5.5%	5.2%	2.5%	-8.9%	9.3%	5.7%	7.4%	5.3%

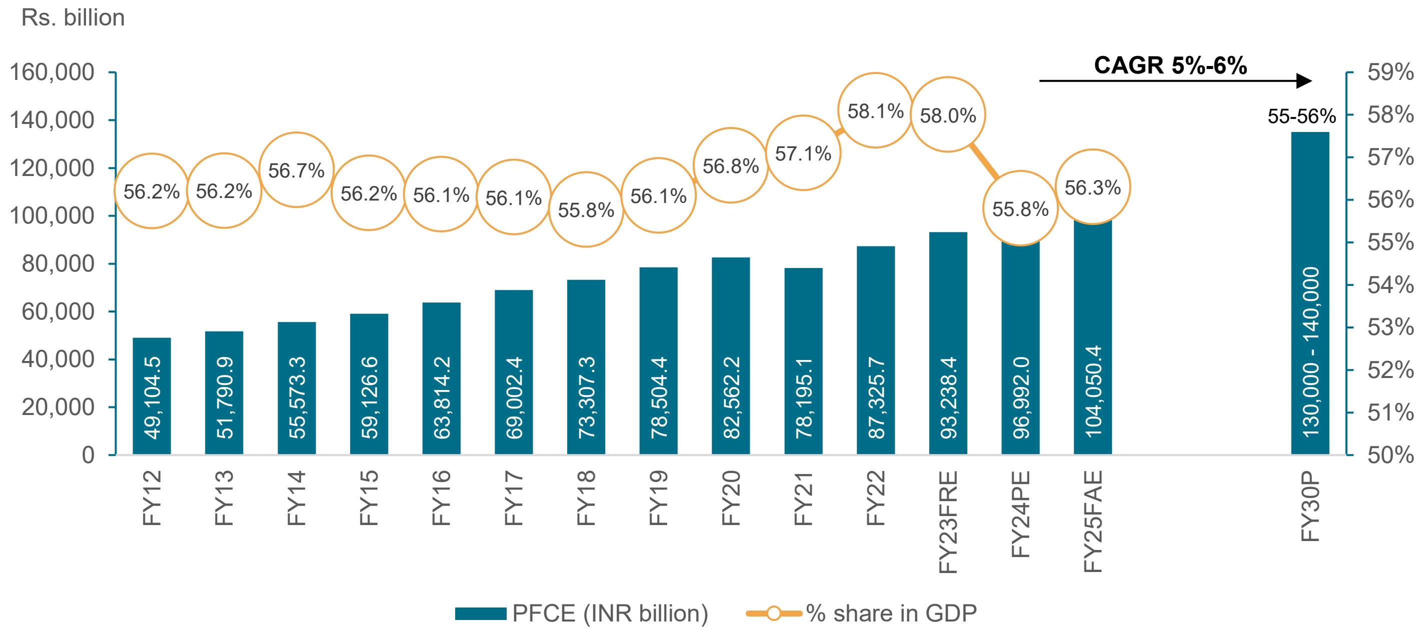
RE – revised estimates, PE- provisional estimates
Source: Provisional Estimates of Annual National Income, 2022-23, CSO, MoSPI, CRISIL Intelligence

PFCE has dominant share in India's GDP

Private final consumption expenditure (PFCE) at constant prices clocked 6% CAGR during fiscals 2012 to 2024, maintaining its dominant share of ~56% of GDP in fiscal 2024. Some of the factors contributing to the growth include benign interest rates, growing middle age population and income, low inflation, and wage revisions due to the implementation of the Seventh Central Pay Commission's (CPC) recommendations. PFCE is estimated to have further increased to Rs 96,992.0 billion, registering a y-o-y growth of ~4%. The increasing share of discretionary spending from FY12 suggests rising disposable incomes and spending capacity of households.

The PFCE CAGR growth of approximately 5.9% has been in line with India's GDP CAGR growth of 6.1% from FY12 to FY25. As of FY25FAE, PFCE is estimated to have further increased to Rs. 104,050.4 billion, registering a y-o-y growth of 7.3% and forming ~56.3% of India's GDP.CRISIL estimates the PFCE to grow at an average annual growth rate of 6-8% from FY24 to FY30, representing approximately 55-56% of GDP in FY30.

PFCE at constant prices



RE – revised estimates; PE- provisional estimates
Source: MoSPI, CRISIL Intelligence

Gross fixed capital formation as percentage of GDP likely to have improved further

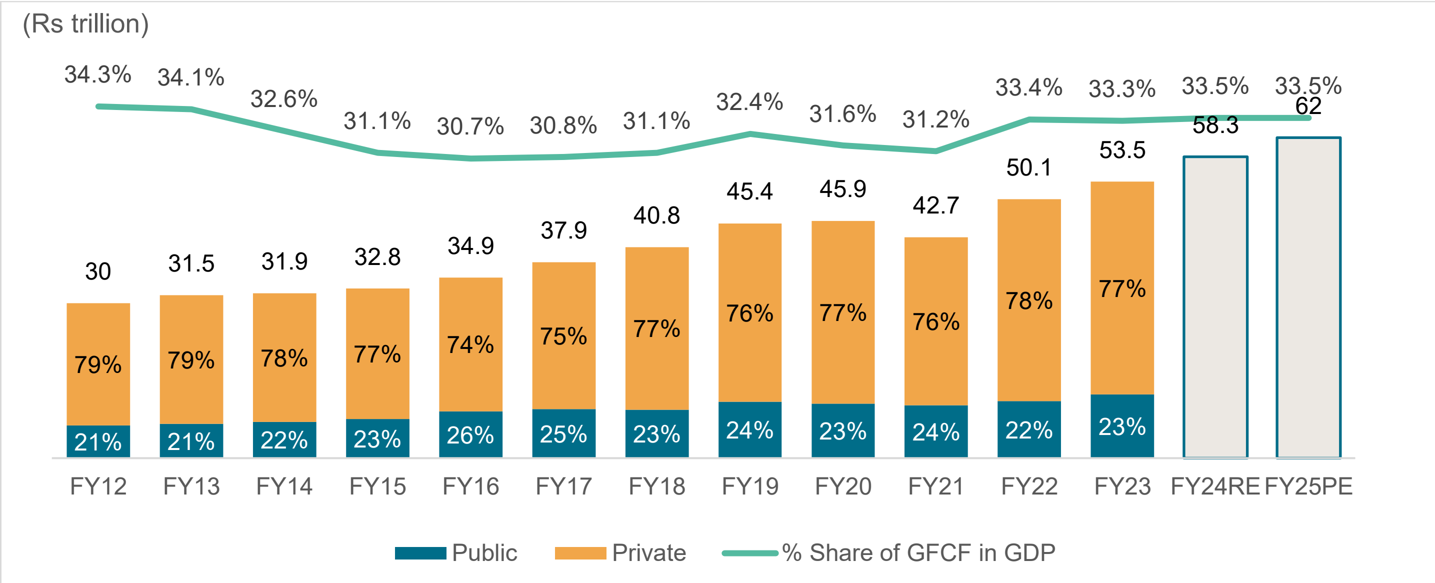
Gross fixed capital formation (GFCF), the indicator for fixed investments done by both government and private sector, has increased at 5.7% CAGR from Rs 30 trillion in fiscal 2012 to Rs 62 trillion in fiscal 2025 (as per provisional estimates).

In fiscal 2025, GFCF as a percentage of India's GDP increased to 33.5% compared with 33.3% of GDP in fiscal 2023 due to the government's focus on infrastructure development and private investments, among other factors.

Private sector is a major contributor to GFCF, share of government contribution improved in fiscal 2023

The distribution of GFCF between the private and public sectors has been relatively constant in India, with the private sector consistently the dominant contributor. In fiscal 2023, the private sector accounted for 77% of total GFCF.

Share of public and private sectors in GFCF



RE – revised estimate, PE – provisional estimate

Note: Private fixed capital formation includes household sector

Source: MoSPI, Crisil Intelligence

Healthy growth in gross value added in fiscal 2025 in line with GDP growth

According to the second advance estimates, gross value added (GVA) grew ~6.37% to Rs 171.8 trillion in fiscal 2025 from Rs 161.51 trillion in fiscal 2024. Financial, real estate and professional services had the highest contribution to GVA at ~23.80%, whereas public administration, defence and other services, and construction GVA had the highest annual growth at ~8.81% and ~8.64%, respectively.

GVA growth at constant prices

Rs trillion	FY12	FY19	FY20	FY21	FY22	FY23 FE	FY24 FRE	FY25 SAE	Share in GVA FY25
Agriculture, forestry and fishing	2.1%	6.1%	4.0%	4.6%	6.3%	2.6%	4.6%	14.41%	2.1%
Mining and quarrying	-0.8%	-3.1%	-8.2%	6.2%	3.6%	3.1%	2.7%	1.97%	-0.8%
Manufacturing	5.4%	-3.0%	3.1%	10.0%	-1.8%	12.3%	4.3%	17.15%	5.4%
Electricity, gas, water supply and other utility services	7.8%	2.4%	-4.3%	10.4%	10.7%	8.8%	6.0%	2.36%	7.8%
Construction	6.5%	1.6%	-4.6%	20.0%	9.0%	10.4%	8.6%	9.09%	6.5%
Trade, hotels, transport, communication and services related to broadcasting	7.2%	5.9%	-19.9%	15.1%	12.3%	7.5%	6.3%	18.54%	7.2%
Financial, real estate and professional services	7.0%	6.8%	1.9%	5.7%	10.8%	10.3%	7.2%	23.80%	7.0%
Public administration, defence and other services	7.4%	6.6%	-7.6%	7.6%	6.6%	8.9%	8.8%	12.66%	7.4%
Total GVA at constant prices	5.8%	3.9%	-4.1%	9.4%	7.2%	8.6%	6.4%	100.00%	5.8%

FE: Final Estimates, FRE: First Revised Estimates, SAE: Second Advance Estimates

Source: MoSPI, Crisil Intelligence

Construction sector's share in overall GVA estimated to have risen further in fiscal 2024

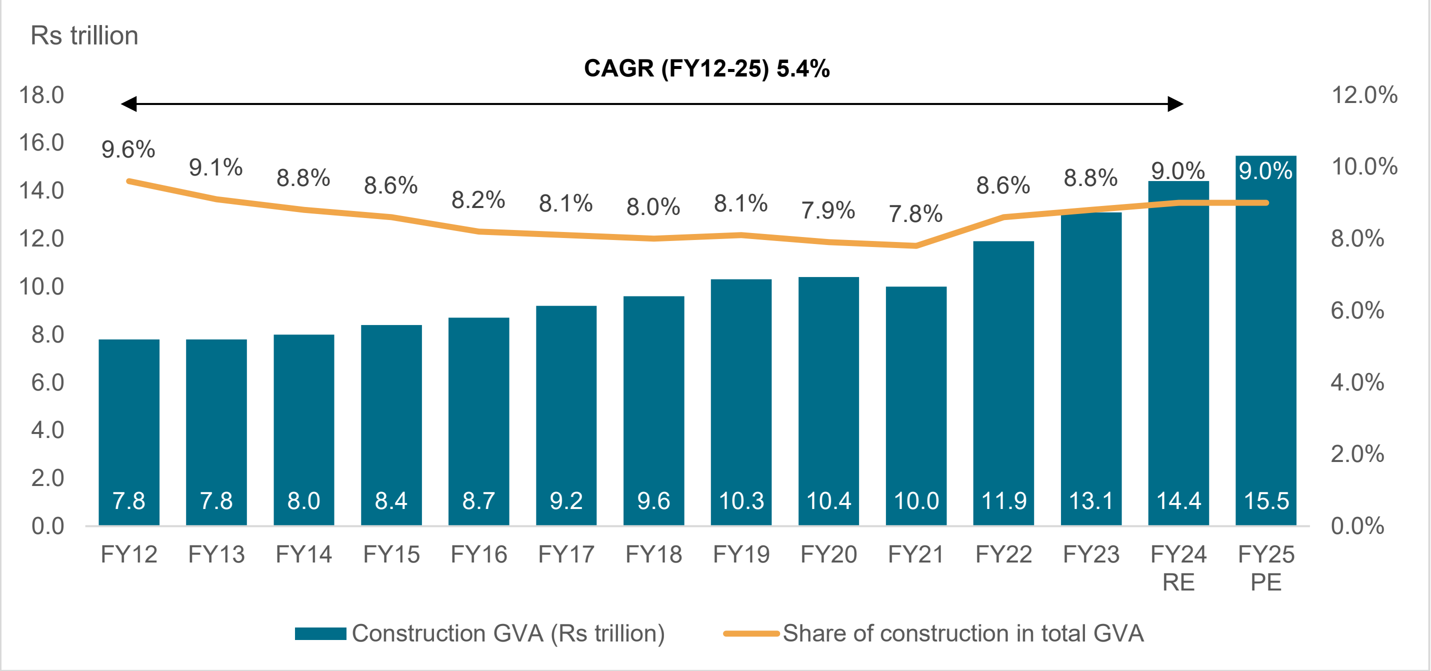
Construction GVA is a critical indicator of economic activity since it represents the value generated by the construction sector, which includes activities related to building infrastructure, real estate and other construction projects.

In India, construction GVA increased to Rs 15.5 trillion in fiscal 2025SAE from Rs 7.8 trillion in fiscal 2012, which was 5.4% CAGR. Several factors contributed to the growth, including economic expansion, the government's commitment to infrastructure development, particularly roads, railways and energy projects, and increase in foreign direct investment, which boosted private sector investment. Furthermore, increasing demand for affordable housing, driven by rising urbanisation and an expanding middle-class population, has also played a significant role in elevating construction GVA.

However, in fiscal 2021, the country's GVA was under pressure amid challenges heaped by the pandemic. In fiscal 2022, though, the share of construction GVA in the overall GVA rebounded to 8.6%, increasing further to 8.8% in fiscal 2023.

As per the provisional estimates for fiscal 2024, construction GVA was Rs 14.4 trillion, thereby contributing to 9.0% in overall GVA.

Construction GVA



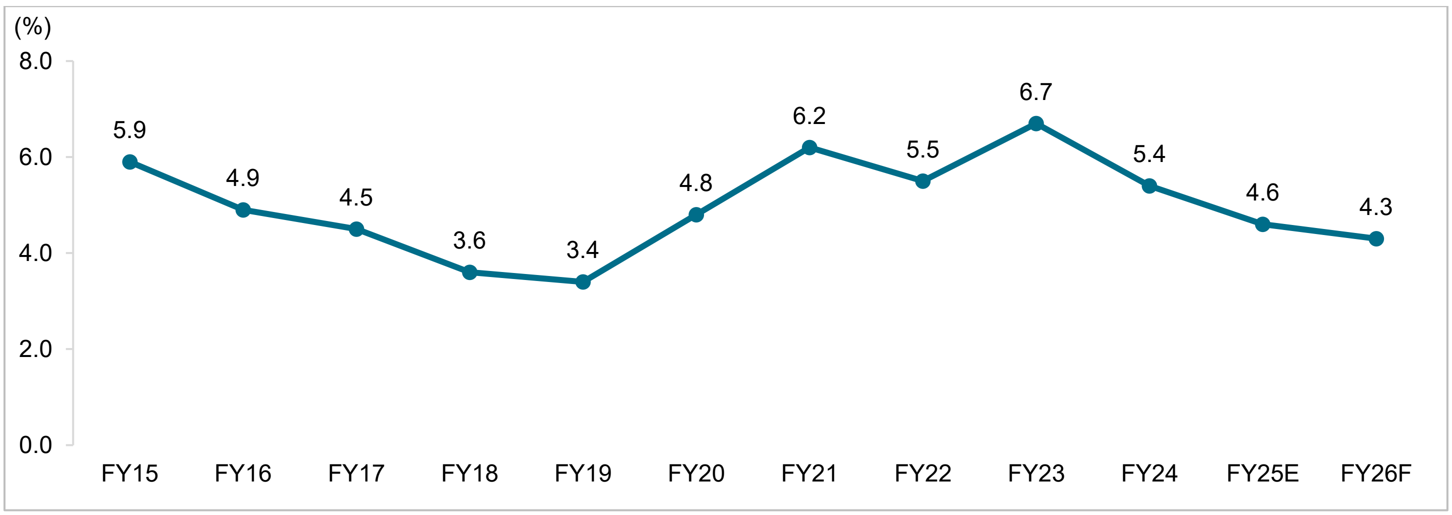
RE – revised estimate, PE – provisional estimates
Source: MoSPI, Crisil Intelligence

CPI inflation is expected to soften to 4.3% in fiscal 2026

In May 2016, the Reserve Bank of India (RBI) adopted flexible inflation targeting, setting a numerical target for Consumer Price Index (CPI) inflation at 4%, with a tolerance band of +/- 2%. CPI has eased from a high of 9.9% in fiscal 2013. Between fiscals 2016 and 2023, inflation was within the tolerance band, except in fiscal 2021 and fiscal 2023. CPI was at 6.2% in fiscal 2021 due to pandemic-induced supply-side disruptions and rose to 5.4% in fiscal 2024 because of reduction in food inflation.

In fiscal 2025, Crisil estimates CPI inflation eased to 4.6% on-year, driven by a normal monsoon and reducing food prices. For fiscal 2026, Crisil Intelligence forecasts CPI at 4.3%. Crisil expects non-food inflation to remain comfortable, supported by softness in consumer demand, a pass-through of the previous year's oil price decline to domestic fuel (petrol and liquefied petroleum gas) prices, and benign crude prices in the base case.

CPI inflation trend



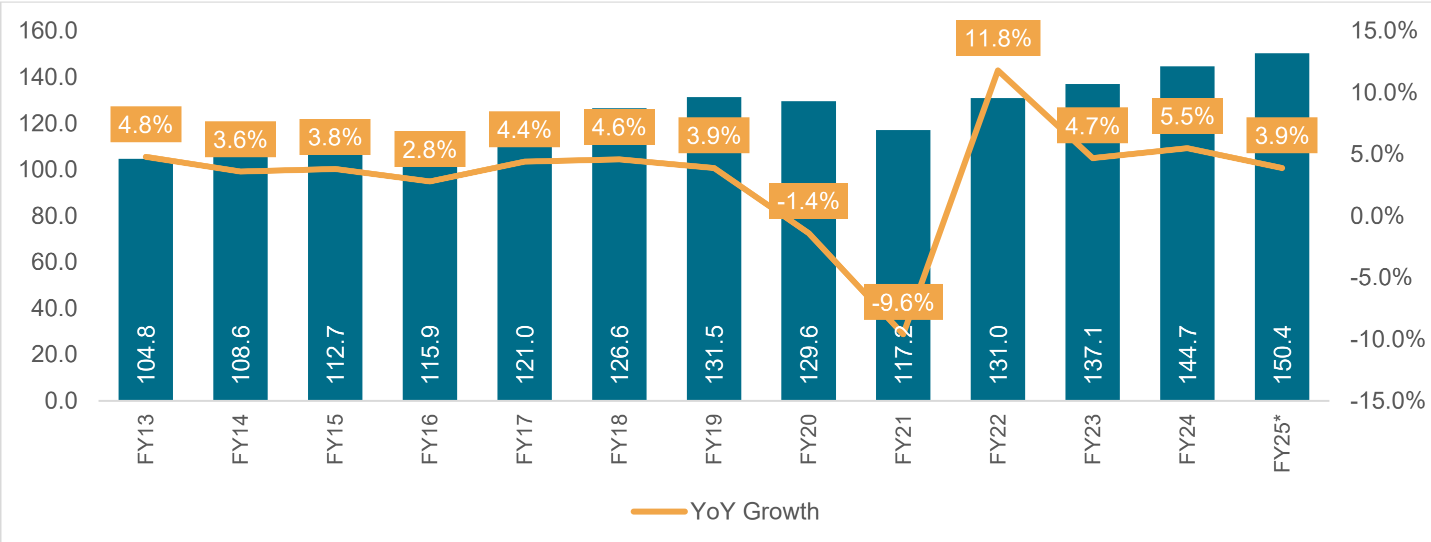
E: Estimated P: Projected
Source: Crisil Intelligence

Manufacturing IIP increased to 150.4 in fiscal 2025

The Index of Industrial Production (IIP) for manufacturing rose to 150.4 in fiscal 2025 from 104.8 in fiscal 2013. The manufacturing sector is a significant contributor to the country’s overall industrial growth, with 78% weightage in the overall IIP as of fiscal 2025.

Even though manufacturing IIP declined in fiscal 2020 to 129.6 and to 117.2 in fiscal 2021 owing to the pandemic, it recovered to 131.0 in fiscal 2022 on the back of easing of Covid-19 related restrictions, government stimulus measures, rising consumer demand and efforts to revitalise the manufacturing sector. Consequently, in fiscal 2025, manufacturing IIP stood at 150.4.

Manufacturing IIP



Note: FY25 data is provisional
Source: Crisil Intelligence

Water supply & sanitation expected to contribute more than half of investments under urban infra

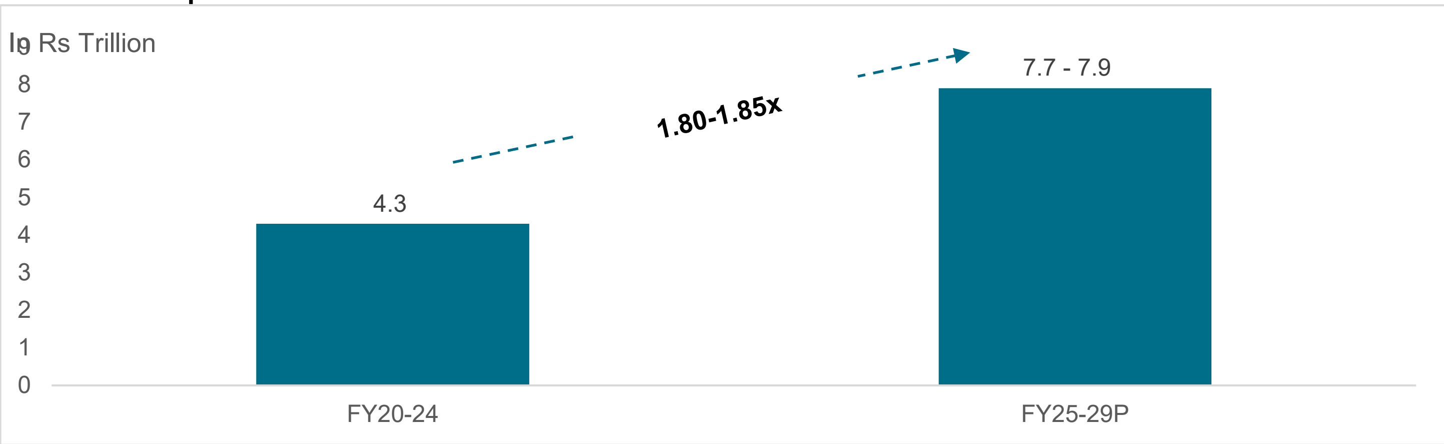
Between fiscal 2020 and 2024, investments in urban infrastructure experienced a significant growth rate of 33% per annum. The primary driver of this growth was spending on water supply and sanitation, which accounted for approximately 62-64% of total urban infrastructure investments. This was largely due to government initiatives such as the Swachh Bharat Mission, Jal Jeevan Mission, and AMRUT, as well as previously deferred investments in metro projects that have now achieved financial closure and are under implementation

CRISIL Intelligence expects ~Rs 7.5-8 lakh crore spends on urban infrastructure between fiscals 2025 and 2029, which is ~80% higher than the amount invested in the previous five years.

Urban infrastructure includes construction-intensive mass rapid transit system (MRTS), bus rapid transit system (BRTS), water supply and sanitation (WSS) projects, smart cities, and related infrastructure development.

WSS projects are expected to account for more than half of the total urban infrastructure investments over the next five years, driven primarily by state governments and through centrally sponsored programmes such as Jal Jeevan mission, AMRUT and Swach Bharat mission.

Construction spends in urban infrastructure

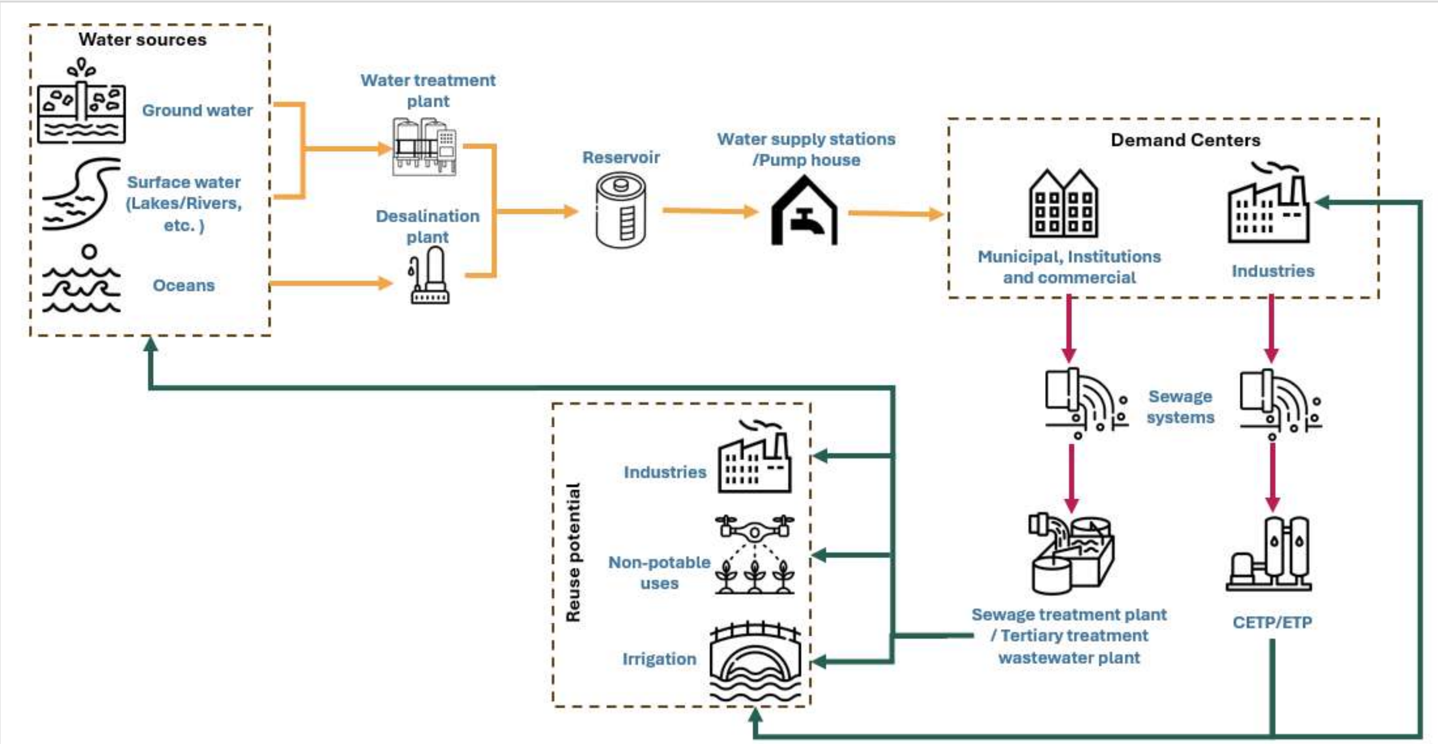


P: projected

Source: Crisil Intelligence

2. Overview of Indian water treatment and supply and Wastewater market

Water treatment, water supply, wastewater treatment and reuse flowchart

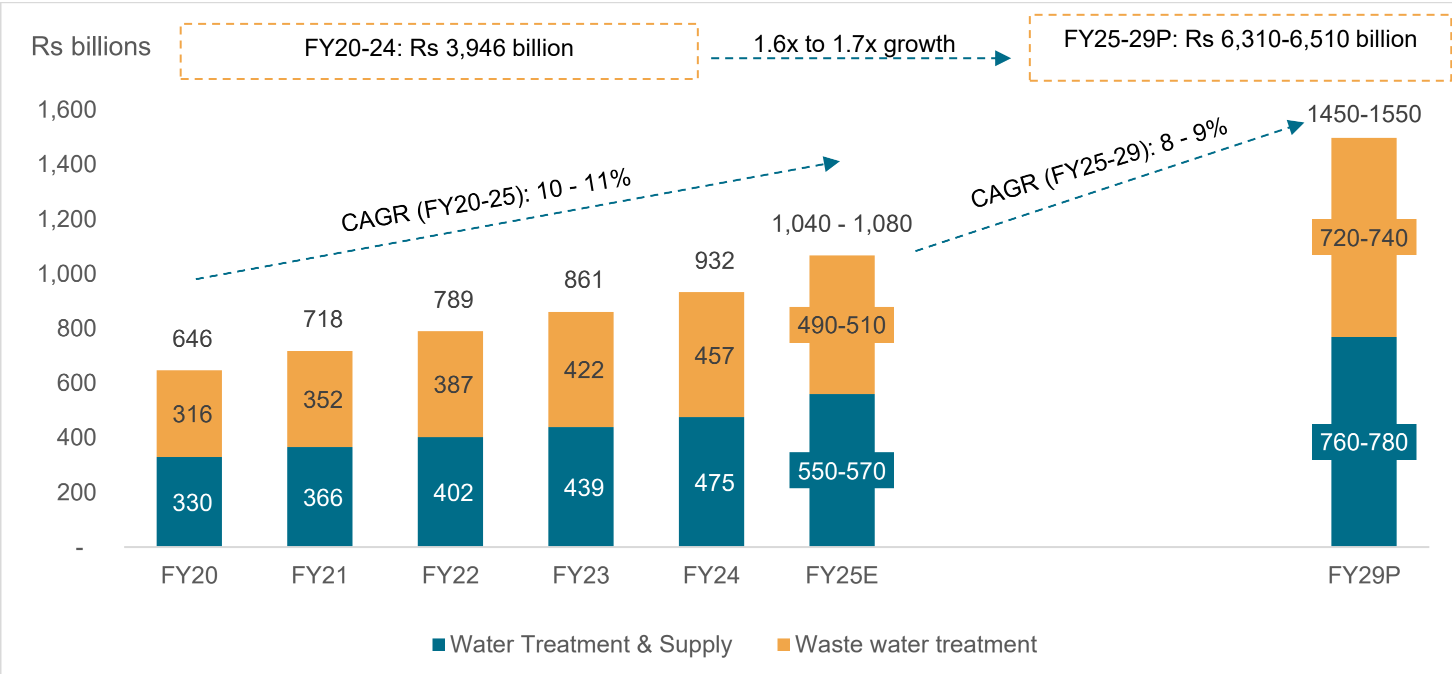


Source: Crisil Intelligence

The Indian water and wastewater treatment market is poised for significant growth, with expected revenues projected to surge 1.6 to 1.7 times from Rs 3,946 billion in the fiscal period 2020-2024 to Rs 6,310-6,510 billion in the fiscal period 2025-2029, primarily driven by increasing demand from municipal and industrial applications.

The Government of India has launched several schemes and programs focussed on water conservation, distribution and infrastructure including the Jal Jeevan Mission, Swachh Bharat Mission, Atal Mission for Rejuvenation and Urban Transformation ("AMRUT"), Namami Gange and Pradhan Mantri Krishi Sinchayee Yojana – Har Khet Ko Pani ("PMKSY-HKKP"). Similarly, policy initiatives by the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) are expected to fuel growth in the wastewater treatment market.

Total Water and wastewater market of India



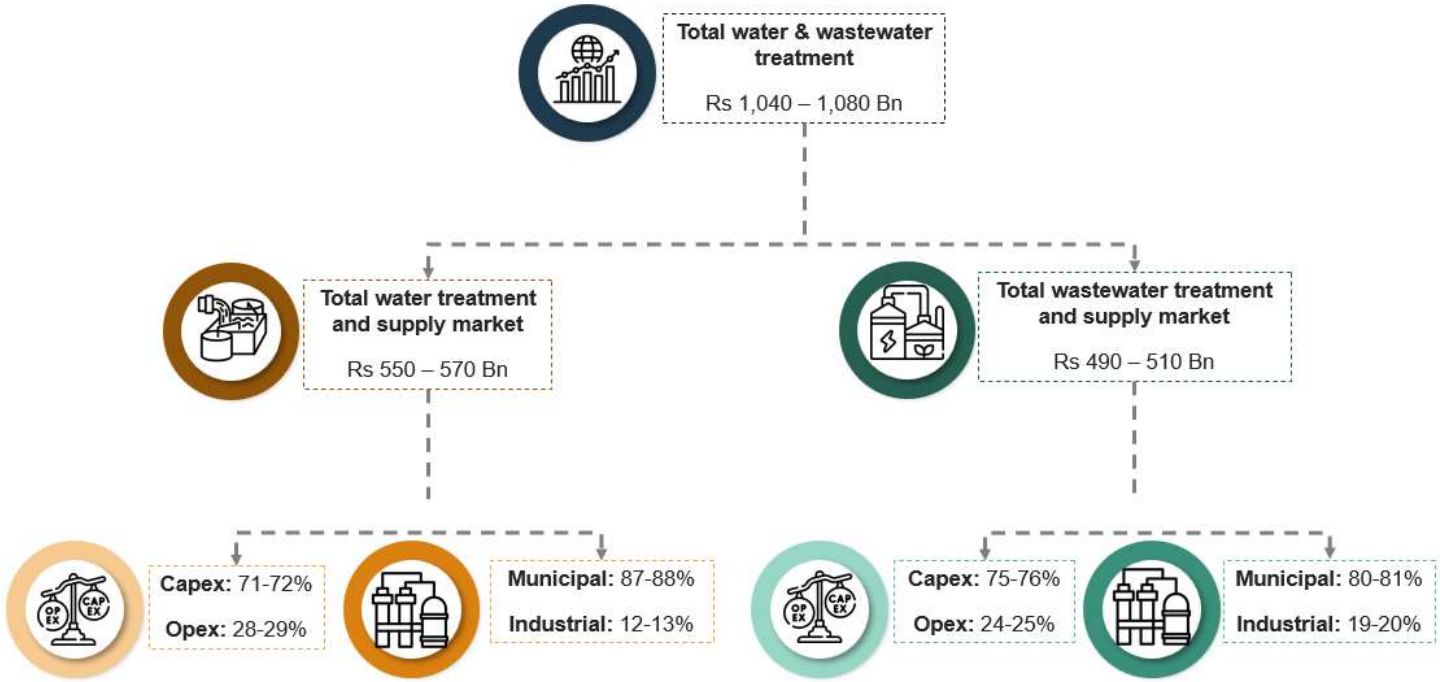
Note: P — projected
Source: Crisil Intelligence

This rapid growth can be attributed to significant investments in water infrastructure, including the augmentation of water treatment plant (WTP) and sewage treatment plant (STP) capacity, renovation of existing WTPs and STPs, and expansion of pipeline infrastructure. Additionally, investments in irrigation systems have improved water distribution efficiency, while the promotion of water reuse and recycling has further enhanced the sector's sustainability. The integration of cutting-edge technologies, such as SCADA and leakage detection systems, has played a crucial role in modernising the sector, enabling real-time monitoring and management of water supply and wastewater treatment, and reducing non-revenue water losses.

However, the growth of the market is also driven by the economic imperative of efficient water management. As concerns over water scarcity intensify, industries and municipalities face increasing pressure to adopt efficient wastewater treatment practices, leading to stringent regulations on effluent treatment. The escalating concern over water scarcity is prompting a significant shift towards reducing freshwater usage across various sectors such as agriculture, thermal power generation and selective industries.

As a result, there is a growing demand for advanced wastewater treatment plants to reduce water pollution and improve water management. The broader trend towards modernization, including the adoption of advanced and smart technologies, is also contributing to this expansion. Implementing smart water and wastewater treatment technologies not only helps meet stringent regulations but also enhances service quality and manages operating costs effectively. Furthermore, there is a heightened focus on wastewater management and reuse to address water scarcity and reduce environmental pollution.

Market assessment split across different segments (FY25E):



Source: Crisil Intelligence

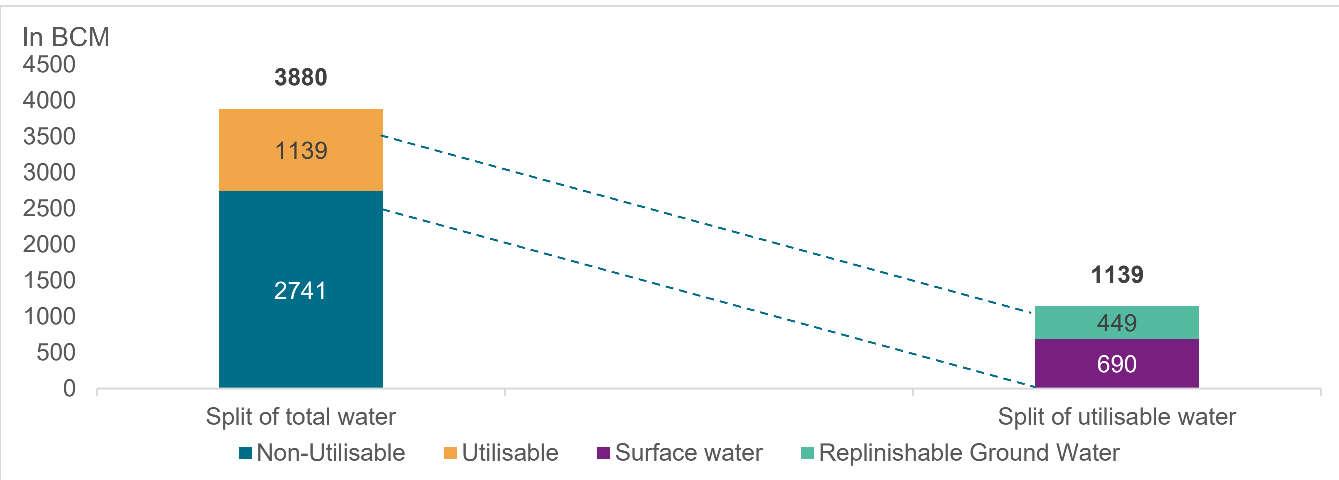
3. Water treatment market in India

Overview

India, with a vast population of 1.46 billion, is the second-most populous country globally, comprising around 18% of the world's population. However, it possesses only 4% of the world's freshwater resources, categorizing it as a water-stressed nation and highlighting the need for effective water management as a key priority

According to Central Pollution Control board India's water bodies are heavily polluted, with 70% of surface water contaminated with toxic chemicals and pollutants, due to industrial effluents, agricultural runoff and domestic sewage. Lack of proper wastewater treatment and management has led to the contamination of rivers, lakes and groundwater, posing health hazards and risks to the environment.

Split of total water and utilisable water (CY24)



Source: CWC, Crisil Intelligence

Rapid urbanisation and industrialisation have led to an increased demand for water, resulting in the over-extraction of groundwater and pollution of surface water bodies. According to the Central Water Commission (CWC), out of total annual average water availability of ~3880 BCM only about 30% can be utilized, with 60% of this usable water coming from surface sources and 40% from replenishable groundwater. The total water potential utilized is approximately 691 BCM, with a breakdown of 65% from surface water and 35% from groundwater. However, the projected water demand is expected to increase significantly, with estimates suggesting 843 BCM by 2025 and 1,180 BCM by 2050, as per the National Commission for Integrated Water Resources Development (NCIWRD)

According to Niti Aayog's Composite Water Management Index (CWMI) report, per capita water availability in India is rapidly reducing, with an average annual availability of 1,486 cubic metre in 2021 and 1,367 cubic metre in 2031. The availability may further reduce given the increasing population, leading to water stress and scarcity. As per Falkenmark water stress indicator annual per capita water availability of less than 1,700 cubic metre is considered as water-stressed and below 1,000 cubic metre as water scarce.

The government has recognised the need for water and wastewater treatment and launched multiple initiatives, including the Namami Gange Programme to clean up the Ganges and other polluted water bodies. The programme has accorded priority to water supply for drinking purposes under the water allocation policy. The CWC has emphasised the need for improving water use efficiency in irrigation and drinking water supply systems. Furthermore, the Central Ground Water Board (CGWB) and ground water departments in states/union territories have jointly assessed the dynamic groundwater resources by using the geographic information system (GIS)-based web portal ‘India-Groundwater Resource Estimation System’, which aims to provide a comprehensive understanding of the country's groundwater resources and support effective management and conservation efforts. Similarly, multiple assessments are being undertaken by central bodies associated with the water sector to streamline water resources in India.

The water sector has a notable impact on various sectors, including agriculture, industries, and domestic use, particularly for grass-root communities in India who rely on natural resources for their water and farming needs. The sector is also connected to food production, energy generation, and industrial activities, which are important for the country's progress. Managing water resources effectively is necessary to balance the needs of different sectors, including these communities, while considering environmental protection and sustainable development.

As part of its efforts towards water security, the government has launched the Jal Jeevan Mission (JJM), which aims to provide piped water to all households by 2030. By prioritising water security and sustainable water management, India is working towards mitigating the risks associated with water scarcity.

Key water statistics

Evolution of per capita water availability in India and world

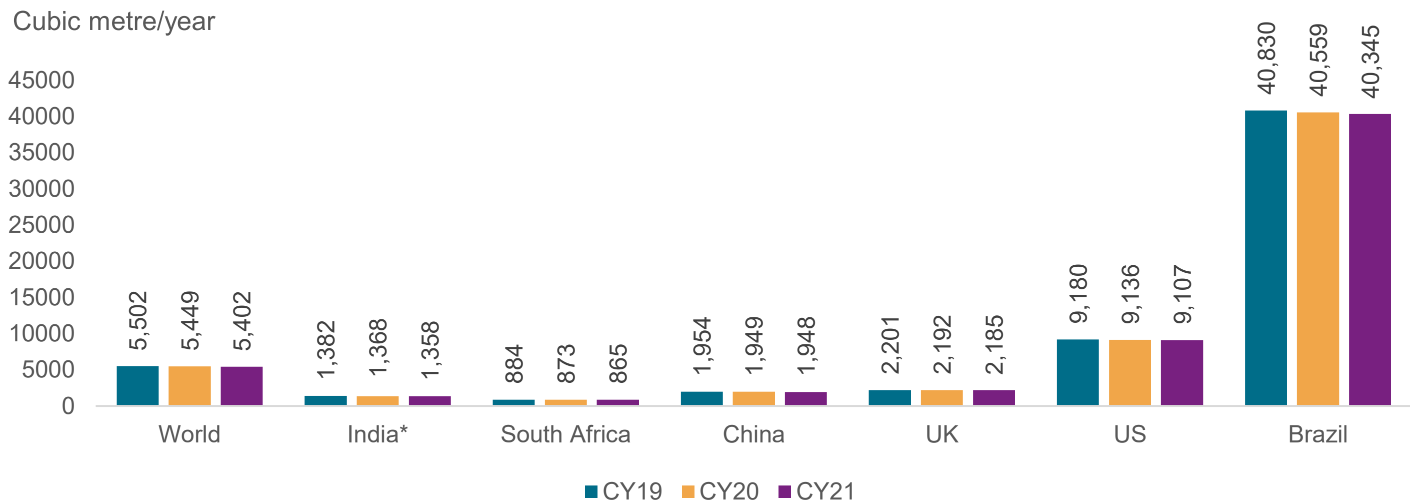
India has been experiencing water stress over the past two decades, with per capita water availability consistently below the threshold of 1,700 cubic meters per year, according to the Niti Aayog's Composite Water Management Index (CWMI) report. Furthermore, estimates by the CWC – Water and related statistics, indicate a declining trend in per capita water availability, from 1,486 cubic meters per year in 2021 to 1,219 cubic meters per year by 2050, highlighting the growing water scarcity concerns in the country

	CY2001	CY2011	CY2015	CY2021	CY2023	CY2024	CY2025P	CY2031P	CY2050P
Per capita water availability in India (Cubic meters)	1820	1651	1508	1486	1461	1449	1434	1367	1219

P: Projected,
Source: CWC, Crisil Intelligence

As per FAO-Aquastat, in calendar year 2019, India's water availability per capita stood at 1,382 cubic metre/year. In 2020 and 2021, the availability per capita stood at 1,368 and 1,358 cubic metre/year, respectively. The decline in water availability per capita is a concern as it can significantly impact the country's economic growth, food security and well-being of its population. With a large and growing population, India's water resources are under increasing pressure, making the adoption of efficient water management practices essential and conservation of the precious resource.

Per capita water availability across key geographies



Note: Data is based on the latest public information, Brazil includes amazon hence the higher availability, India numbers are different because the data in table is from Centre for water commission and data in above chart is from UN - Aquastat database

Source: Food and Agriculture Organization (FAO) – AQUASTAT Database, Crisil Intelligence

The availability of water per capita for all countries, except South Africa and India, is above the threshold of 1,700 cubic metre/year. China is at a risk of turning water stressed. The availability of water per capita below 1,700 cubic metre/year for India over 2019-21 highlights the need for urgent water conservation and management measures to ensure sustainable development and to meet the growing demand of the population. India must adopt a multi-faceted approach to address water scarcity, including improved use of water, promotion of water-saving technologies and better water storage and recharge systems.

Additionally, India must also focus on protecting its water sources from pollution and degradation and ensure efficient allocation of water across sectors. The country must prioritise water reuse and recycling by implementing effective systems for treating and reusing wastewater in industries, agriculture and urban areas for non-potable purposes such as irrigation, flushing and industrial processes. By promoting reuse, India can reduce its freshwater withdrawals, minimise wastewater discharge and lift the pressure off its water resources.

Water stress levels

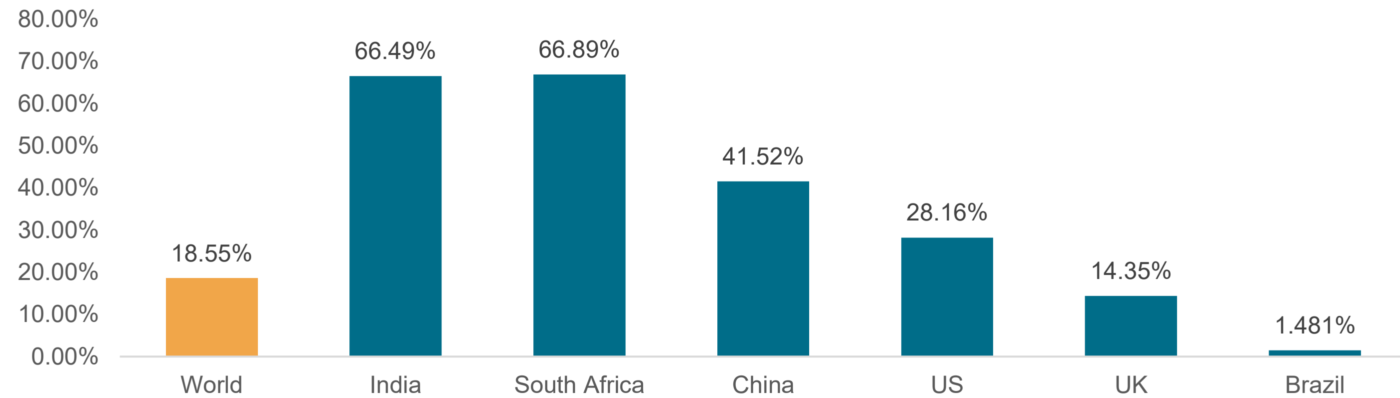
According to the CWC report of 2023, several river basins are experiencing water stress or scarcity. The Mahanadi and Tapi basins are water-stressed, while the Subarnarekha, Krishna, Mahi, Sabarmati, the west flowing rivers of Kutch and Saurashtra, including Luni, Pennar, the east flowing rivers between Mahanadi and Pennar, Indus (up to the border), Cauvery and those flowing between the Pennar and Kanyakumari basins are facing water scarcity.

The Central Ground Water Board (CGWB) assessed 7,089 groundwater units in 2022, categorizing their status as follows: 14% as over-exploited, 12% as semi-critical, 4% as critical, and 2% as having saline groundwater. On the other hand, 67% of the units were found to be safe. Notably, the majority of the over-exploited units are concentrated in the north-western part of India, indicating a region of high groundwater stress and potential vulnerability to water scarcity

India’s water stress level stood at 66.49% in 2021, level of groundwater extraction in Haryana, Punjab, Rajasthan, Dadra and Nagar Haveli, and Daman and Diu exceed 100%, indicating that annual groundwater consumption surpasses the annual extractable groundwater resources. In contrast, groundwater extraction levels in Delhi, Tamil Nadu, Uttar Pradesh, Karnataka and the union territories of Chandigarh, Lakshadweep and Puducherry range between 60% and 100%, while the rest are below 60%.

Following the findings, the government has been focusing on the development of water resources. Initiatives on water management, including conservation and rainwater harvesting are primarily the states' responsibility. However, the Centre has taken important measures for conservation, management of groundwater and effective implementation of rainwater harvesting in the country, including facilitating tap water connection to every household under the JJM.

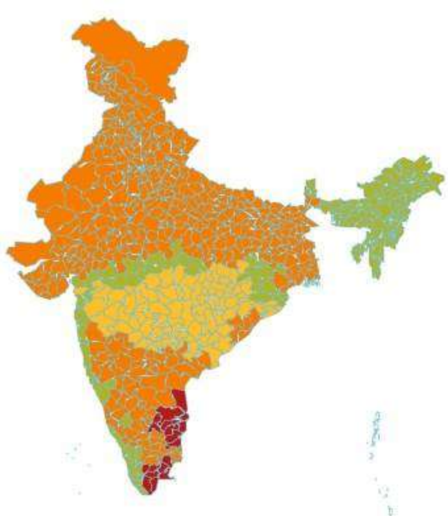
Water Stress level across geographies and world (CY21)



Note: Latest public information

Source: FAO – AQUASTAT Database, Crisil Intelligence

Per capita water availability across districts (CY25)



Per capita water availability across districts (CY50)

Per capita water availability	Absolute scarcity (<500 m^3)	Scarcity (500 - 1000 m^3)	Stress (1000 – 1700 m^3)	No stress (>1700 m^3)

Note: Latest public information

Source: Niti Aayog, India Climate and Energy Dashboard, Crisil Intelligence

In addition, several states have undertaken significant water conservation and harvesting measures, such as Rajasthan's Mukhyamantri Jal Swavlamban Abhiyan, Maharashtra's Jalyukt Shivar Abhiyan, Gujarat's Sujalam Sufalam Jal Abhiyan, Telangana's Mission Kakatiya, Andhra Pradesh's Neeru Chettu, Bihar's Jal Jeevan Hariyali Abhiyan and Haryana's Jal Hi Jeevan Hai, among others.

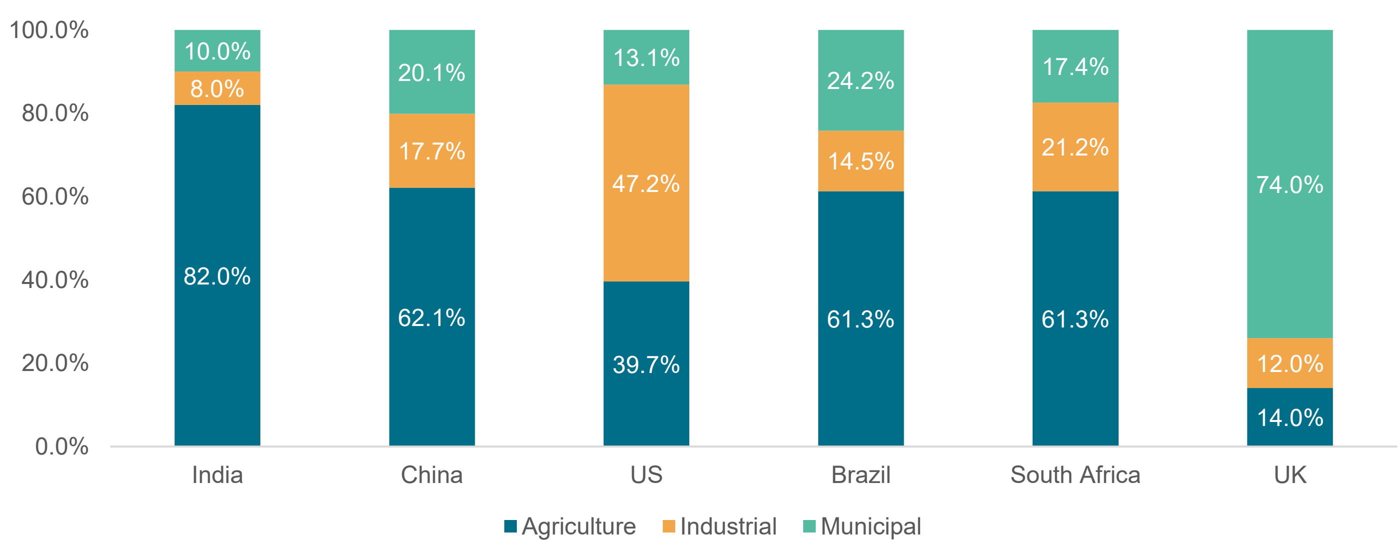
The government launched multiple initiatives to address water stress, including the Jal Shakti Abhiyan (JSA) in 2019, a time-bound campaign aimed at improving water availability, including groundwater conditions in 256 water-stressed districts. The government has also launched the JSA-II: Catch the Rain to generate awareness. Furthermore, the Atal Bhujal Yojana, a Rs 60 billion central sector scheme is being implemented in 80 water-stressed districts of seven states (Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh) to promote sustainable management of groundwater resources with community participation.

Use of water across sectors

According to data from the Food and Agriculture Organization (FAO), the use of water in sectors varies significantly across countries. A comparison with China, a major economy, reveals that India's water use in agriculture is significantly higher than that in China. However, China's industrial and municipal water use is substantially higher than that in India. Notably, the UK and US have a different pattern of water allocation, with a greater emphasis on industrial uses.

The above highlights the varying priorities and needs of different countries in terms of water allocation, with some placing more importance on industrial and municipal uses, while others, such as India, relying heavily on agriculture.

Water uses across sectors (CY22)



Note: Latest public information
Source: FAO – AQUASTAT Database, Crisil Intelligence

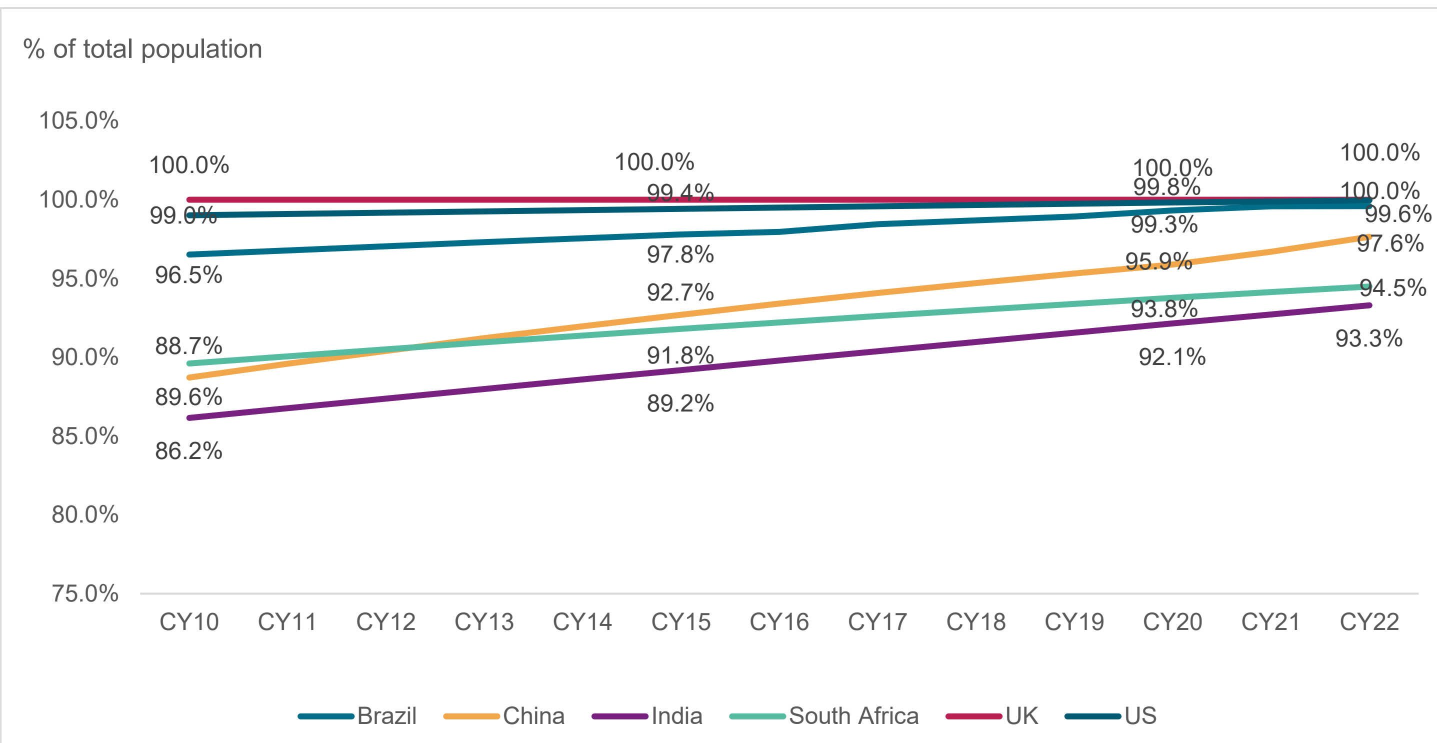
CWGB's assessment, 2023, highlights the significant role of groundwater in India's irrigation sector, accounting for ~87% of the total groundwater utilisation, which amounts to 209.74 BCM. Majority groundwater is used for cultivating water-intensive crops, with about 74% and 65% constituting the areas under wheat and rice cultivation, respectively.

As demand for water continues to rise from the industrial and municipal segment, it is likely to put an additional pressure on India's water resources, underscoring the need for efficient water management and conservation measures to ensure sustainable use of groundwater and other sources. To cater to the growing needs, the government recognises the need to improve efficiency in agriculture, which is the largest user of groundwater. To achieve this, the Centre has formulated the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) with an aim of extending the coverage of irrigation and improving water use efficiency. The scheme aims to achieve the goals of Har Khet Ko Paani (water to every field) and More Crop Per Drop, thereby optimising water use in agriculture and making water more available for other sectors, while also ensuring sustainable and efficient use of the vital resource.

Access to drinking water

Over the years, access to drinking water has undergone a significant transformation, with a growing focus on water quality, in addition to availability. In India, significant progress has been made in increasing access to basic drinking water, with nearly 95% of population having access to piped water, wells and tubewells. According to the National Compilation on Dynamic Ground Water Resources of India, 2023, ground water constitutes ~85% of total rural water supply and 50% of urban water supply.

% of population with access to drinking water



Note: Latest public information

Source: United Nations-Water Sustainable Development Goals 6 data portal, Crisil Intelligence

India has made significant strides in improving access to safe and adequate drinking water, particularly in rural areas, with 75% of the rural population having access to piped water systems within their premises as of fiscal 2024, compared with less than 40% in fiscal 2016.

Percentage of population using an improved drinking water source in India

	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24
% of total population	94.57	94.35	95.23	95.98	96.96	98.56	98.64	99.25	99.29

Note: Latest public information

Source: DDWS Ministry of Jal Shakt, Crisil Intelligence

Furthermore, by May 31, 2022, the Department of Drinking Water and Sanitation reported that 75% of rural households had a tap connection within their premises. The progress is a testament to the government's JJM, which aims to provide piped water to all households by 2030. It has not only improved access to drinking water but also enhanced water quality, reducing the risk of water-borne diseases. The government's focus on decentralised water management, involving local bodies, has also contributed to the success of these initiatives. With continued efforts, India is poised to make further progress in providing all its citizens access to water.

Water demand on the rise due to rapid urbanisation and industrialisation

Various agencies, including the Ministry of Water Resources, River Development and Ganga Rejuvenation (MoWRRDGR), NCIWRD and the Planning Commission, have conducted assessments to estimate the future water demand in India. Although the predicted numbers vary, the demand for water is expected to increase significantly by 2030 and 2050.

According to MoWRRDGR, the total water demand by 2050 is projected to be 1,447 BCM. In contrast, the NCIWRD predicts the total water demand at 1,180 BCM in a high-demand scenario. The Planning Commission and Water Resource Group data, published in Niti Aayog's CWMI report, estimates the demand in 2030 to be 1,498 BCM.

India faces challenges in water management due to its growing population, urbanization, and industrialization, highlighting the need for effective water management and conservation strategies to meet the growing demands of various sectors, including agriculture, industry and municipal use.

Water demand projections until 2050

In BCM	By MoWRRDGR			By NCIWRD					
Sectors	2010	2025	2050	2010		2025		2050	
				Low	High	Low	High	Low	High
Irrigation	688	910	1072	543	557	561	611	628	807
Drinking water	56	73	102	42	43	55	62	90	111
Industry	12	23	63	37	37	67	67	81	81
Energy	5	15	130	18	19	31	33	63	70
Others	52	72	80	54	54	70	70	111	111
Total	**813**	**1093**	**1447**	**694**	**710**	**784**	**843**	**973**	**1180**

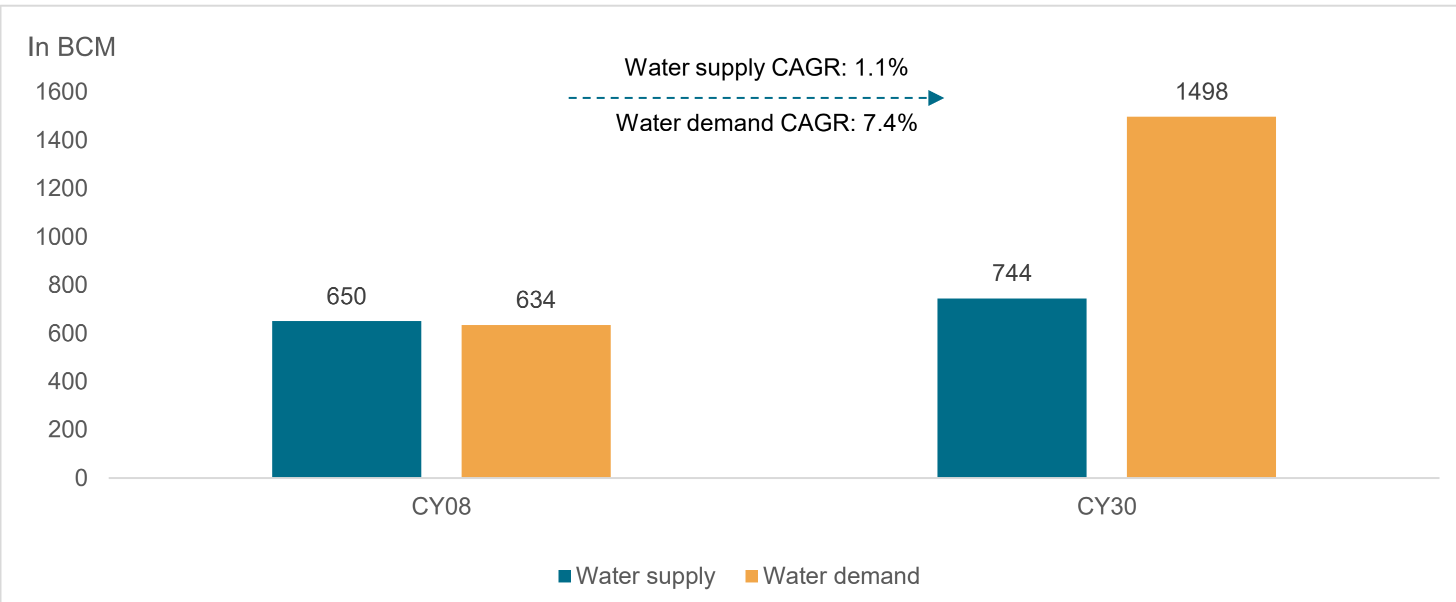
Note: MoWRRDGR, NCIWRD

Source: CWMI, Crisil Intelligence

A wide gap has been projected in water supply and demand in the coming years. According to estimates in the Niti Aayog CWMI report, the country's water supply is expected to increase to 744 BCM by 2030 from 650 BCM in 2008. However, demand is expected to rise at a much faster rate to 1,498 BCM by 2030 from 634 BCM in 2008. The significant gap suggests that nearly 50% of India's water needs will remain unmet, posing a major threat to its economic growth, food security and public health.

As the demand for water continues to outstrip supply, it is essential to adopt innovative and sustainable solutions to treat and reuse water, minimizing waste and maximizing conservation. Investing in water treatment infrastructure and technologies can help bridge the gap between supply and demand, ensuring that India's growing population has access to clean and safe water, and mitigating the risks associated with water scarcity

Water demand and supply



Note: Estimated by the Planning Commission and Water Resource Group
Source: CWMI, Crisil Intelligence

Overview of key water treatment technologies

Water treatment is a critical process that ensures quality and safety. The goal is to remove contaminants and impurities from raw water to produce drinking water that meets regulatory standards. The key processes and equipment used in the process include filtration, disinfection, adsorption, desalination and testing, among others.

Filtration: Removes suspended solids and contaminants from water using a porous medium, such as sand or membranes. It helps remove particulate matter, sediment and other impurities that affect water quality.

Disinfection: Kills or deactivates microorganisms that can cause waterborne diseases. Common methods include chlorination, UV light, ozone treatment and chlorine dioxide treatment.

Adsorption: Removes contaminants by exposing them to activated carbon. It is commonly used to remove organic compounds such as pesticides

Desalination: Removes salt and minerals from seawater or brackish water to produce fresh water. Methods include reverse osmosis, distillation and electrodialysis.

Testing: Monitors water quality and ensures it meets regulatory standards. Common tests include pH measurement, turbidity measurement and analysis of chemical and biological parameters.

Other key processes: Include coagulation and flocculation, sedimentation, biological treatment, advanced oxidation processes, membrane bioreactors, and UV/H2O2 treatment. These processes help remove contaminants, improve water quality and protect public health and environment.

Key technologies used for water supply

The following technologies are being used extensively by water utilities to improve the efficiency, reliability and sustainability of their operations. By leveraging the technologies, utilities can reduce water loss, optimise system performance and provide better service to their customers.

Hydraulic modelling: Is a crucial technology used to simulate and analyse the behaviour of water distribution systems. It helps utilities predict pressure, flow and quality in the network, allowing identification of potential issues and optimisation of system performance. Hydraulic models can be used to design new systems, upgrade existing ones and respond to emergencies such as main breaks or contamination.

Advanced metering infrastructure (AMI): Is a technology that enables remote reading of water meters, providing real-time data on water consumption patterns. The data can be used to detect leaks, identify areas of high water usage and optimise water distribution. AMI systems can also enable smart metering, which allows utilities to implement time-of-use pricing, demand response programmes and other conservation measures.

GIS: Is a powerful tool used to manage and analyse spatial data related to water distribution systems. It enables utilities to map their infrastructure, track assets and visualise data such as pressure, flow and quality. GIS can also be used to identify areas of high risks, such as zones prone to flooding or contamination and optimise maintenance and repair activities.

Pressure monitoring systems: Are used to measure the pressure of water in the distribution network, allowing utilities to identify areas of high or low pressure. The data can be leveraged to optimise system performance, reduce energy consumption and prevent pipe bursts and other failures. Pressure monitoring systems can also be used to detect leaks and other anomalies in the system.

Supervisory control and data acquisition (SCADA) systems: Are used to monitor and control water distribution systems in real time. They enable utilities to collect data from sensors and other devices, analyse it and respond to changes in the system. SCADA systems can be used to optimise system performance, respond to emergencies and implement conservation measures such as demand response programmes.

Leak detection technologies: Technologies, such as acoustic sensors and ground-penetrating radar, are used to identify and locate leaks in the water distribution network. They can help utilities reduce water loss, prevent property damage and optimise maintenance activities.

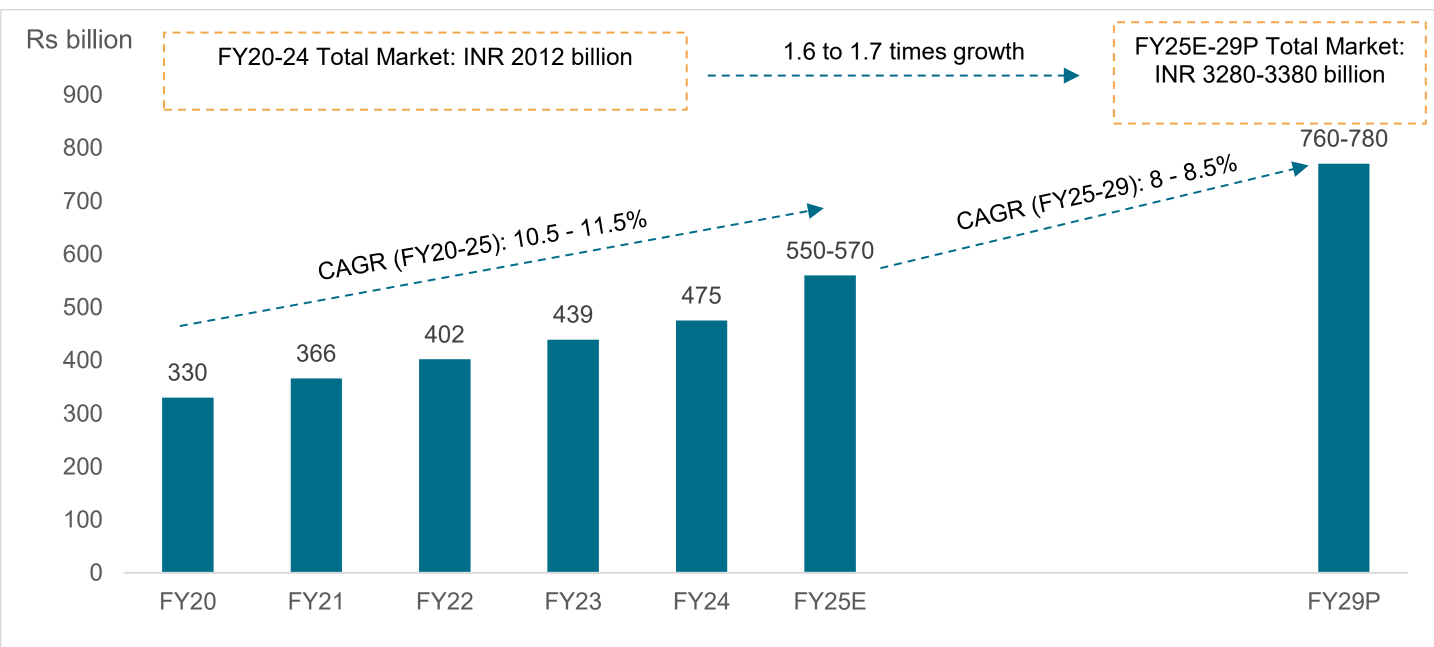
Water quality monitoring systems: They play a vital role in assessing the quality of water in distribution networks by tracking key parameters such as pH, turbidity and bacterial levels. The implementation of such systems has become increasingly crucial as states are now required to monitor and report water quality, in accordance with the standards set by the CWC. By leveraging such systems, utilities can swiftly detect contamination events, pinpoint high-risk areas and fine-tune water treatment processes to ensure compliance with regulatory requirements and provide safe drinking water to consumers.

Asset management systems: Asset management systems are used to manage and optimise the maintenance and repair of water distribution infrastructure. They enable utilities to track the condition and performance of assets, prioritise maintenance activities and optimise resource allocation.

Water treatment and supply market

The Indian water treatment market has grown remarkably over the past five years, fuelled by the government's initiatives to enhance water supply and sanitation infrastructure. The Har Ghar Jal scheme for rural areas under the Jal Jeevan Mission and the 24x7 water supply plan for 500 cities under the AMRUT programme have been instrumental in driving this growth, with additional support from other schemes such as the Smart City Mission. As a result, the market size is expected to expand by 1.6 to 1.7 times growth from fiscal 2020-24 to 2025-29. This rapid growth can be attributed to significant investments in water infrastructure, including the augmentation of water treatment plant (WTP) capacity, renovation of existing WTPs and expansion of pipeline infrastructure. The integration of cutting-edge technologies, such as SCADA and leakage detection systems, has played a crucial role in modernising the sector. With continued urbanisation and industrialisation, the country's demand for clean water is on the rise, creating a pressing need for efficient water treatment solutions.

Market size of water treatment and supply (FY20-29P)

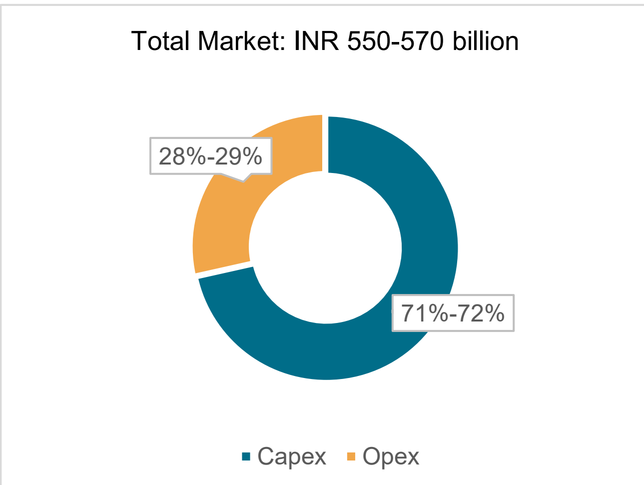


Note: P — projected

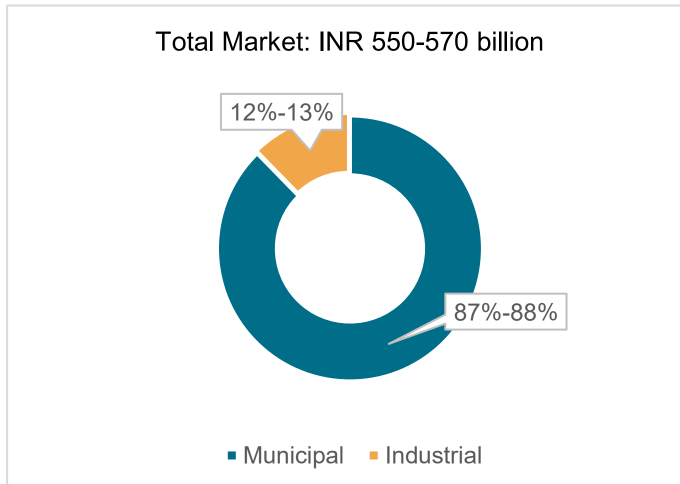
Source: Crisil Intelligence

The Jal Jeevan Mission has already led to substantial investment in rural water infrastructure, with rural household tap water connections increasing from 16.1% in 2019 to 80% just five years later, the next phase of growth is expected to be driven by urban development. The government's plans to provide 24x7 water supply and reduce non-revenue water (NRW) in urban areas are anticipated to be major growth drivers.

Market size of water treatment and supply split across Opex and Capex (FY25E)



Market size of water treatment and supply split across Municipal and Industrial (FY25E)



Note: P — projected
Source: Crisil Intelligence

Key projects in Water treatment and supply sector in India

Sr no	Project	State / Union territory	Capacity	Total cost (Rs Mn)	Status
1	Water Treatment Plant (Bhandup)	Maharashtra	2000 MLD	41238.8	Planning
2	Water Treatment Plant (Bilga, Ludhiana)	Punjab	580 MLD	1,5460.0	Planning
3	Water Treatment Plant (Aluva) and associated transmission network	Kerala	190 MLD	4950.0	Planning
4	Water Supply Scheme (Indore)	Madhya Pradesh	400 MLD	5797.8	Planning
5	Water Treatment Plant (Jite, Raigarh)	Maharashtra	270 MLD	4264.7	Planning
6	Water Treatment Plant (Bidkin) and associated transmission network	Maharashtra	70 MLD	4000.0	Planning
7	Water Treatment Plant (Vallah) associated transmission network and over head service reservoirs	Punjab	440 MLD	6653.2	Under execution
8	Water Treatment Plant & its ancillary structures for improvement of water supply to Bhubaneswar city	Odisha	130 MLD	3120.0	Under execution
9	Water Treatment Plant (Dighi Port Industrial Area)	Maharashtra	50 MLD	1771.6	Under execution

Sr no	Project	State / Union territory	Capacity	Total cost (Rs Mn)	Status
10	Telangana Drinking Water Supply Scheme for Adilabad, Karimnagar, Warangal, Khammam, Nalgonda, Mahaboobnagar, Medak, Nizamabad and Rangareddy districts of Telangana	Telangana	1,30,000 km – covering 26 internal grids, 62 intermediate pumping stations, 16 intake wells, 110 water treatment plants and 37,573 Overhead Service Reservoirs.	428530.0	Under execution
11	Pipe Water Supply Scheme (Mathura)	Uttar Pradesh		33115.0	Under execution

Note: The above list is not exhaustive and only an indicative list of projects
Source: Projects Today, CRISIL Intelligence

Key growth drivers for the water treatment industry

Growth drivers	Details
Focus on water security	• The government has intensified its focus on water security, with central and state authorities working towards implementing effective and equitable water management systems • The Union government has proposed offsetting up an Integrated Water Resources Management Authority (IWRMA) in each state as part of its vision for a developed India by 2047. A draft model Bill has been circulated to all states for consideration. • The IWRMA is expected to play a crucial role in developing comprehensive water security plans for various administrative tiers, including villages, cities, districts and states. Its responsibilities will also encompass groundwater and floodplain management, and river conservation, all of which are critical components of a robust water management framework
24x7 water supply	• The Environmental Hygiene Committee has outlined recommendations to facilitate this change, aiming to provide 24x7 water supply to all citizens • Currently, only a handful of cities, including Puri, Malkapur and certain parts of Bengaluru and Delhi, have achieved this milestone, while others like Coimbatore are actively working towards it • The government of Assam laid the foundation stone for the Jorhat 24x7 Water Supply Scheme on December 14, 2024
Growing private sector participation	• There is a growing trend of private sector participation in the water management sector, with companies increasingly bidding for government projects under various models such as one city, one operator (under the hybrid annuity model), performance-based contracting and payments • This increased engagement of private players is expected to bring in expertise, efficiency and investment, ultimately enhancing the country's water infrastructure and services

Growth drivers	Details
Reduction of NRW	• The government is taking steps to reduce NRW levels by metering the supply lines; AMRUT 2.0 targets to reduce NRW in cities to 20% • Thane Municipal Corporation and Thane Smart City Ltd have installed 105,000 smart water meters in October 2024 across Thane under its Smart Water Meter project
Increase in uptake of desalination as a technology for water filtration	• Desalination has emerged as a prominent technology in multiple coastal Indian states, such as Gujarat, Maharashtra and Tamil Nadu, for water filtration and increased water supply • A new desalination plant with a capacity of 400 million litres a day (MLD) is being set up in Perur, Chennai, with an estimated investment of Rs 42.8 billion. Once completed, it is expected to be the largest desalination plant in the south-east asia

Key challenges for the water treatment industry

Challenges	Details
Water network and coverage	• Indian cities face significant challenges in providing adequate water supply and sewerage services, with notable deficiencies in network coverage and service quality • Despite their size, even million-plus cities have substantial backlogs, with gaps greater than 20% in network coverage, highlighting the need for infrastructure expansion and upgrading to meet the growing demands of urban populations.
Economic challenges	• Most WTPs in India are outdated and need modernisation with new technologies. However, most urban local bodies (ULBs) lack the financial resources to upgrade them, relying heavily on government grants and schemes to build and operate WTPs, which hinders their effective operation and maintenance
Technical inadequacies of ULBs	• Most ULBs lack adequate manpower and technical capacity for meter reading. As a result, they continue with a fixed rate billing system and the meters are unread • As per the CWC, only 20-30% of current water supply is metered, which is leading to losses
Lack of formal reuse standards	• A few states have drafted water reuse policies, but many lack clear guidelines on the processes and technologies for water reuse, as well as criteria to select suitable business models

4. Assessment of wastewater treatment market in India

Wastewater treatment landscape

In India, the wastewater sector is facing significant challenges, with a large portion of the population lacking access to proper sanitation and wastewater treatment facilities. The National Commission for Integrated Water Resources Development projects the country's water requirements to reach approximately 1,180 billion cubic metres by CY2050, with around 70% allocated for agriculture, 9% for drinking water, 7% for industrial purposes, 6% for energy generation and the rest for other uses.

The increasing trend of urbanisation is expected to shift the priority from irrigation to drinking water. According to the United Nations, 64% of the country's population resides in rural areas, while 36% is connected to metropolitan centres. By CY2050, 50% of the country's population (877 million) is estimated to be living in cities, which are rapidly expanding as a result of economic development and reforms.

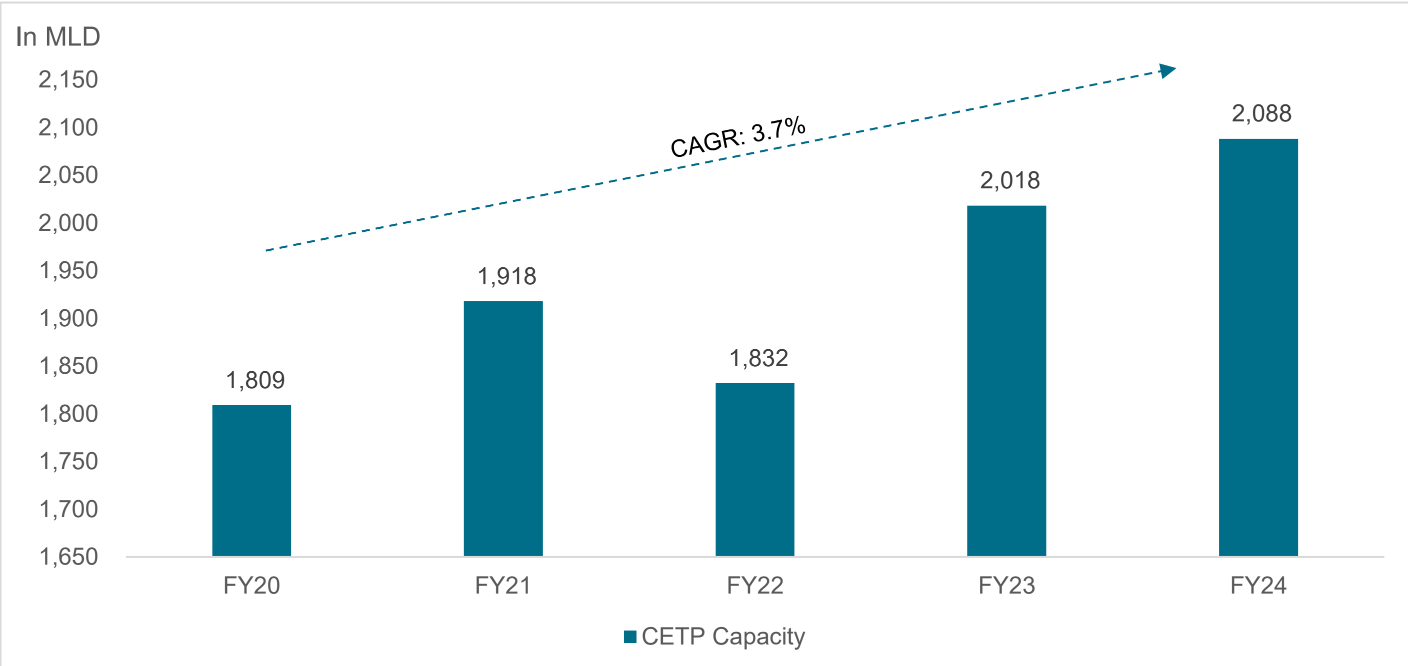
Many towns are situated on riverbanks, where freshwater is used by the population and wastewater is discharged back into the river, thereby affecting the drinking and irrigation water supply. Research conducted by the Ministry of Jal Shakti shows the quality of rivers has shown some improvement, with 46% of rivers examined in CY2022 designated as contaminated, compared with 70% in CY2015. The Central Pollution Control Board (CPCB) has identified the release of industrial waste and untreated or partially treated municipal wastewater into water bodies, and inadequate solid waste management as some of the primary causes of water pollution.

A CY2021 assessment by NITI Aayog indicates that India is one of the most water-stressed regions globally, with approximately 600 million Indians facing high water stress. By CY2030, the demand for the water is expected to be twice the available supply, potentially leading to water scarcity for millions of people and impacting the country's GDP. Effective management of water resources, and reusing and recycling them, is essential for a sustainable future.

The Indian wastewater treatment landscape is characterized by the presence of three primary types of treatment plants: Common Effluent Treatment Plants (CETP), Sewage Treatment Plants (STP), and Effluent Treatment Plants (ETP). While STPs are designed to treat domestic sewage and municipal wastewater, ETPs are employed to treat industrial effluent, and CETPs are used to treat effluent from multiple industries at a single location. The key differentiator among these treatment plants lies in their treatment capacity, technology, and ownership structure.

A deeper dive into CETPs reveals that they are designed to treat effluent from multiple industries, such as textiles, pharmaceutical, and chemical, at a single location. CETPs are typically owned and operated by a group of industries or a government agency and are equipped with advanced treatment technologies to handle a wide range of pollutants. The treatment process in CETP typically involves physical, chemical, and biological treatment methods, followed by tertiary treatment and sludge management. The use of CETPs has gained significance in recent years, particularly in industrial clusters, where a large number of industries generate substantial amounts of effluent, and a centralized treatment system is more efficient and cost-effective. The Indian government has also emphasized the importance of CETPs in reducing pollution and promoting sustainable industrial development, and has implemented policies to encourage the adoption of CETPs in industrial estates and clusters.

CETP Capacity across the years



Note: For states where NGT monthly progress reports for March were not available, data from the nearest available month was used. Additionally, data for Chandigarh and Arunachal Pradesh has not been published and therefore was not included in the analysis

Source: NGT monthly progress reports, Niti Aayog, CPCB, Crisil Intelligence

The Common Effluent Treatment Plant (CETP) capacity in India witnessed an increasing trend over fiscal 2020 to 2024 except a dip in fiscal 2022, with a capacity of 1,832 MLD. This decline can be attributed to the COVID-19 pandemic, which led to a slowdown in industrial activity and consequently, several CETPs were closed or underwent renovation, contributing to the reduced capacity in FY22. However, increase in the capacity has increased and reached to 2,088 MLD in fiscal 2024, indicating a positive outlook for the sector.

Sewage Treatment Plants (STPs) are another crucial component of India's wastewater treatment infrastructure, designed to treat domestic sewage and municipal wastewater. Unlike CETPs, which cater to industrial effluent, STPs focus on treating wastewater generated from residential, commercial, and institutional sources. The primary objective of an STP is to remove pollutants, contaminants, and pathogens from sewage, producing treated water that can be safely discharged into water bodies or reused for non-potable purposes.

According to the Wastewater Assessment Program, high-income countries treat around 70% of the wastewater they generate, upper-middle-income countries treat 38%, lower-middle-income ones 28% and low-income ones 8%. In India, wastewater treatment capacity is 27.3% of wastewater generated, as per the CPCB's Status of STP — 2020-21 report. Although India's waste and sewage treatment capacity is higher than the global average which is estimated to be ~20% of total wastewater generated, it still needs improvement given the magnitude of the problem, as highlighted by the CPCB and other bodies.

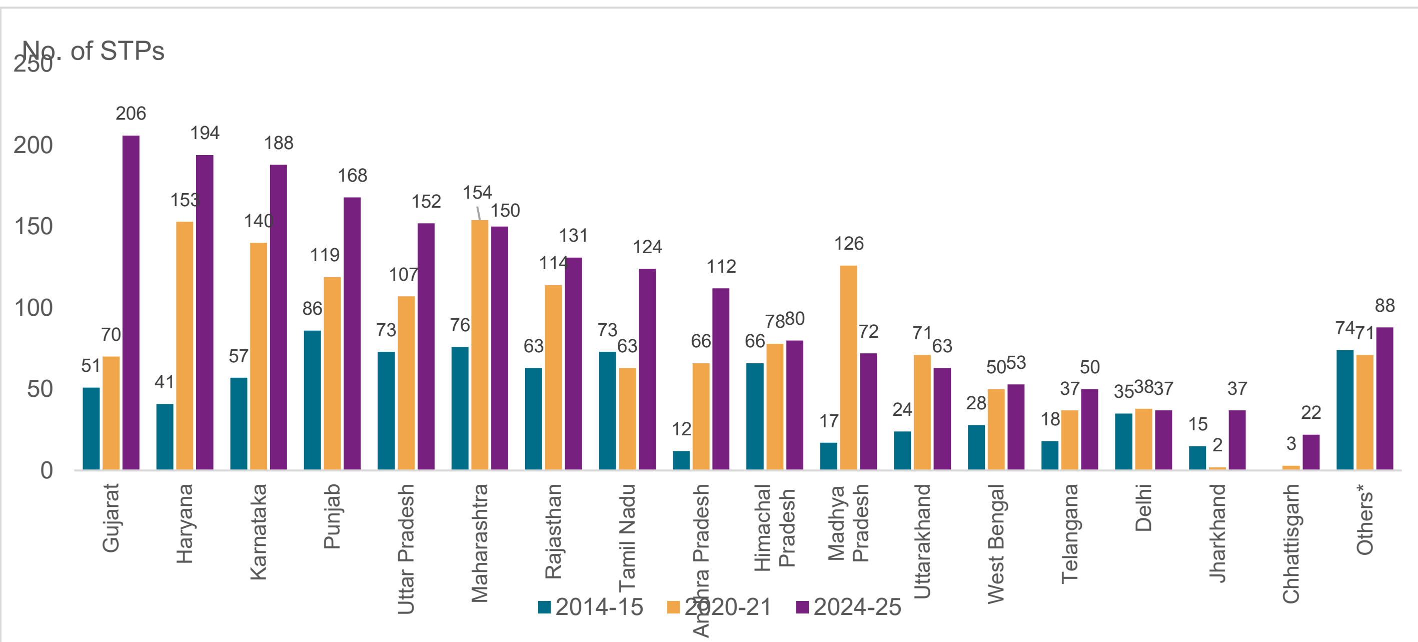
Comparative statistics on the STP inventory for fiscals 2015 and 2021

	Number of STPs			Capacity (MLD)			CAGR - Capacity	
STP status	**FY15**	**FY21**	**FY24**	**FY15**	**FY21**	**FY24**	**FY15-24**	**FY21-24**
Total no. of current STPs	601	1,195	1,951	20,120	31,841	42,012	8.0%	9.7%
Under construction	145	274	783	2,528	3,566	10,192	5.9%	41.9%
Proposed	70	162	1,385	629	4,827	16,284	40.4%	50.0%

Notes: FY15 and FY21 information is from CPCB, FY 24 Information is collated basis latest updated MPR report published by each state
Source: CPCB Status of STP report, MPR report, NMCG, Crisil Intelligence

There is a positive trend in the development of sewage treatment infrastructure, with a significant increase in the number of STPs and their capacity over the years. The substantial rise in the number of proposed and under-construction STPs indicates a proactive approach by the authorities to address the growing need for effective wastewater management. However, the fact that the number of proposed STPs has increased more rapidly than those under construction or already operational suggests that there may be challenges in implementing these projects

Number of STPs across states



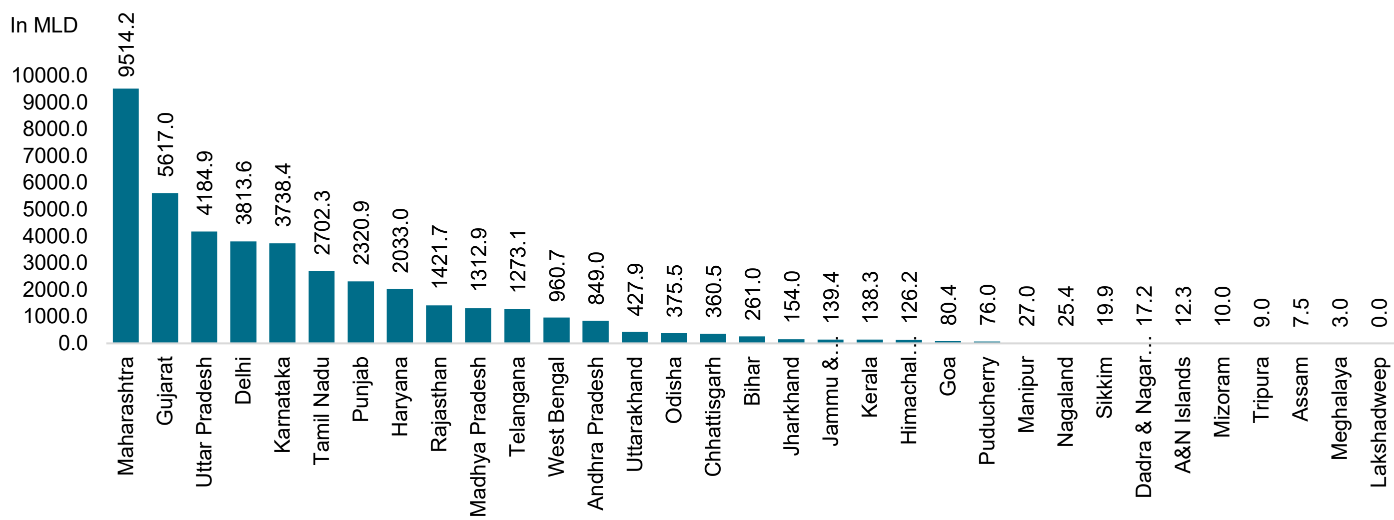
*Notes: * Others includes states with less than 20 operational STPs such as J&K, Odisha, Goa, Sikkim, Puducherry, Bihar, Kerala, Mizoram, Daman & Diu, Tripura*
Source: CPCB Status of STP report, MPR report published by each SPCBs, Crisil Intelligence

The state-wise distribution of STPs reveals that the top six states, namely Gujarat, Haryana, Karnataka, Punjab, Uttar Pradesh, and Maharashtra account for approximately 54% of the total number of STPs in fiscal 2024 caters to 65.2% of total capacity (27,408 MLD). Gujarat leads the pack with 206 STPs, followed closely by Haryana with 195 STPs.

Certain states, including Gujarat, Haryana, Karnataka, and Uttar Pradesh, have not only established a large number of Sewage Treatment Plants (STPs) but have also demonstrated remarkable growth in their numbers between 2015 and

2024, with some even achieving triple-digit growth. This surge suggests that these states are prioritizing the development of smaller, ULB-based STPs, which has contributed to the significant increase in their overall numbers.

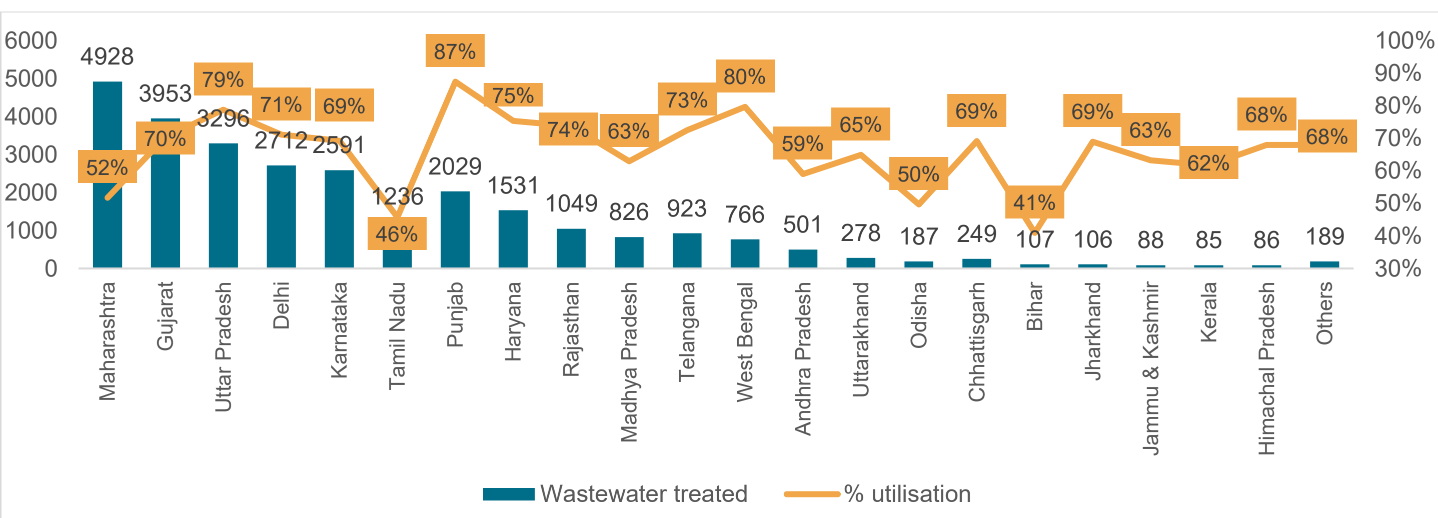
STP capacity across states (FY24)



Note: For states where NGT monthly progress reports for March were not available, data from the nearest available month was used. Additionally, data for Chandigarh and Arunachal Pradesh has not been published and therefore was not included in the analysis

Source: NGT monthly progress reports, Crisil Intelligence

STP capacity utilised across states (FY24)

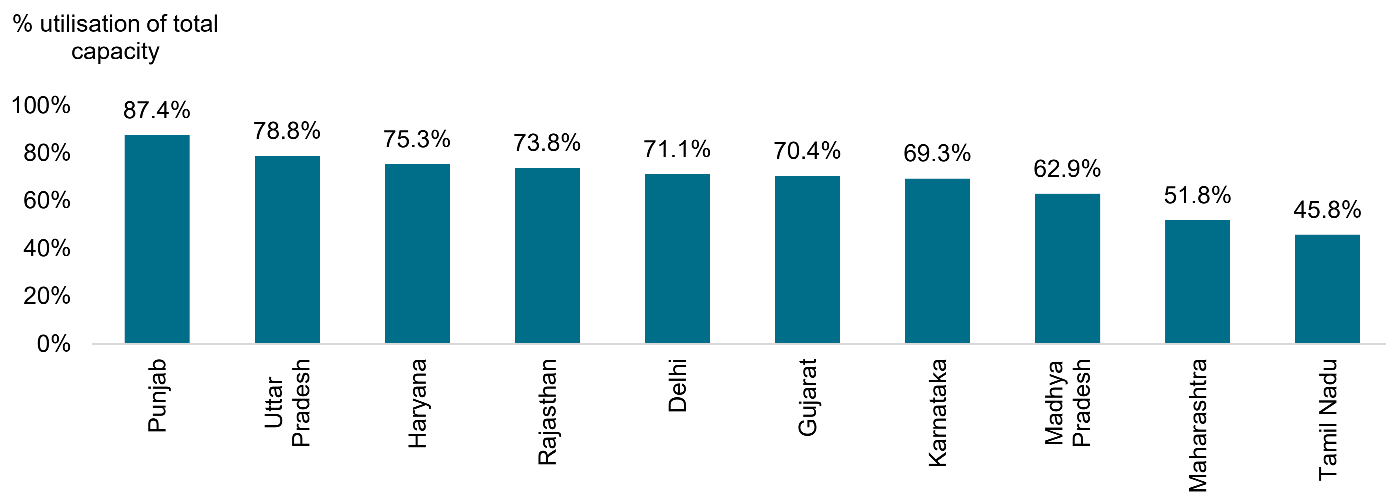


Note: For states where NGT monthly progress reports for March were not available, data from the nearest available month was used. Additionally, data for Chandigarh and Arunachal Pradesh has not been published and therefore was not included in the analysis

Source: NGT monthly progress reports, Crisil Intelligence

The states with the highest treatment capacity are Maharashtra, Gujarat, Uttar Pradesh, Delhi and Karnataka, accounting for approximately 53% of the country's total treatment capacity. Maharashtra has the largest share at around 18%, followed by Gujarat with 11%, Uttar Pradesh with 8%, and Delhi and Karnataka with each around 7%. These are among the most populous and industrialised states and their high treatment capacities reflect the significant efforts being made to manage their wastewater.

Capacity utilisation of top 10 states



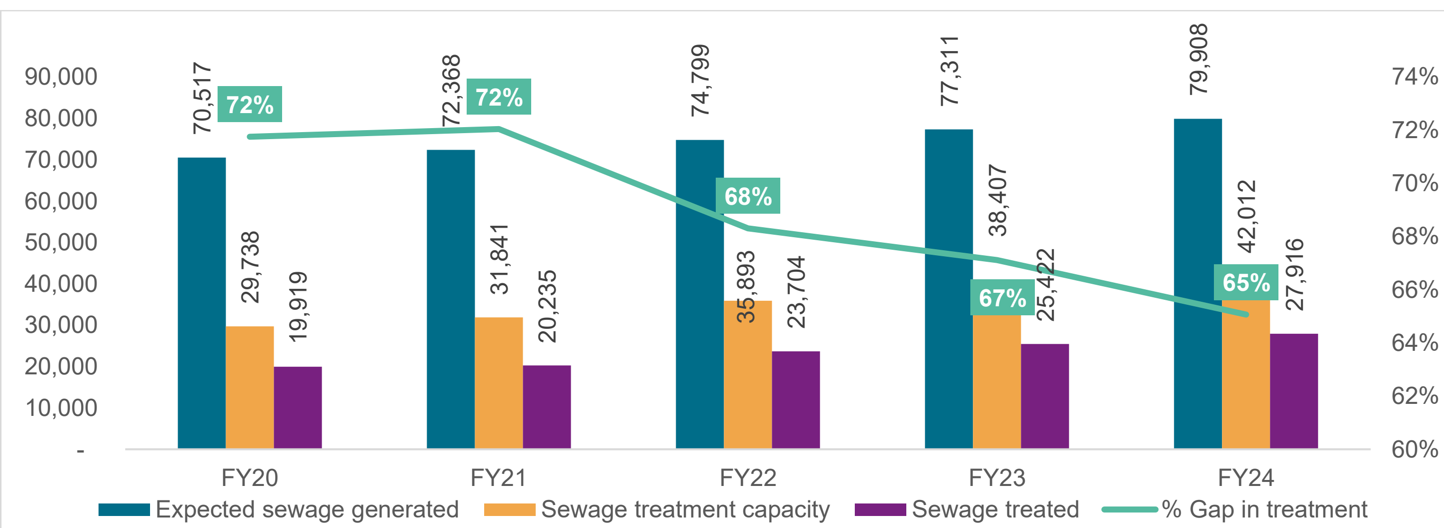
Note: For states where NGT monthly progress reports for March were not available, data from the nearest available month was used. Additionally, data for Chandigarh and Arunachal Pradesh has not been published and therefore was not included in the analysis.

Source: NGT monthly progress reports, Crisil Intelligence

The utilisation rates of treatment capacity in the top 10 states vary significantly. Punjab has the highest utilisation rate of 87.4%, followed by Uttar Pradesh with 78.8%, and Haryana with 75.3%. Maharashtra has a utilisation rate of 51.8%, Delhi 71.1% and Karnataka 69.3%. The high utilisation rates in some of these states suggest they are making efficient use of their treatment capacities.

Overall, the data indicates that the top 10 states are making significant progress in managing their wastewater. This progress can be attributed to state-level initiatives, such as the New Liquid Waste Management Rules in Gujarat and Maharashtra's upgraded water policy of 2019, which added mandates on reuse and sanitation. These initiatives highlight the importance of tailored approaches to address the unique challenges and opportunities in each state.

STP capacity vs utilisation (In MLD, %)



Note: For states where NGT monthly progress reports for March were not available, data from the nearest available month was used. Additionally, data for Chandigarh and Arunachal Pradesh has not been published and therefore was not included in the analysis

Source: NGT monthly progress reports, Niti Aayog, CPCB, Crisil Intelligence

The expected sewage generated has increased steadily over the years, from 70,517 MLD in fiscal 2020 to 79,908 MLD in fiscal 2024, based on population growth and rapid urbanisation. Sewage treatment capacity has also increased from 29,738 MLD to 42,012 MLD during this period, based on monthly reports submitted by state pollution control boards to the National Green Tribunal (NGT). This is a positive step towards addressing the country's wastewater management challenges.

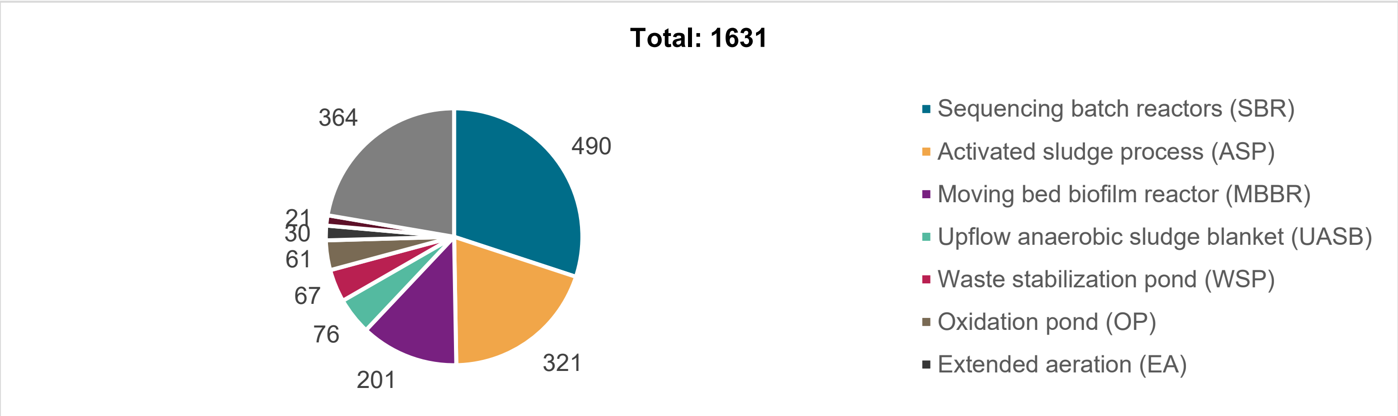
The actual sewage treated has also shown an increasing trend, from 19,919 MLD to 27,916 MLD, indicating a growth of ~30% during the period. While there is still a significant gap between installed capacity and actual treatment, it has narrowed over the years, indicating improved utilisation of existing infrastructure.

The percentage of total sewage generated that is treated has increased from 28.2% to 34.6% during this period. This suggests that while there is still a significant gap in treatment capacity, the country is making progress in treating a larger proportion of sewage generated.

The utilisation rate of STPs hovering around 60% can be attributed to several factors. One major reason is that STP capacities are often designed to cater to future demand, considering the projected population growth and urbanisation in the area. This means that the existing capacity may not be fully utilised, as the current sewage generation might lower than the designed capacity for the respective catchment area.

Another significant reason for low utilisation is the lack of proper sewage supply infrastructure in many areas. In some cases, the sewage collection network is incomplete, or the pipes are old and leaky, leading to significant losses of sewage during transmission. This results in a lower volume of sewage reaching the STP, which in turn affects the utilisation rate.

Split of STPs basis technology used (FY21)



Notes: Also includes technology of proposed STPs
Source: CPCB Status of STP report, Crisil Intelligence

Sequencing batch reactor (SBR) is the most widely used technology, accounting for 490 STPs with a total capacity of 10,638 MLD in FY2021. Activated sludge process (ASP) is the second most common technology, used at 321 STPs with a capacity of 9,486 MLD. Upflow anaerobic sludge blanket (UASB) and moving bed biofilm reactor (MBBR) are also popular technologies, with 76 and 201 STPs, respectively, using them.

In terms of capacity, SBR and ASP dominate the landscape, accounting for approximately 53% of the total STP capacity in FY2021. UASB and the "Others" category also cover significant capacities at 3,562 MLD and 8,497 MLD, respectively.

The “Others” category is notable for its diversification, encompassing a range of technologies such as membrane bioreactors (MBR), hybrid systems and advanced oxidation processes, among others. This diversity suggests that the Indian STP market is open to innovation and experimentation, with various technologies being explored to address specific wastewater treatment challenges.

Wastewater treatment technologies

The wastewater industry employs various technologies and treatment plants to remove contaminants and pollutants from water. Here is a qualitative overview of some key technologies and types of treatment plants:

Activated sludge process (ASP): It is a biological treatment method that uses microorganisms to break down organic matter in wastewater. It involves aerating the wastewater to promote microbial growth, followed by settling and removal of the sludge.

Membrane bio reactor (MBR): It is a hybrid treatment process that combines biological treatment with membrane filtration. It uses microorganisms to break down organic matter and then uses membranes to separate the treated water from the sludge.

Moving bed bio reactor (MBBR): It is a biological treatment process that uses moving beds of biomass carriers to support microbial growth. It is a compact and efficient treatment process that can handle high organic loads.

Sequencing batch reactor (SBR): It is a biological treatment process that uses a single tank to perform all treatment steps, including filling, reacting, settling and decanting. It is a flexible and efficient treatment process that can handle variable flows and loads.

Ultrafiltration (UF): Ultrafiltration is a membrane filtration process that effectively removes suspended solids, bacteria, viruses, and macromolecules from wastewater, producing high-clarity effluent suitable for reuse or as pre-treatment for Reverse Osmosis (RO). In India, UF is commonly used in WWTPs, especially in industries like pharmaceuticals, textiles, and food processing, where water recycling is critical. The advantages of UF in the Indian context include its compact design, low energy use, and compliance with CPCB norms for discharge into rivers like the Ganga. However, UF also has some challenges, including membrane fouling, which can be addressed through regular backwashing. UF plants are used in STP/ETP setups to purify water post-biological treatment, often combined with Membrane Bioreactor (MBR) for enhanced efficiency. In CETPs, UF serves as a pre-RO step to reduce fouling and extend membrane life, as seen in projects handling textile effluents.

Reverse Osmosis (RO): It is a high-pressure membrane process that removes dissolved salts, ions, organic compounds, and nearly all contaminants, producing near-potable water. It's often the final stage in advanced treatment trains for ZLD compliance, especially in water-scarce regions. In case of ETP and CETP, RO is used post-UF or biological treatment to recycle water for industrial processes. For example, in textile and chemical CETPs, RO follows UF to achieve Total Dissolved Solids (TDS) reduction below 100 ppm, enabling reuse and minimizing environmental discharge. The advantages of RO include high rejection rates (up to 99%) for salts and pollutants, supporting India's National Mission for Clean Ganga. However, RO also has some challenges, including the generation of brine concentrate, which requires evaporation or crystallization for ZLD, and higher energy costs, which can be mitigated by solar integrations in some plants.

Fiber Disc Filters: Fiber disc filters are advanced tertiary filtration systems that use stacked discs with fiber media to capture fine particles down to 5-10 microns. They operate via gravity or pressure, with automatic backwashing, making them efficient for polishing treated effluent. In India, these filters are deployed in STP, ETP, and CETP for removing residual solids before discharge or reuse. The advantages of fiber disc filters include their low footprint, energy efficiency, and high throughput (up to 1000 m^3/hour per unit). They complement UF/RO by reducing load and extending membrane life in water-stressed areas.

Nanofiltration (NF): Nanofiltration is a membrane process used to remove divalent ions, organic matter, and partial salts from wastewater. NF is majorly used for selective removal of hardness, dyes, and organic pollutants. The advantages of NF include lower energy consumption compared to RO, high rejection of organic pollutants, and extended RO membrane life. Indian suppliers provide NF membranes for wastewater applications, making it a popular choice. However, the challenges associated with NF include fouling risks and concentrate management, although these are less severe than those associated with other technologies

Electrocoagulation and Electro-oxidation: Electrocoagulation and electro-oxidation are technologies used to remove suspended solids, metals, and emulsified oils from wastewater. Electrocoagulation is commonly used in ETPs for industries like dairy, oil, and metal processing, while electro-oxidation is emerging in pharmaceutical ETPs for COD reduction. The advantages of these technologies include minimal chemical use, effectiveness for complex effluents, and compact systems. However, the challenges associated with electrocoagulation and electro-oxidation include electrode corrosion and energy costs, as well as the need for sludge management to avoid secondary pollution.

Advanced Oxidation Processes (AOPs): Advanced oxidation processes combine oxidants with catalysts to generate hydroxyl radicals, which break down complex organic pollutants and micropollutants resistant to conventional treatment. AOPs are used for treating recalcitrant effluents from pharmaceuticals, textiles, and chemical industries. The advantages of AOPs include their high effectiveness for micropollutants and non-biodegradable compounds, enabling ZLD compliance. AOPs can be retrofitted into existing plants, making it a viable option.

Activated Carbon Filtration: Activated carbon filtration is a technology used to remove organic compounds, odors, and micropollutants from wastewater. This method is employed for tertiary polishing. The advantages of activated carbon filtration include its effectiveness for low-concentration pollutants, improvement of taste and odor, and complementing UF/RO by reducing organic load.

Ion Exchange: Ion exchange is a technology used to remove specific ions, such as heavy metals or nitrates, from wastewater by exchanging them with less harmful ions. This method is commonly used in in electroplating, leather, and chemical industries to remove heavy metals or salts. The advantages of ion exchange include high selectivity for targeted ions, enabling compliance with strict discharge norms.

Ultraviolet (UV) Disinfection: This method uses ultraviolet light to inactivate pathogens by damaging their DNA, ensuring the effluent is safe for discharge or reuse without chemical residues. The advantages of UV disinfection include the absence of chemical byproducts, a low footprint, and effectiveness against chlorine-resistant pathogens.

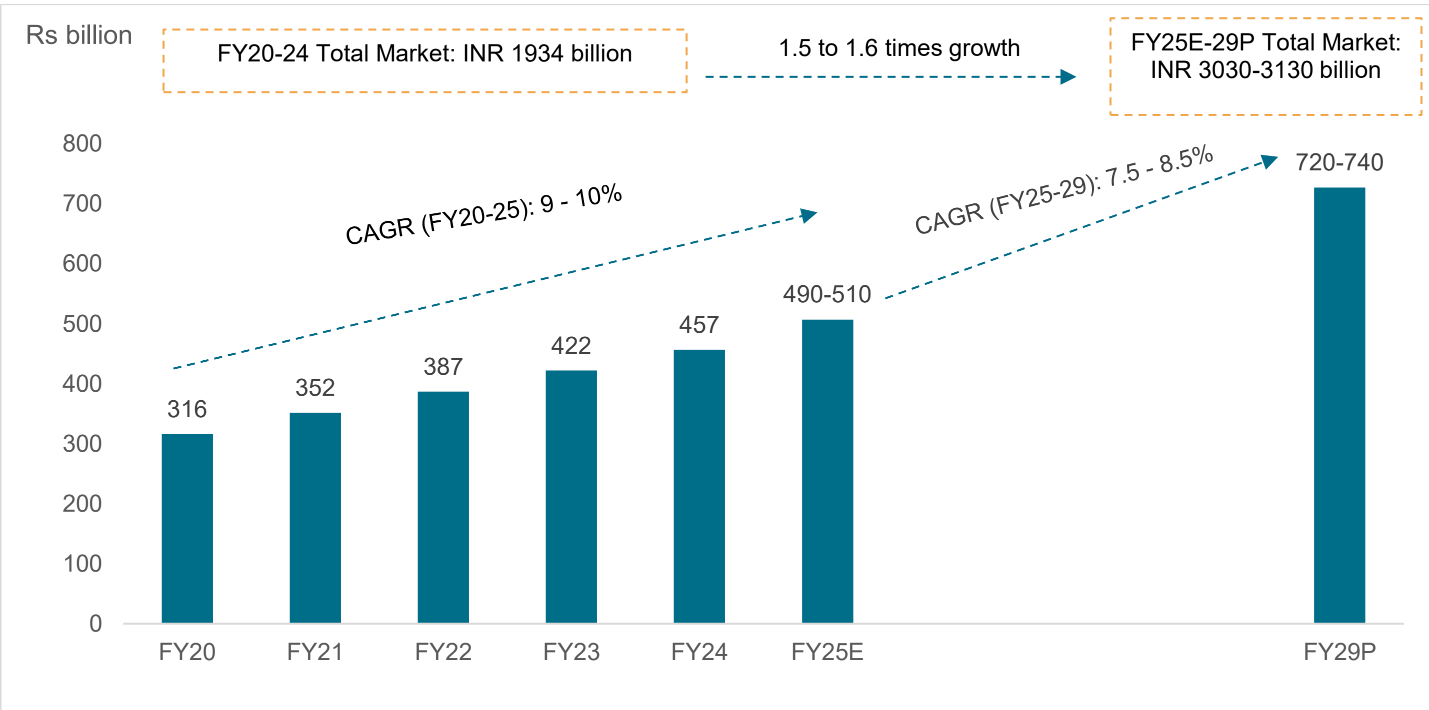
Ozonation: It involves injecting ozone gas into the water to disinfect and oxidize organic and inorganic pollutants. This method is widely used in textile and pharmaceutical industries, to remove residual dyes and ensure compliance with discharge norms. The advantages of ozonation include chemical-free disinfection, effectiveness against viruses and bacteria, and the ability to degrade recalcitrant organic compounds. Additionally, ozonation can be paired with solar power to reduce costs.

Others: Other key technologies and types of treatment plants include trickling filter, rotating biological contactor (RBC), upflow anaerobic sludge blanket (UASB) reactor, and constructed wetlands, which use various methods such as fixed bed media, rotating disks, sludge blankets, plants, and oxidising agents to break down organic matter and remove contaminants from water.

Market assessment of wastewater treatment

The Indian wastewater treatment market is projected to expand a substantial 1.6 to 1.7 times from Rs 1,934 billion during fiscals 2019-2024 to Rs 3.030-3,130 billion during fiscals 2025-2029, driven by policy initiatives of CPCB and SPCBs and the government's efforts to enhance sewage infrastructure and treatment capabilities. The urgent need to mitigate water pollution, improve water management and promote water reuse is fuelling demand for advanced wastewater treatment solutions, particularly in industries such as pharmaceuticals, leather, paper and pulp, and power plants.

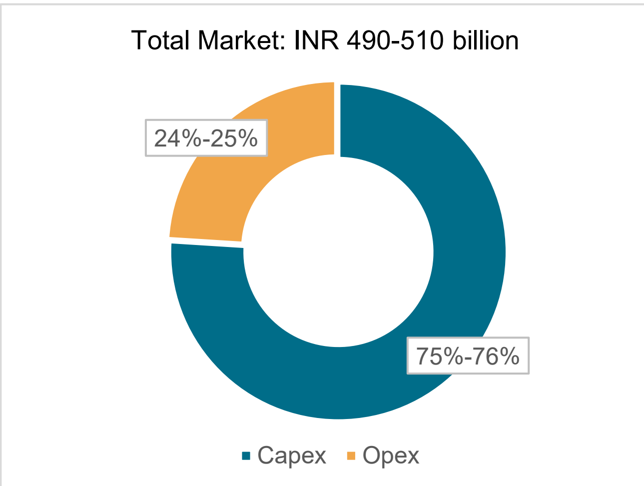
Size of India's wastewater treatment market (FY20-29P)



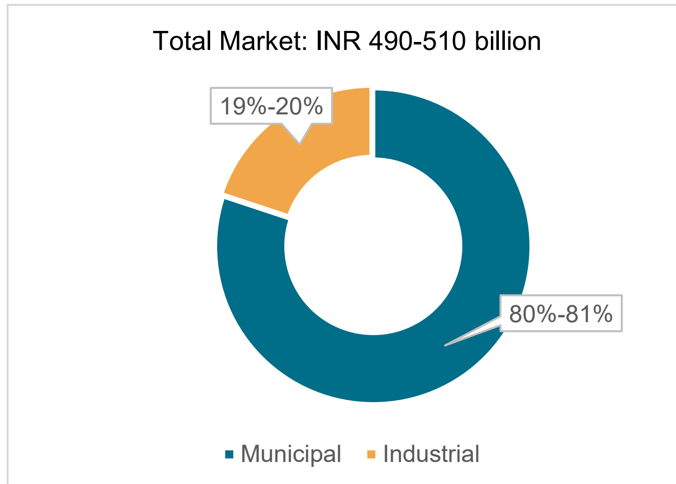
Note: P – Projected
Source: Crisil Intelligence

The adoption of cutting-edge technologies, including ultrafiltration, ozonation and zero liquid discharge (ZLD) techniques, is also contributing to the market's growth. These advanced technologies not only enable industries to comply with stringent regulations but also enhance the quality of treated water, making it suitable for various non-potable uses. As a result, India's wastewater treatment market is expected to expand significantly, driven by the increasing focus on modernisation, sustainability and environmental stewardship. The government's initiatives and policy push, combined with the growing demand for efficient wastewater treatment solutions, are expected to drive growth in the market.

Capex and Opex split of wastewater treatment market (FY25E)



Municipal and Industrial split of wastewater treatment market (FY25E)[1]

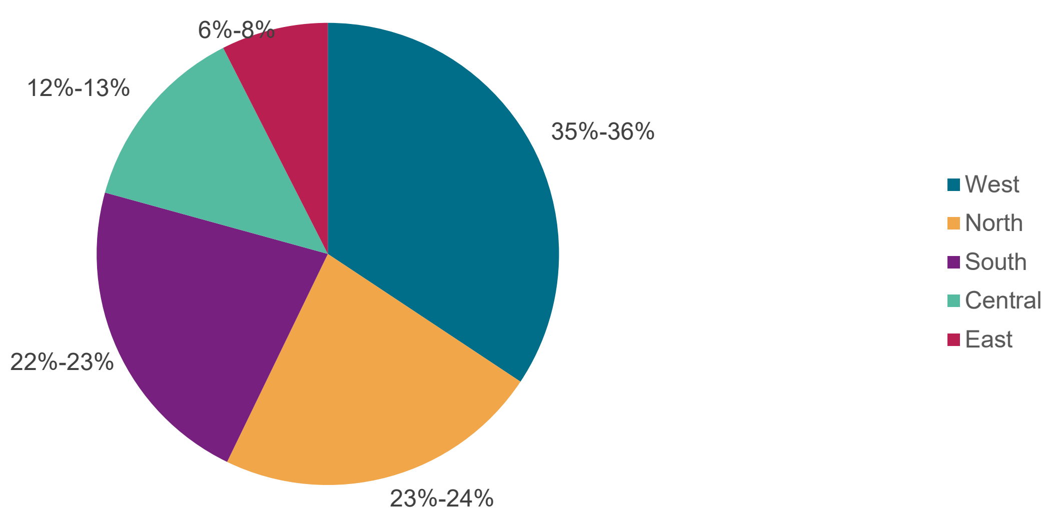


Note: P – Projected,

1: Industrial includes CETPs and ETPs

Source: Crisil Intelligence

Regional split of India's wastewater treatment market (FY25E)



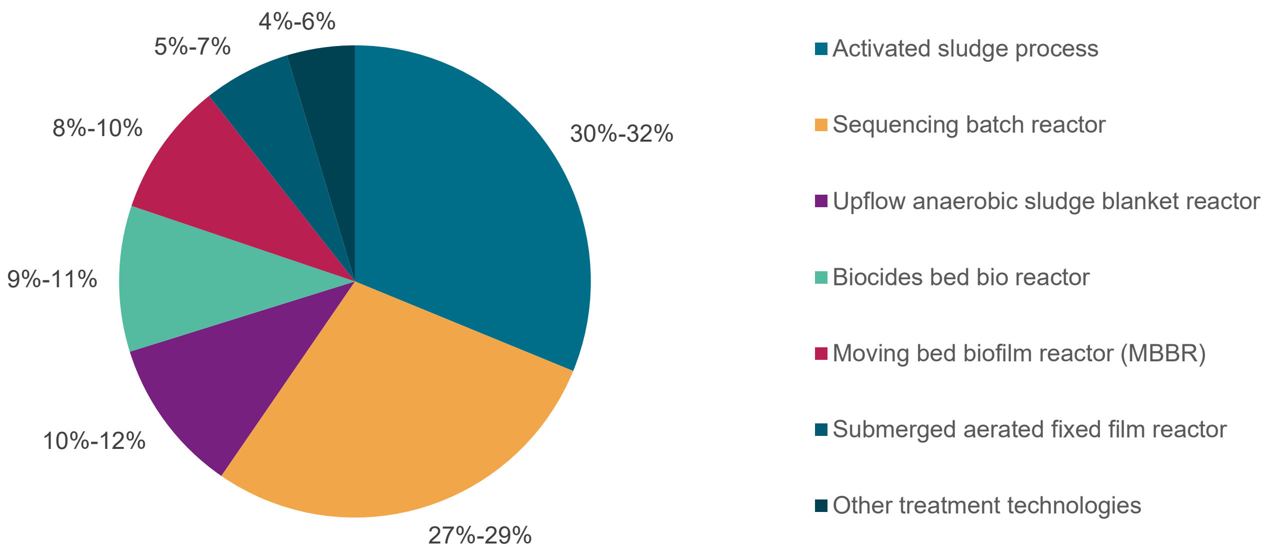
Note: North includes Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, National Capital Territory of Delhi and Union Territory of Chandigarh. Central includes Chhattisgarh, Uttarakhand, Uttar Pradesh and Madhya Pradesh. South includes Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Union Territory of Puducherry, Andaman and Nicobar Islands and Lakshadweep. East includes Bihar, Jharkhand, Odisha, Sikkim, West Bengal, Assam, Arunachal Pradesh, Manipur, Tripura, Mizoram, Meghalaya and Nagaland

Source: MoHA (Zonal Councils), Crisil Intelligence

The regional split of India's wastewater treatment market for fiscal 2024 reveals that the west region accounts for the largest market share (35%-36%), followed by the north region (23%-24%), the south region (22%-23%), and the central and east regions (~18%-21% combined). The top five states in terms of wastewater treatment capacity are Maharashtra, Gujarat, Uttar Pradesh, Delhi and Karnataka.

The Namami Gange programme, which has completed 127 projects with 90% of them located in the north, central and east regions, has likely contributed to the growth of the wastewater treatment market in these regions. The south and west regions, which include states such as Karnataka, Tamil Nadu, Maharashtra and Gujarat, have a significant share of the wastewater treatment market, driven by presence of major industrial hubs and urban centres and stringent reuse policies in these states.

Treatment technologies split of India's wastewater treatment market (FY25E)



Source: Crisil Intelligence

India's wastewater treatment market is dominated by conventional technologies, with ASP and SBR being the most widely adopted technologies. In fiscal 2024, ASP accounted for ~30-32% of the market and SBR for ~27-29%, together making up a significant share. The prevalence of ASP and SBR technologies can be attributed to their proven track record, ease of operation and relatively low maintenance costs. These technologies have been widely adopted across the country, with many sewage treatment plants (STPs) being designed and built using these technologies. The fact that they can treat wastewater to meet non-potable requirements makes them an attractive option for municipalities.

The other technologies, such as UASB reactor, biocides bed bio reactor and MBBR, though less prevalent, are still significant players in the market. These technologies are often used in specific applications or industries where their unique characteristics and advantages make them more suitable. For example, MBBR technology is often used in industrial applications where high organic loads are present, while UASB reactor is used in applications where biogas production is a priority. As India's wastewater treatment market continues to evolve, these alternative technologies are likely to gain more traction, driven by advances in technology, increasing environmental concerns, and the need for more efficient and effective treatment solutions.

Key projects in Wastewater treatment sector in India

Sr no	Project	State / Union territory	Capacity	Total cost (Rs Mn)	Status
1	Waste Water Treatment Plant (Worli)	Maharashtra	500 MLD	58,170	Under execution
2	Waste Water Treatment Plant (Malad)	Maharashtra	454 MLD	56,880	Under execution
3	Waste Water Treatment Plant (Dharavi)	Maharashtra	418 MLD 209 MLD (TTP)	46,360	Under execution
4	Waste Water Treatment Plant (Bandra)	Maharashtra	360 MLD	42,933.4	Under execution
5	Sewage Treatment Plant (Kukatpally, Quthbullapur & Serilingampally)	Telangana	376.5 MLD	12,808.7	Under execution
6	Sewage Treatment Plants (Hyderabad, South of Musi)	Telangana	480.50 MLD	11,800	Under execution
7	Sewage Treatment Plants (Agra)	Uttar Pradesh	176 MLD	9,400	Under execution
8	Integrated Sewerage System (Bhubaneswar) - JNNURM	Odisha	127.5 MLD	7,542.3	Under execution
9	Sewage Treatment Plant (Indore)	Madhya Pradesh	260 MLD	9,460.9	Planning
10	Sewage Treatment Plant (Koramangala-Chellaghatta Valley) Project	Karnataka	400 MLD	9,000	Planning
11	Sewage Treatment Plant (Pirana)	Gujarat	240 MLD 160 MLD (TTP)	8445.1	Planning
12	Common Effluent Treatment Plant (Vapi)	Gujarat	70 MLD	6603.6	Planning
13	Waste Water Treatment Plant (Nayanadana Halli)	Karnataka	150 MLD	5578.3	Planning

Note: The above list is not exhaustive and only an indicative list of projects

Source: Projects Today, CRISIL Intelligence

Recent initiatives across wastewater management

Initiatives	Details
Delhi Jal Board (DJB)	• In December 2024, DJB started partial operations of the Okhla STP under the Yamuna Action Plan Phase III in Delhi. Currently, the trial run is ongoing. The STP will be commissioned in phases • The project involves development of 124 million gallon per day at Okhla to treat the sewage generated in South Delhi, New Delhi Municipal Corporation (NDMC) areas and some other parts of Delhi
Greater Chennai Corporation (GCC)	• On October 30, 2024, GCC passed a resolution to raise municipal bonds worth Rs 2 billion for the construction of stormwater drains. The stormwater drain projects are expected to be implemented in Thiruvottiyur, Manali and Madhavaram localities in Northern Chennai • GCC will invest about Rs 4.7 billion under the Asian Development Bank-financed Kosasthalaiyar Basin project. Out of the 769 kilometre (km) drain network proposed, about 100 km is yet to be constructed under the project
Bangalore Water Supply and Sewerage Board (BWSSB)	• In October 2024, BWSSB proposed to mandate having onsite STPs in upcoming independent houses in Bengaluru. This mandate is already in place for apartment complexes built after 2016 • Reportedly, a new policy requiring dual piping systems and small recycling units in upcoming residential buildings has been approved by BWSSB. It will also be submitted to the government for approval and necessary legislative amendments
BWSSB has revived Kengeri Lake	• BWSSB has revived Kengeri Lake by filling it with treated wastewater. The lake had dried up due to absence of rainfall in Bengaluru • It further plans to recharge five more lakes and has issued a public disclaimer advising against using the water for potable purposes
Treated wastewater from fish processing plants proposed to be reused by steel rolling mills in Goa	• Treated wastewater discharged by fish processing plants is expected to be utilised for water requirements of steel rolling mills at the Cuncolim Industrial Estate in Goa. This water conservation solution has been suggested by the Goa State Pollution Control Board (GSPCB) • As per a study by GSPCB, seven fish processing plants and exporters together consume about 567 kld (thousand litres per day) and generate approximately 494 kld of wastewater • The steel mills need 749 kld of water every day for cooling, slag crushing, the furnace tank, and other processes
Ghaziabad Municipal Corporation (GMC)	• GMC has a significant budget for fiscal 2025, with Rs 1.94 billion earmarked for infrastructure development, including sewer and road construction, and Rs 1.39 billion for water conservation, distribution, and strengthening of water infrastructure • The corporation also expects to generate revenue through the sale of treated water, with estimated earnings of Rs 670.10 million from the TSTP (Tertiary sewage treatment plant) and Rs 5 million sewage which will supply treated water to private, industrial and other units, promoting sustainable practices and contributing to the corporation's revenue streams

Growth drivers of the wastewater treatment industry

Market drivers	Details
Supporting financial models for industries	• Improved risk allocation through innovative financing models, such as the hybrid annuity model (HAM), which is attracting private sector participation • Diversified funding sources, including international organisations (e.g., the World Bank, the Asian Development Bank and Japan International Cooperation Agency) and government grants and subsidies • Increased private sector participation, driven by the provision of additional funding sources and improved risk allocation
Unlocking revenue potential through reuse	• Implementing regulatory measures to enforce or incentivise the mandatory reuse of treated wastewater in industries • Creating a market for compost from digested sludge, which can provide an additional revenue stream
Integrated water management	• Sharing resources across projects, to increase the scale of operations and reduce costs • Implementing city-wide sanitation and wastewater treatment programmes, to achieve integrated water management and improve overall efficiency • Adoption of energy-efficient technologies, such as variable frequency drive (VFD)-based pumps, which can reduce energy consumption and costs • Conversion of biogas to bio-CNG (compressed natural gas), which can provide a new revenue stream and reduce greenhouse gas emissions
Focus on rural segment	• Decentralised wastewater treatment systems in rural areas, where traditional centralised systems are often not feasible due to lack of infrastructure and resources, are driving innovation and investment in this sector • Including the development of low-cost, community-based treatment systems that can effectively manage wastewater and promote sustainable sanitation practices in rural communities
Regularisation of O&M works by the government	• The government is making efforts to streamline O&M works in projects by introducing specific guidelines • It is promoting the One City One Operator model and long-term concession periods (25-30 years) to increase accountability of the private sector
Deploying technological innovations and energy efficient measures	• Operational efficiency of WTPs/ STPs is being improved through application of energy-saving systems such as VFD-based and other energy efficient pumps • New technologies such as sewer cleaning machines, programmable logic controller (PLC)-based SCADA systems, and sensor-based predictive maintenance are also being deployed

Key challenges in India's wastewater treatment industry

The industry faces numerous challenges in setting up and operations. They are grouped as follows: i) institutional challenges, ii) regulatory challenges, iii) economic challenges, iv) technological challenges, and v) social challenges.

Market challenges	Details
Institutional challenges	• ULBs are primarily responsible for the provision and maintenance of wastewater treatment facilities in their administrative area. However, in many cases, they lack the capacity to plan and implement such projects • Performance audit by CPCB in the 'human power availability in SPCBs" report (CPCB, 2020) based on category states that the shortage of staff is 37.6%, 39% and 52.3% in the Group A, B and C categories, respectively • Labs are not well equipped due to a shortage of manpower and procurement delays in instruments, equipment and consumables
Regulatory challenges	• No standards have been set for the ambient water quality for a surface waterbody which is probably on the receiving end of treated or untreated domestic sewage and, thus, misses the goals that need to be set (water quality criteria by CPCB are set based on the uses) • As per the CPCB notified "General Discharge Standards", a surface waterbody is regulated by 35 parameters, while wastewater for land application (or irrigation) is regulated by 10 parameters, not including heavy metals

Economic challenges	• Cost of STPs increases substantially with more advanced treatments that ensure reduced pollution
	  o Hence, the direct economic benefits from the STP derived from the use of treated water in agriculture or fisheries are considerably low
	• Higher capital and O&M (Operations and Maintenance) costs and cost of utilities are rarely covered by revenue from STPs (may include dried sludge and treated water) due to high uncertainty in demand
	  o Thus, smaller towns find it difficult to install STPs of adequate capacity, and the gap increases in cities and towns with lower revenue

Technological challenges	• Conventional centralised wastewater treatment plants are designed only to remove biological oxygen demand (BOD), nitrogen (N) and phosphorous. With rapid urbanisation, the nature and type of contaminants are changing, along with the emergence of new challenges. Hence, new technologies that are more efficient in treating water for reuse are required

Digital and technological initiatives

Digital initiatives	Details
Automatic drain cleaning machines by Bhubaneswar Municipal Corporation	• The Bhubaneswar Municipal Corporation plans to use automatic drain cleaning machines instead of excavators • They will be utilised owing to advantages such as automatic drain cover removal, silt extraction and a complete shift to mechanical cleaning of drains
Online monitoring stations by Delhi Pollution Control Committee	• The Government of Delhi has started constructing an online monitoring station along Yamuna River and different locations of drains flowing into it • It is being installed by the Delhi Pollution Control Committee. It will help access real-time data on pollutants discharged in the river. The work is expected to be completed by end-2025
Fully automated vacuum sewer network in Goa	• India's first fully automated vacuum sewer network system was inaugurated in Goa on October 15, 2024, under AMRUT. It is expected to aid sewage management for more than 200 households in areas with a high-water table, such as Mala and St Inez Creek in Panaji • The project is expected to overcome the geographical constraints of traditional gravity-based sewer systems, such as a high-water table and narrow lanes. It offers advantages such as minimal excavation requirements, fully sealed solution and prevention of groundwater infiltration
Desiltation machineries and monitoring systems	• The Hyderabad Metropolitan Water Supply and Sewerage Board has undertaken desiltation of 300,000 manholes under its 90-day initiative in Hyderabad, with the use of 220 airtech machines and 146 silt removal vehicles for sewage management • A dedicated dashboard has been established to monitor the initiative on a daily basis. It enables data uploading of details such as cleaned pipeline lengths and manhole counts, along with photographs as evidence. Also, Google Maps using CAN (Communication area network) numbers with GPS integration is being deployed to record complaints relating to sewage overflow, contaminated water and road silt

Adoption of ZLD systems in India

The Indian government, through the Ministry of Environment, Forest and Climate Change and CPCB, is promoting the adoption of ZLD systems for wastewater treatment in industries, with a focus on recycling and reusing wastewater.

ZLD involves advanced treatment technologies that convert wastewater into solid or vapor form. Its adoption is being driven by regulatory initiatives such as the National Guidelines on Zero Liquid Discharge 2015. While conventional treatment processes can be expensive, membrane-based technologies, such as reverse osmosis (RO), and energy-efficient water pumps, such as axial piston pumps, can help reduce costs. Industries such as textiles, tanneries and distilleries are under scrutiny to comply with environmental regulations, and the adoption of technologies such as RO, membrane-based filtration, ultrafiltration and nanofiltration is on the rise.

The benefits of ZLD include resource efficiency, maximised water recycling, reduced freshwater consumption, and cost savings in the long run, despite high initial investment, making it an attractive solution for addressing water scarcity in dry regions. In line with India's National Water Policy, CPCB drafted guidelines in 2015 for the implementation of ZLD technologies in water-polluting industries, with the goal of recovering and reusing treated water to conserve freshwater resources. The guidelines, which were circulated to SPCBs and Pollution Control Committees (PCCs) for feedback, targeted industries with high-polluting potential, such as distilleries, pulp and paper, textiles, pharmaceuticals, tanneries, and sugar production, which generate wastewater with high chemical oxygen demand (COD), biological oxygen demand (BOD), colour, metals, pesticides, toxic waste, solvents, and total dissolved solids (TDS). However, while CPCB has mandated ZLD for distilleries in the Ganga basin, it has not directed other industrial sectors to adopt ZLD, despite the potential benefits of this technology in reducing wastewater pollution and conserving water resources.

Sector	Number of industries implemented ZLD	Number of industries consented of having ZLD	Compliance status of ZLD plants reported by SPCBs/PCCs (not complying)
Pulp and paper	260	226	7
Distillery	210	204	4
Sugar	9	9	0
Textile	187	149	4
Pharma	304	286	12
Tannery	9	9	0

Note: Numbers are reported as of December 2022
Source: Status report by CPCB in compliance with NGT order dated February 8, 2022, Crisil Intelligence

Reuse of treated wastewater

India's policy landscape on treated water reuse is evolving to address water scarcity through improved infrastructure, service enhancements, and a recent focus on circularity, reflecting shifting priorities towards sustainable water management. Initially, the emphasis on infrastructure development was primarily driven by the need to address basic water supply and sanitation challenges, with a focus on constructing sewage treatment plants and developing wastewater treatment infrastructure to ensure proper sanitation and protect public health.

As the understanding of water management evolved, the focus shifted towards service-level improvement of the overall sanitation system, recognizing that merely building infrastructure was not enough, and it was equally important to ensure efficient operation and maintenance of the infrastructure, along with improving service delivery and access to water and sanitation services. In recent years, there has been a growing recognition of the need for circularity in water management policies, with circular economy principles emphasizing the sustainable use and reuse of resources, including water, to minimize waste and maximize resource efficiency.

The Bureau of Indian Standards (BIS) notifies various IS standards to ensure that the water quality meets the needs of industrial and agricultural sectors, while the Central Public Health and Environmental Engineering Organisation (CPHEEO) has recommended norms to ensure treated sewage quality for specified activities at the point of use, including norms for dissolved phosphorus, nitrogen, and faecal coliform, allowing treated sewage-water to be used in horticulture practices, golf courses, for irrigation of non-edible crops and some edible ones.

The governance model for the reuse of treated used water in India is multifaceted, involving various stakeholders at the national, state, and local levels, with the central government formulating extensive policies and regulatory frameworks, state governments developing region-specific regulations and incentives, and municipal authorities implementing used water treatment and reuse projects, while partnerships between government agencies, private sector entities, academic institutions, and civil society organizations are fostered to promote innovation, capacity-building, and community engagement.

The reuse of treated wastewater is a vital practice that can significantly mitigate water scarcity issues in various sectors, particularly in industries with high water demands. In India, despite the vast majority of treated wastewater being underutilized, its reuse for non-potable purposes such as crop irrigation, industrial processes, and groundwater recharge holds immense potential. One key area where water reuse can play a crucial role is in Thermal Power Plants (TPPs), which account for the largest share of freshwater use in the industrial sector.

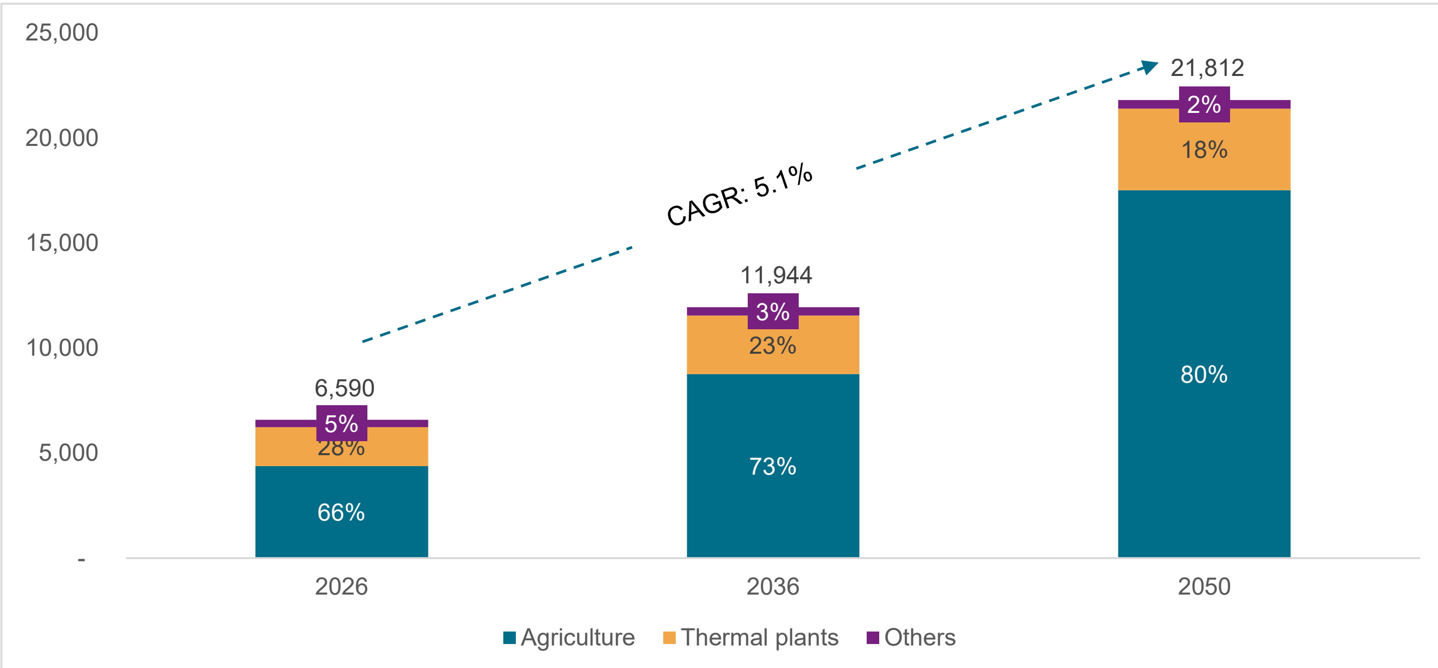
Potential reuse sectors of wastewater:

Byproducts of TWW	Sectors could use	Reuse segment
Treated sewage	Agriculture Industrial Municipal Energy	• TWW used in thermal power plant (TPP) for a variety of functions, including the boiler, cooling system, and coal and ash management systems, with the cooling system accounting for the majority of the volume • Non-potable requirements such as preparation of steam boilers and humidifiers, heat transfer in heating systems, pyro condensate, cooling liquid and solids, flushing of solid particles and gas purification, baths for the surface treatment of various kinds • Can be used in Irrigation across different crops, based on treated quality
Sludge	Agriculture Transport Energy	• Treated sludge can be used as urea for irrigation • Biomethane generated can be injected into the city gas network and partly replace the gas usually used for domestic purposes (heating, cooking, etc.) or to supply vehicles equipped to use it as fuel
Bio-solids	Agriculture	• Rich sources of nitrogen, phosphorous and potassium, critical nutrients in agriculture, of which phosphorous and potassium are imported by India.

According to the Niti Aayog circular economy waste water management report, the proportion of wastewater treatment is expected to increase significantly over the next few decades. By CY2026, agriculture and thermal plants are projected to account for 66% and 28% of wastewater treatment, respectively, with others contributing 5%. By CY2036, the share of agriculture is expected to rise to 73%, while thermal plants and others will account for 23% and 3%, respectively. By 2050, the proportion of wastewater treatment is expected to reach 80% for agriculture, 18% for thermal plants, and 2% for others.

It is noteworthy that this growth is expected to occur at a Compound Annual Growth Rate (CAGR) of 5.1% per year till CY2050. This rapid increase in wastewater treatment is crucial for ensuring the sustainability of our water resources and mitigating the impacts of climate change.

Sector wise waste water expected to be reused (Mcum/Year)



Source: Niti Aayog, Crisil Intelligence

As per inventory of STP (2021) by CPCB, only a small fraction of treated wastewater, approximately 3%, is being reused for valuable purposes. At the state level, Delhi is reusing about 405 MLD (12.5%) of its treated wastewater, and Haryana about 192 MLD (16%), Gujarat (60 MLD, 1.55%), Madhya Pradesh (84 MLD, 4%), Tamil Nadu (211 MLD, 6.6%), Chandigarh (27-40 MLD, 10-16%) and Puducherry (15.3 MLD, 26%). These regions are using treated wastewater for various purposes, including horticulture, irrigation, non-contact impoundments, washing, construction, and industrial activities.

The safe reuse of treated wastewater offers numerous benefits, including reducing the pressure on freshwater resources, curbing the over-extraction of groundwater, and mitigating the impacts of climate change on water availability. As noted by NITI Aayog, the over-extraction of groundwater is a major concern in India, and the reuse of treated wastewater can help alleviate this issue.

The use of treated wastewater for irrigation in farm fields near treatment plants can reduce the distance that water needs to be transported, resulting in significant water savings. Additionally, combining treated wastewater with micro-irrigation methods for horticulture crops can further reduce water consumption. By adopting this approach, cities can reduce their reliance on freshwater resources, mitigate the impacts of climate change, and promote sustainable agriculture practices. The safe reuse of treated wastewater is a critical step towards addressing India's water scarcity concerns and promoting sustainable development. Below are a few examples of current and upcoming reuse projects.

MAHAGENCO's wastewater reuse initiatives through multiple projects

MAHAGENCO has been actively involved in wastewater reuse initiatives in India, recognizing the urgent need to conserve freshwater resources, it started its wastewater reuse journey with the investment in a 130 MLD Sewage Treatment Plant to treat the sewage from Nagpur Municipal Corporation, marking the start of 110 MLD treated wastewater supply to Koradi

TPS. This was followed by the implementation of a 190 MLD Wastewater Reuse Project at Koradi TPS and Khaperkheda TPS, which is the first and largest project implemented under the Public-Private Partnership (PPP) model through Vishvaraj Environment Ltd. The project involves tertiary treatment of municipal wastewater to meet industrial-grade water quality standards. The project utilizes 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 operations across its plants.

MAHAGENCO also reuses 50 MLD of treated wastewater in its Chandrapur TPS and is implementing similar projects at New Koradi (2x660 MW) TPS, and Bhusawal TPS. The company's approach to wastewater reuse not only conserves vital freshwater for urban drinking and agricultural use, currently freeing over 350 MLD of fresh water, with upcoming projects set to add another 235 MLD, but also reflects a forward-thinking circular economy strategy focused on sustainable water resource management. By converting urban wastewater into a critical industrial input, MAHAGENCO demonstrates how utilities can drive sustainable development while enhancing operational resilience.

The first 110 MLD wastewater reuse project was funded by MAHAGENCO, while the ongoing 190 MLD and 50 MLD wastewater reuse projects, along with the upcoming 110 MLD Reuse at New Koradi TPS (2x660 MW), and 80 MLD Reuse at Bhusawal TPS, are being implemented under the PPP model through Vishvaraj Environment Ltd. is responsible for the design, financing, implementation, and long-term operations of these projects, enabling high efficiency, risk-sharing, and replicability of the model.

This initiative aligns with the Government of India's directive for thermal power stations to utilize treated sewage water within a 50 km radius, contributing to integrated urban-industrial water reuse and offering a scalable and sustainable solution for water-stressed cities and utilities across India. In total, approximately 7,335 billion liters of freshwater will be conserved for the people of the respective regions over the operational life (of approximately 30 years) through these reuse projects.

TTWP in Tamil Nadu (Kodungaiyur and Koyambedu)

The wastewater treatment and reuse facility at Kodungaiyur and Koyambedu in Tamil Nadu is a pioneering project that showcases the potential for large-scale wastewater reuse in India. Commissioned in 2020, this facility utilises ozonation for disinfection. The facility employs a multi-stage treatment process, including ultrafiltration, RO, rapid gravity sand filters, and ozonation for disinfection, to recycle municipal secondary treated water into industrial-grade water.

The treated water is stored and disinfected with ozone before being supplied to industries through a 60 km network, which includes intermediate pumping stations at Pillaipakkam, Vallamvadagal and Oragadam. The distribution of treated water to industries is managed by Small Industries Promotion Corporation of Tamil Nadu (SIPCOT), and approximately 691 industrial units benefit from this project. The Koyambedu plant has approximately 60 km of pipelines for conveying the treated water to industrial parks of SIPCOT, including Sriperumpudur, Oragadam and Irungattukottai. Whereas the kodungaiyur plant services industries such as fertilisers, petrochemicals, and thermal power plants.

- Built under the design, build and operate (DBO) model by:
  - VA Tech Wabag Ltd (Koyambedu project)
  - M/S BGR Energy System Ltd (Kodungaiyur project)

- Includes a 15-year O&M contract with Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)
- Total estimated cost for Koyambedu plant: Rs 3.97 billion (construction) + Rs 1.98 billion (O&M for 15 years)
- Total estimated cost for Kodungaiyur plant: Rs 2.35 billion (construction) + Rs 2.05 billiion (O&M for 15 years)
- Funding arranged under the scheme of Tamil Nadu Sustainable Urban Development Project (TNSUDP) and AMRUT

The key project stakeholders include TNSUDP, CMWSSB, VA Tech Wabag Ltd, M/S BGR Energy System Ltd and SIPCOT.

This project demonstrates the feasibility of large-scale wastewater reuse in India and highlights the importance of adopting innovative technologies to address the country's water challenges. By providing a reliable source of industrial-grade water, this facility is contributing to the growth and development of industries in the region, while also promoting water conservation and sustainability.

FMDA plans to increase reuse of treated water to 250 MLD in coming years

The city of Faridabad is taking steps to increase the reuse of treated wastewater, with a goal of boosting usage from 25-30 MLD to about 250 MLD within the next two years. Currently, the city's STPs and common effluent treatment plants (CETPs) have a treatment capacity of about 250 MLD, but the majority of the treated water is being disposed of in drains or canals instead of being reused.

- Total treated water being reused: about 25 MLD
- Current reuse applications:
  - 15 MLD for irrigation from the Badshahpur plant
  - 10 MLD for refilling Badkhal Lake
- Faridabad Metropolitan Development Authority (FMDA) is preparing a detailed project report (DPR) to utilise treated water for horticulture and parks
- About 700 parks and greenbelts require a supply of 60-80 MLD for watering plants

By increasing the reuse of treated wastewater, Faridabad aims to reduce its dependence on freshwater sources and mitigate the pressure on its water supply system. The city's plan to utilise treated water for horticulture and parks is a step in the right direction.

Additional Reuse projects across multiple states

Project Name	Location	STP Capacity (MLD)	Reuse water capacity	Treated water used by	Project status*
Bhesan Sewage Treatment Plant - Phase 1	Gujarat	100		Hazira based industries (Industrial use)	Completed
Variav-Kosad Sewage Treatment Plant	Gujarat	84		Hazira based industries (Industrial use)	Completed
Asarma Sewage Treatment Plant	Gujarat	15		Utran Gas Based Power Plant, GSECL.	Completed
Bamroli STP - Phase 1	Gujarat	57	40	Pandesara GIDC	Completed (Commissioned in 2014)
Dindoli Phase 1 STP	Gujarat	57	40	Pandesara Industrial Estate (Nos. of Units :178)	Completed (Commissioned in 2020)
Bamroli STP - Phase 2	Gujarat	50	35	Sachin Textile Process Industries Welfare Association (Nos. of Units : 71)	Completed (Commissioned in 2020)
Bingawan STP, Kanpur	Uttar Pradesh	210	40	Panki thermal power plant	Completed (Commissioned in 2024)
Shahjahanpur STP	Uttar Pradesh	45	40	Rosa thermal power stations	Completed (Commissioned in 2024)
Varachha – Valak – Kamrej STP	Gujarat	140		Industries in Kadodara – Palsana (Industrial use)	Under execution
50 MLD Pathanpura 45 MLD STP & Rahmat Nagar 25MLD STP – Chandrapur reuse plants	Maharashtra	120		Unit no. 8 & 9 (2 x 500MW) at Chandrapur Super Thermal Power Station (CSTPS)	Completed

Project Name	Location	STP Capacity (MLD)	Reuse water capacity	Treated water used by	Project status*
Bhesan (extention) Sewage Treatment Plant	Gujarat	70		Hazira based industries (Industrial use)	Under execution
Indirapuram sewage treatment plant	Uttar Pradesh	56	40	Sahibabad Industrial Estate, Ghaziabad	Under execution
Korba STP	Chhattisgarh	33	20.5	NTPC Jamni Pali	Under execution
Naini prayagraj sewage treatment plant	Uttar Pradesh	80	55	Bara thermal power station, Naini	Under execution (Planned to be completed in 2025)
Aligarh STP	Uttar Pradesh	45	30	Harduaganj thermal power stations	Under execution (Planned to be completed in 2025)
Bulandshahar STP	Uttar Pradesh	40	20	Rosa thermal power stations	Under execution (Planned to be completed in 2025)
Nimora STP	Chhattisgarh	90		Alok ferro alloys limited and Adani thermal power plant	Proposed
Chandandih STP	Chhattisgarh	75		NTPC-SAIL Power Company limited (NSPCL)	Proposed
Jalgaon STP	Maharashtra	48		Bhusawal thermal power stations	Proposed
New Koradi Reuse Project	Maharashtra	110	110	New Koradi (2x660 MW) TPS	Under execution
Bhusawal Reuse Project	Maharashtra	100	80	Bhusawal TPS	Under execution

*Note: Non exhaustive, *Please note that the project statuses mentioned are based on the latest available information on the respective websites and may have changed since the last update*

Source: CPCB, SPCB websites, News reports, Crisil Intelligence

Potential industrial reuse of treated wastewater

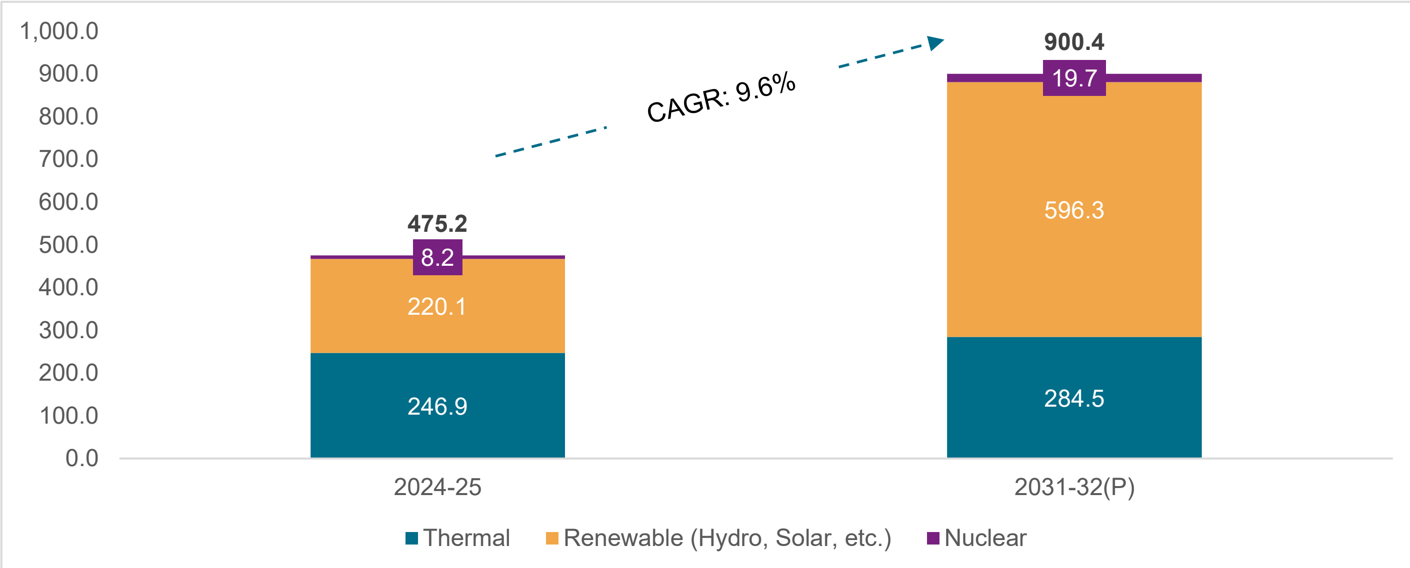
The benefits of water reuse for industries in India are multifaceted and significant. One of the primary advantages is the cost savings that can be achieved through wastewater reuse, with a study by The Energy and Resources Institute (TERI) estimating that thermal power plants can save INR 300 million annually and conserve 10 million cubic meters of water per year per plant. Additionally, water reuse plays a crucial role in environmental protection by reducing the amount of untreated discharge into rivers and groundwater, thereby mitigating pollution, seawater intrusion, and aquifer depletion, with a significant 40% of industrial wastewater being reused. Furthermore, water reuse enables industries to meet the stringent discharge norms set by the Central Pollution Control Board (CPCB), avoiding penalties that can range from INR 1-5 crore per violation, while also enhancing their sustainability credentials. Another benefit of water reuse is the potential for energy recovery, with anaerobic digestion of sludge producing biogas that can offset 10-20% of energy costs in large sewage treatment plants.

Many large Indian companies, particularly in the refining and steel sectors, are now moving towards adopting advanced in-house effluent treatment solutions, enabling them to reuse water and become environmentally compliant. For example, Indian Oil Corporation's (IOCL) refinery in Panipat has implemented a state-of-the-art effluent treatment plant that recycles and reuses over 80 – 95% of its wastewater in refineries, reducing its freshwater intake and minimizing its environmental impact. Similarly, Reliance Industries' Jamnagar refinery has implemented a zero-liquid discharge system, which treats and reuses all its wastewater, In the steel sector, companies like Tata Steel and JSW Steel have also adopted advanced water treatment and reuse technologies, with Tata Steel's Jamshedpur plant achieving a water recycling rate of over 90%. Additionally, Hindustan Zinc's (HZL) zinc has implemented an ZLD and only in FY24, it has recycled around 18 billion litres of the wastewater, making it one of the most water-efficient zinc smelters in the world. By adopting such solutions, these companies are not only reducing their environmental footprint but also enhancing their brand reputation, improving regulatory compliance, and contributing to the country's water security and sustainability goals.

Currently Thermal power plants are one of the major users of water in the country In recognition of this, the Ministry of Power's Tariff Policy (2016) mandates thermal power plants within 50 km of a sewage treatment plant to use treated sewage water, with associated costs allowed as a pass-through in the tariff. By adopting advanced treatment technologies, treated sewage water can be utilized in various stages of TPPs, such as ash pond sprinkling, cooling towers, and horticulture, making water reuse a vital strategy for ensuring sustainable operations in the thermal power sector.

As per the new environmental Regulations issued by MOEF&CC in Dec-2015, all new stations to be installed after 1st January 2017, shall be required to meet specific water consumption up to maximum of 2.5 m3/h / MW without FGD. These norms are, however, not applicable to the Thermal Power Plants using sea water. Since, the availability of water is going to be a concern in operation of thermal power projects in the future, efforts need to be made to access the feasibility of adopting air cooled condensers, especially in areas with shortage of water.

Total power generation capacity (in GW) in India



Source: NEP, CEA, Crisil Intelligence

The treated wastewater reuse market in India is poised for significant growth, driven by the increasing adoption of treated wastewater (TWW) in thermal power plants. With the current thermal power generation capacity of 247 GW expected to reach 284.5 GW as per the National Energy Policy (NEP), the potential market for TWW reuse is substantial. As thermal power plants begin to utilize TWW, a large and lucrative market is expected to emerge, presenting opportunities for stakeholders to capitalize on the growing demand for sustainable and efficient water management solutions.

National-level Initiative in wastewater reuse landscape:

Liquid waste-management rules:

To address the lack of standard rules for domestic and industrial sewage treatment, the government has introduced the Liquid Waste Management Rules, 2024. Notified by the Ministry Environment, Forest and Climate Change in October 2024, these rules aim to minimise, collect, treat, and reuse liquid waste, including wastewater and sludge. The rules will come into effect from October 2025, giving stakeholders a one-year period to comply with.

The key component of the initiative includes:

- Extended User Responsibility (EUR) framework, which requires industries, institutions, and large housing societies to treat and reuse a specified percentage of wastewater.
- Additionally, bulk users (those consuming more than 5,000 litres per day or generating 10 kg BOD per day) will be required to meet reuse targets of 20% by fiscal 28, increasing to 50% by fiscal 31.
- Urban local bodies (ULBs), wastewater treatment operators, and users will be responsible for setting up on-site sanitation systems, ensuring a comprehensive approach to liquid waste management.

This initiative has identified and provided the reuse target for new bulk users and existing bulk users along with industries, below are detailed target across each category:

Target for new bulk users:

	Minimum of the treated wastewater (percentage of water consumed)			
Category of bulk user	**FY28**	**FY29**	**FY30**	**FY31 and onwards**
Residential societies	20	30	40	50
Institutional / commercial /establishments such as government offices / private offices	20	20	40	40

Target for existing bulk users

	Minimum of the treated wastewater (percentage of water consumed)			
Category of bulk user	**FY28**	**FY29**	**FY30**	**FY31 and onwards**
Residential societies	10	15	20	25
Institutional / commercial / establishments such as government offices / private offices	10	10	20	20

Target for Industries:

	Minimum of the treated wastewater (percentage of water consumed)			
Category of bulk user	**FY28**	**FY29**	**FY30**	**FY31 and onwards**
Industrial Units	60	70	80	90

National Framework for the Safe Reuse of Treated Wastewater (SRTW):

The National Framework for Safe Reuse of Treated Water was launched by the National Mission for Clean Ganga (NMCG) under the Ministry of Jal Shakti in November 2022. It aims to promote the safe and sustainable reuse of treated wastewater in India, addressing water scarcity, environmental concerns, and economic opportunities.

Objective of the framework:

The main objectives for the Framework are to set the context, priorities and direction for SRTW, raise awareness of its importance and facilitate its implementation through support programmes. More specifically, the Framework will:

- Move India on a pathway of mainstreaming SRTW by 2022 by encouraging States to adopt the necessary enabling environment and actively promoting its implementation.
- View SRTW as part of the wider water cycle encouraging multiple cycles of use-reuse.
- Contribute to the Government's commitment to environmental sustainability and achievement of SDG 6.3 on improving water quality through increased recycling and safe reuse.

- Define the roles and responsibilities of various government entities and agencies and of other key stakeholders such as industry and other parts of the private sector, local government, civil society organisations and citizens.
- Establish funding mechanisms and support synergies among relevant Central Government programmes such as AMRUT, NMCG, SBM and JJM.
- Support initiatives on river basin planning including the potential for SRTW within the catchment water cycle and clarify entitlements for used water.

Scope of SRTW:

The Framework scope addresses the reuse of non-potable urban and rural wastewater, considering the varying levels of economic development and water availability across the country. It promotes a holistic approach to water management, integrating with existing policies on sanitation, faecal sludge management, and industrial wastewater reuse, while considering river basin planning and climate change mitigation. The Framework serves three key purposes, providing a structured approach to safely reusing treated wastewater from national to local levels

- the mandate for the reuse of treated used water for a range of non-potable end-uses, setting out the principles to incorporate in the planning and design of SRTW projects and encouraging adoption of national standards for different end-uses.
- a mechanism to support SRTW through provision of incentives, including access to funding programmes, and disincentives, including the actions at central level to facilitate uptake across the country
- a model policy framework for States to consider and adapt in the development and enhancement of their own policy, regulatory and implementation instruments,

The Framework focuses on wastewater generated from households and commercial activities in both urban and rural areas, including water treated by Sewage Treatment Plants (STPs) or Faecal Sludge Treatment Plants (FSTPs). While industrial wastewater is addressed through separate policies, the Framework acknowledges that it may not always be separated from municipal wastewater, requiring special attention to assess risks from contaminants like heavy metals.

Additionally, the Framework supports the separation of stormwater collection systems from sewerage systems, as part of integrated urban water management, allowing for more cost-effective treatment options, including nature-based solutions, to achieve required water quality standards for end-use.

There are a wide range of potential non-potable end users for SRTW in urban, rural and peri-urban settings, including:

- industry (including industrial estates, power generation and railways)
- agriculture (including forestry and horticulture) and aquaculture c) municipal uses (e.g., landscaping, parks, toilet flushing and firefighting)
- environment, including discharge into surface water bodies, maintenance of wetlands and environmental flows

- aquifer recharge (aquifer recharge should be kept as last priority when there is no other alternative for use of TUW. The level/ quality of treatment of TUW and method of recharging groundwater would need to be determined by States during the finalisation of their respective policies)
- construction
- on-site use within STPs for landscaping and cleaning of desludging vehicles.

Milestones planned under SRTW:

The policy emphasises for the achievement of targets of the 2030 Agenda of Sustainable Development Goals (SDGs) and set targets for 100% collection of used water and 100% treatment of used water by March 2027 to enable the achievement of targets for reuse. Specific short to medium term milestones are proposed phase wise for consideration in State policy:

- **Phase-I** Where STPs are operational and collection and treatment capacity already exists, 50% of TUW to be safely reused by 2030
- **Phase-II:** Where STPs are operational and collection and treatment capacity already exists, 100% of TUW to be safely reused by 2035.
- **Phase-III:** Where STPs do not exist or are non-operational and collection and treatment capacity does not yet exist, 30% of used water to be safely reused by 2030
- **Phase-IV:** Where STPs do not exist or are non-operational and collection and treatment capacity does not yet exist, 50% of used water to be safely reused by 2035.
- **Phase-V:** Where STPs do not exist or are non-operational and collection and treatment capacity does not yet exist, 100% of used water to be safely reused by 2045
- A situation of universal treatment and reuse will effectively lead to ‘zero untreated discharge cities

Wastewater reuse policy by Ministry of power under Tariff policy,2016

In 2016, India's coal power generation sector faced severe water shortages, resulting in the shutdown of several plants for extended periods. To mitigate this issue, the Ministry of Power introduced the Tariff Policy in January 2016. According to Clause 6.2(5) of the policy, thermal power plants located within a 50 km radius of a sewage treatment plant (STP) operated by a municipality or local body are required to use treated sewage water, with the cost of treatment being factored into the tariff as a pass-through expense. The thermal plants must also ensure a backup water source to meet their needs in case of a shortage from the STP. The policy stipulates that the cost of the STP is borne by the Urban Local Body, while the thermal power plant is responsible for the costs associated with tertiary treatment, pipeline transportation, and pumping systems. Additionally, any shutdown of the STP must be coordinated with the power plant developer to minimize disruptions. This policy aims to promote the use of treated sewage water in thermal power generation, reducing the sector's reliance on freshwater sources and mitigating the risk of water scarcity-related shutdowns.

TWW reuse policies across key states:

State	Policy	Details
Tamil Nadu	Treated Wastewater Reuse Policy 2019	• To reuse treated wastewater for industrial and agriculture uses. Memoranda of Understanding (MoUs) are signed between multiple ULBs and the user agencies for reuse of secondary treated effluent water.
West Bengal	Treated Wastewater Reuse Policy of Urban West Bengal (2020)	• The policy emphasizes the need for sustainable water management in West Bengal by promoting the reuse of treated wastewater, reducing dependence on freshwater resources and introducing reforms in planning, institution, finance, technology and regulation. • It acknowledges the benefits of reusing treated wastewater in agriculture, highlighting its potential to support sustainable water practices
Gujarat	Policy for Reuse of Treated Wastewater (2018)	• Maximise the collection and treatment of sewage generated and sustainable reuse of treated water, thereby reducing the dependency on freshwater sources. • The policy puts forward an ambitious target of reuse of 70% of treated wastewater by 2025 and 100% reuse by 2030.
Maharashtra	State water policy	• The policy encourages recycling or reuse of treated wastewater and mandates penal action of the polluter of water resources. • The policy considers that at least 80% of the water used for domestic purpose will be available for reuse. • It is the obligation of local bodies to make available the entire quantity of generated sewage for reuse, after treating it to the standards prescribed by the Maharashtra Pollution Control Board (MPCB)
Punjab	Treated Wastewater Policy (2017)	• Prioritises agricultural reuse of treated effluent for unrestricted irrigation. • The policy states that crops to be irrigated with treated effluents or a blend thereof with freshwater resources shall be selected to suit the irrigation water, soil type and chemistry, and the economics of the reuse operations
Madhya Pradesh	Govt. of M.P. State Level Policy (2017) for Waste Water Recycle & Faecal Sludge Management (FSM)	• The Department of Urban Development & Housing in Madhya Pradesh has introduced a state-level policy (2017) for wastewater recycling and faecal sludge management, aligning with national initiatives such as the National Urban Sanitation Policy 2008 and the Atal Mission for Rejuvenation and Urban Transformation. • While the policy recognizes agriculture as a potential sector for wastewater reuse, it restricts its application to non-agricultural purposes within urban areas, such as public parks, green spaces, and residential lawns, due to the limited availability of agricultural land in urban areas.
Jharkhand	Used water Policy, 2017	• The Jharkhand Wastewater Policy, 2017, views wastewater as a reliable and renewable water source, and emphasizes its importance in the state's water resources. The policy mandates urban local bodies to develop, manage, and treat wastewater, with a focus on reuse. • However, it takes a cautious stance on reusing treated wastewater for agricultural purposes due to concerns about public acceptance and potential health risks, reflecting a need for careful consideration and planning in this area.

State	Policy	Details
Haryana	Reuse of treated wastewater, 2019	• In October 2019, Haryana introduced a policy for the reuse of treated wastewater, considering the state's limited water resources and water quality concerns. The policy establishes a priority order for reusing treated wastewater, with a decreasing order of preference that starts with thermal power plants, followed by industrial units, construction activities, dual water supply systems in houses, offices, and business establishments, large commercial use, municipal use, and finally, agriculture and irrigation. • According to the policy, treated wastewater can be used for agriculture and irrigation purposes, but only if there is a surplus quantity available after meeting the demands of the above-mentioned uses, indicating that these other uses take precedence over agricultural, and irrigation needs.
Andhra Pradesh	Wastewater reuse and recycle for urban local bodies	• The Andhra Pradesh policy on wastewater reuse and recycle for urban local bodies aims to promote the use of treated wastewater as a substitute for groundwater. The policy prioritizes the use of reclaimed water for industrial and agricultural purposes, in order to conserve freshwater for domestic uses. • Additionally, the policy outlines a framework for institutional arrangements, participatory approaches, and legislative measures to support the effective implementation of wastewater reuse and recycling in urban areas, ensuring a holistic approach to water management.
Rajasthan	State Sewerage and Wastewater Policy, 2016	• In 2016, the Local Self Government Department of Rajasthan introduced the State Sewerage and Wastewater Policy, with the primary objective of enhancing the health and well-being of the urban population, particularly the poor and underprivileged, by providing sustainable sanitation services and protecting the environment. • The policy emphasizes the treatment of wastewater to produce an effluent that meets the World Health Organization (WHO) guidelines, making it suitable for reuse in irrigation. • Furthermore, the policy explores potential financial models and approaches to incentivize the effective implementation of wastewater treatment and reuse, promoting a sustainable and environmentally friendly approach to water management.
Chhattisgarh	Waste Water Recycle & Reuse Policy	• The Urban Administration and Development Department has introduced a Used Water Recycle and Reuse Policy, aiming to encourage the reuse of treated used water that adheres to specified quality standards for non-potable purposes. • The policy seeks to promote the harmonious coexistence of domestic, agricultural, and industrial sectors by reusing treated water, thereby reducing the likelihood of inter-state conflicts over scarce water resources and ensuring a more sustainable and equitable distribution of this precious resource.
Karnataka	Policy for Urban Used Water Reuse	• In December 2017, Karnataka approved the Policy for Urban Used Water Reuse with a goal to establish an enabling environment for the reuse of municipal used water in order to maximize efficient resource use, protect the environment, address water scarcity and enhance economic output. Agriculture is one of the major categories of reuse in this policy. • The policy also outlines the pricing of treated water and the recovery of operational costs for wastewater treatment plants.

State	Policy	Details
Jammu and Kashmir	J&K state policy for wastewater reuse (2017	• It aims to promote the sustainable use of treated wastewater to address water scarcity and environmental concerns in the Union Territory. Developed under the framework of the Jammu and Kashmir Water Resources (Regulation and Management) Act, 2010, the policy encourages the reuse of treated wastewater for non-potable purposes such as irrigation, industrial processes, and construction • It outlines steps for implementing reuse projects, including technical and economic feasibility assessments, PPP models, and compliance with standards set by the CPCB and NGT directives. The policy emphasizes decentralized treatment systems and stakeholder coordination to enhance infrastructure and public acceptance
Telangana	Telangana State Policy for Reuse of Treated Wastewater (2017)	• It aims to address water scarcity and promote sustainable water management by encouraging the reuse of treated wastewater for non-potable purposes such as irrigation, industrial use, and urban applications like landscaping and construction. • Aligned with the National Urban Sanitation Policy and directives from the CPCB, the policy emphasizes reducing freshwater demand in a water-stressed state through measures like mandatory reuse for industries within a certain radius of STPs, PPPs, and the development of infrastructure for wastewater treatment and distribution. • It also promotes initiatives like Mission Kakatiya, which integrates wastewater reuse with tank rejuvenation to enhance water conservation and groundwater recharge

Source: Crisil Intelligence

Market drivers for reuse TWW

Government Initiatives

- Emphasis on water conservation, wastewater treatment and reuse through initiatives, such as the National Water Mission, Swachh Bharat Abhiyan and the recently launched Liquid Waste Management Rules, 2024, will create a favorable policy environment

Economic benefits

- Revenue generation from the sales of treated water, lower wastewater treatment cost and support for the circular economy
- Hyderabad Metropolitan Water Supply and Sewerage Board is selling water to private companies in the nearby areas for non-potable use

Cross-Sectoral Synergies

- Government initiatives are poised to facilitate the convergence of treated wastewater reuse opportunities across different sectors and industries
- For example, programme aimed at enhancing agricultural productivity, such as the PM Krishi Sinchayi Yojana, are exploring the potential of reusing treated municipal wastewater for irrigation in peri-urban areas

Market challenges for TWW:

Lack of prescribed standards for reuse of sludge

- Absence of clear guidelines and regulations for the reuse of sludge from wastewater treatment plants
- Uncertainty about the safe and effective use of sludge in various applications, such as agriculture or construction

Lack of infrastructure

- Limited availability of infrastructure to support the reuse of treated wastewater
- Pipelines and distribution networks to transport treated water to industries or agricultural areas
- Storage facilities to hold treated water until it is needed.

Lack of incentives to end-users

- Limited economic benefits or incentives for industries, farmers or other end-users to adopt treated wastewater reuse
- High costs associated with treating and transporting wastewater, which can make it less competitive with traditional water sources

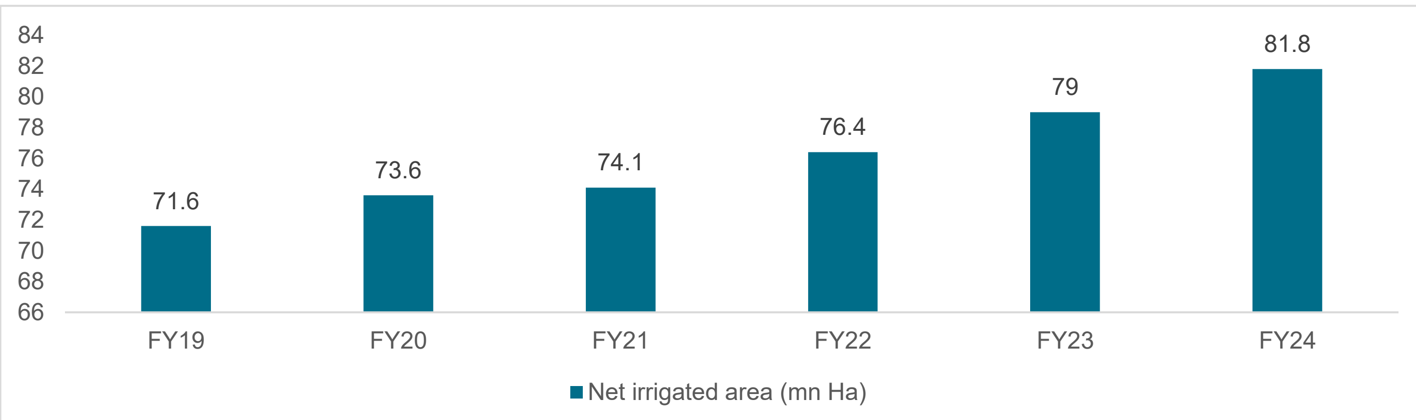
An overview of the irrigation sector in India

India has the second-largest agricultural land, with 181.95 million hectares (Mha) of agricultural land (MoA&FW, 2016). The country is also one of the leading producers of various crops, including wheat, rice, sugarcane, cotton, pulses, tea and oilseeds. With more than half of the population dependent on agriculture for their livelihood, the sector plays a crucial role in India's economy and food security. The agricultural sector contributes around 18% to the country's GDP and provides employment to over 50% of the workforce (MoA&FW, 2016). However, the sector faces several challenges, including low productivity, limited access to dependable irrigation and inadequate infrastructure.

The Ultimate Irrigation Potential (UIP) in India has been assessed at 140 Mha (CWC, 2013). However, the irrigation potential created (IPC) is only 112 Mha and the gross irrigated area is 93 Mha, resulting in a gap of 19 Mha (16%) between IPC and irrigation potential utilised (IPU) (MoA&FW, 2016). The major causes of this gap include poor maintenance of the canal systems, lack of participatory management and inefficient water use. The efficiency of irrigation for surface and groundwater is currently around 30-40% and 55-60%, respectively, indicating significant potential for improvement (MoWR, RD & GR, 2017). The gap between IPC and IPU is a significant concern, as it affects the livelihoods of millions of farmers and the overall food security of the country.

The area under irrigation in India has been consistently increasing since FY21, with the net irrigated area expanding from 71.6 million hectares in fiscal 2019 to 81.8 million hectares in fiscal 2024. This growth can be attributed to the investments made by various states to improve their irrigation penetration. Notably, southern states such as Andhra Pradesh, Telangana, and Karnataka, along with Madhya Pradesh, have been at the forefront of creating new irrigated areas, demonstrating a steady commitment to enhancing their irrigation infrastructure. Additionally, Odisha has emerged as a significant contributor to improving irrigation penetration, with a substantial increase in outlay towards irrigation, underscoring the state's efforts to boost agricultural productivity and reduce dependence on rainfall. The sustained growth in irrigated area is a positive trend, indicating a gradual shift towards more reliable and sustainable agricultural practices in the country

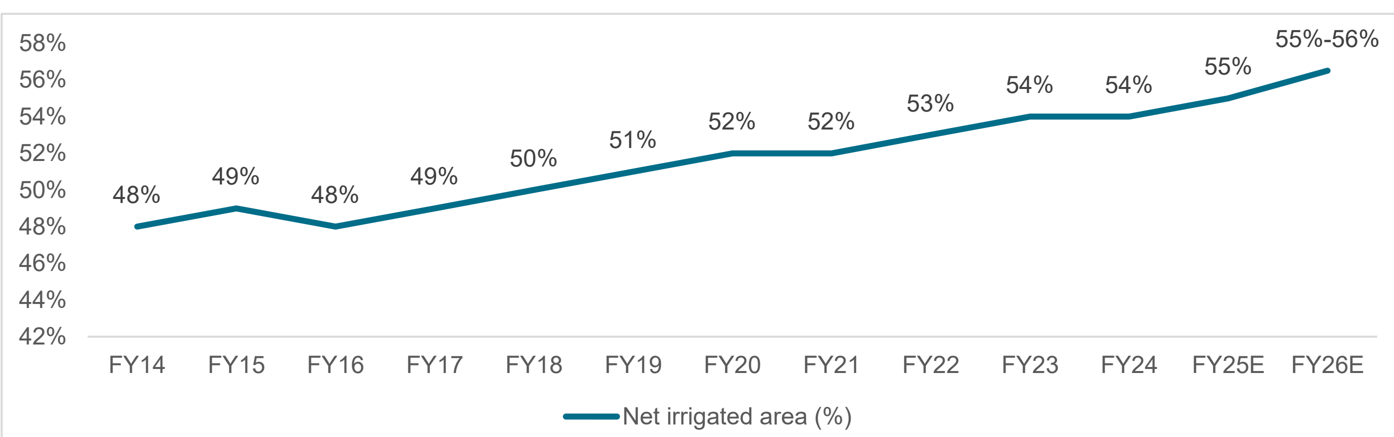
Net irrigated area in India for the year



Source: Ministry of agriculture, Crisil Intelligence

Irrigation penetration in India is expected to witness a marginal improvement, reaching 55%-56% by fiscal 2026. Despite efforts to enhance irrigation infrastructure, most states still heavily rely on natural rainfall, indicating a significant dependence on monsoon patterns. As of FY23, irrigation penetration levels stood at 54%, and are projected to increase to around 55% by FY25. The anticipated growth in investments in the irrigation sector over the next few years is expected to drive this improvement, suggesting a gradual shift towards more reliable and sustainable irrigation practices. However, the pace of progress is likely to be slow, highlighting the need for continued investments and initiatives to enhance irrigation infrastructure and reduce dependence on rainfall.

India's irrigation penetration levels over the years



Note: Irrigation penetration is net irrigated area over net sown area

Source: Ministry of agriculture, Crisil Intelligence

The irrigation sector is poised for significant growth, with the irrigated land area expected to reach around 55% by FY25. This growth is anticipated to drive the sector's value to Rs 6,500-7,500 billion, representing a 1.5 to 1.6 times increase from the Rs 4,600 billion recorded in the FY19-24 period. The direct correlation between crop yield and irrigation levels is a key factor driving this growth.

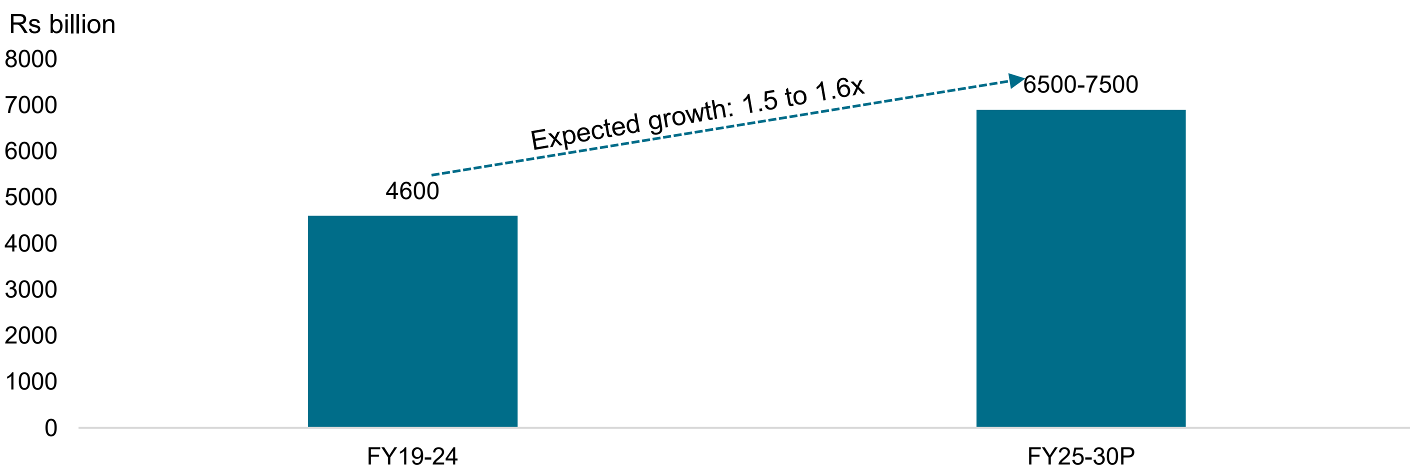
In terms of state-funded irrigation construction, capital expenditure is expected to rise by 10-12% in FY25, building on a high base. This increase is driven by a heightened focus on completing major irrigation projects. After averaging a 3% annual growth rate between FY21 and FY24, investment in irrigation is expected to accelerate, with a 5% increase anticipated in FY25 and a further 8% rise in FY26, as key states prioritize the completion of ongoing projects

Many states still have less irrigation coverage than the national average, showing there is a lot of room for improvement. The top seven states account for 65-70% of total irrigation investment, as they either have high agricultural output or ongoing irrigation projects. These states have played a major role in the sectors growth, and their continued investments will be important for expanding irrigation coverage.

Between fiscal years 2025 and 2027, states like Telangana, Maharashtra, and Gujarat are expected to significantly increase their spending on irrigation compared to the previous three years (fiscal years 2022-2024). Odisha, which has recently started investing more in irrigation, is likely to join the top seven states in terms of spending.

The government has increased the spending requirement by state governments from 32% to 42%, in line with greater transfer of taxes to states. The central government will play an active role in monitoring the progress of PMKSY projects, and has taken several steps to crystallise investments for irrigation

Construction spending in irrigation



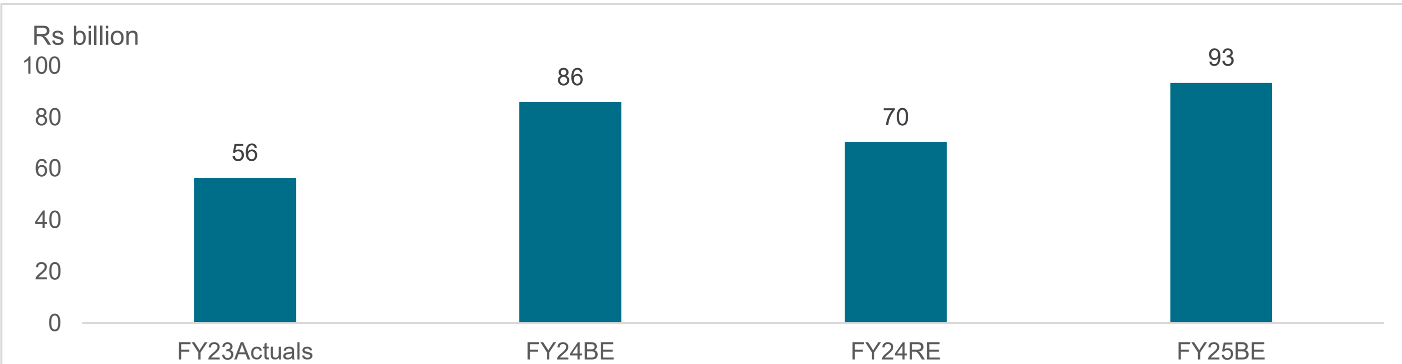
Notes: P-Projected
Source: Crisil Intelligence

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

To address the challenges in irrigation, the government launched the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) in 2015. The scheme aims to provide an end-to-end solution in irrigation supply chain, including water resources, distribution, and efficient application and extension services. The programme has four components: Accelerated Irrigation

Benefit Programme (AIBP), Har Khet Ko Pani (Command Area Development and Water Management), Repair, Renovation, and Restoration (RRR) of Water Bodies, and Per Drop More Crop (micro-irrigation). The scheme focuses on creating additional irrigation potential, improving water-use efficiency, and bridging the gap between IPC and IPU. The PMKSY scheme is an umbrella programme that converges investments in irrigation through comprehensive District and State irrigation plans.

Budgetary allocation for PMKSY scheme



Source: India Budget, Crisil Intelligence

Several projects have been fast-tracked under PMKSY, including the Gosikhurd Irrigation Project in Maharashtra and the Polavaram project in Andhra Pradesh. The Polavaram project, which has been under construction for over 75 years, aims to irrigate 23,20,000 acres of land and provide water to 13 districts in Andhra Pradesh. The project is expected to be completed by 2027. The Gosikhurd Irrigation Project, launched in 1984, aims to irrigate 2.5 lakh hectare of land in the Vidarbha region of Maharashtra. These projects are critical to addressing the irrigation needs of the region and improving the livelihoods of farmers.

The Har Khet Ko Pani component of PMKSY emphasises a participatory approach, engaging farmers in the optimal upkeep of irrigation systems and effective utilisation of irrigation water. The participatory approach focuses on engagement of beneficiaries – farmers – that helps immensely in the optimal upkeep of irrigation system and effective utilisation of irrigation water.

The Per Drop More Crop (PDMC) component aims to develop a mechanism for water-use efficiency through micro-irrigation. Studies have shown that micro-irrigation can increase irrigated land by 8.41%, reduce the irrigation cost 32.3%, and increase productivity of fruits and vegetables by 42.3% and 52.8%, respectively (MoA&FW, 2014). The PDMC component is critical to improving water-use efficiency and reducing the burden on groundwater resources.

Micro Irrigation Fund (MIF)

- MIF with an initial corpus of Rs 50 billion was operationalized in NABARD in 2019-20 to facilitate State Govts. efforts in mobilizing additional resources for expanding coverage under micro irrigation and incentivizing its adoption beyond provisions of Pradhan Mantri Krishi Sinchayee Yojana-Per Drop More Crop.
- The Ministry of Agriculture & Farmers' Welfare (MoA&FW), Government of India (GoI), has conveyed that the continuation and augmentation of the Micro Irrigation Fund (MIF) by an another Rs 50 billion (as announced in the Union Budget 2021-22) for the 15th Finance Commission period has been approved by the Union Cabinet in its

meeting held on 03 October 2024, with the interest subvention revised to 2% from the earlier 3%. Accordingly, the Board of Directors (BoD) of NABARD, in its 259th meeting held on 12 November 2024, approved the augmentation and continuation of the MIF funding arrangement for State Governments during the 15th Finance Commission period.

- Under the funding arrangement, loans will be extended to participating State Governments with a 2% interest subvention from the Government of India (GoI) starting from October 3, 2024.
- During 2025-26, no loan amount has been sanctioned, and loan amount of Rs 1.12 crore has been released. Cumulative loan sanctioned stood at Rs 47.19 billion, against which Rs 37.51 billion has been released as on 31 May 2025.
- The sanctions made by NABARD till date under MIF envisages expansion of micro irrigation coverage by an area of 22.22 lakh ha. Out of this, an area of 21.69 lakh ha has been covered by the States as on 31 March 2024

State wise loan sanctioned and released under MIF

Sr. No	Name of the State	Loan Sanctioned (INR bn)	Loan Released (INR bn)
1	Andhra Pradesh	6.2	6.2
2	Gujarat	7.6	6.4
3	Tamil Nadu	13.6	13.6
4	Haryana	7.9	3.7
5	Punjab	1.5	0.3
6	Uttarakhand	0.1	0.0
7	Rajasthan	7.4	5.8
8	Karnataka	2.9	1.6
	Total	**47.2**	**37.5**

Notes: As on 31st May 2025

Source: NABARD, Crisil Intelligence

Key projects in Irrigation:

Sl. No	State	Project Name	Brief Projects description	Area	Project cost (Rs Billion)
1	Telangana	Kaleshwaram Lift Irrigation Project	The project involves construction of barrage across river Godavri near Medigada village across river Godavari, state for diversion of 195 TMC (5522 million Cubic Meter) of Godavari water to irrigate about 18.25 lakh acres of land in 13 districts (out of total 31 districts) of Telangana. The project also proposes to provide drinking water facility for Hyderabad and Secunderabad cities. Total land requirement about 32,000 ha	18.25 lakh acres	1,278.73
2	Gujarat	Kalpasar Dam Project	Narmada Water Resources, Water Supply & Kalpsar Department plans to construct 64 km long dam across the Gulf of Khambhat and the Narmada Estuary to create a lake consisting of an area over 2,770 km2 at Kalpasar in Gandhinagar district of Gujarat.		1,002.00
3	Rajasthan	Link Channel (Parbati-Kali Sindh-Mez-Chakan-Banas-Ghanbhiri-Parwati) Project	Water Resources Department, Rajasthan plans construction of Link Channels (Ram Jal Setu Link Project) in between Parbati-Kalisindh-Mez-Chakan-Banas-Ghanbhiri-Parwati etc. rivers (Part-I) in Rajasthan. The project will provide irrigation facilities to an extent of 568342.37 acres of land. The project is expected to support Rajasthan 17 districts	568342.37 acres	750.0
4	Andhra Pradesh	Polavaram Irrigation Project	The project will provide irrigation facilities to an extent of 7.20 lakh acres i.e. (4.00 lakh acre under left main canal and 3.20 lakh acre under right main canal) in Visakhapatnam, East Godavari, West Godavari and Krishna districts. Power Generation of 720 MW diversion of 80 TMC of water to Krishna Basin, providing 23.44 TMC of water supply to Visakhapatnam city and industries enroute villages are also proposed in the scope. The project will also generate 960 MW of hydel power	7.2 Lakh acres	555.49
5	Rajasthan	Eastern Rajasthan Canal Project	The project proposes to bring Chambal River water to 13 parched districts of east Rajasthan, the project will help to irrigate nearly 10 lakh acres of land.	10 Lakh acres	370
6	Telangana	Palamuru-Rangareddy Lift Irrigation Scheme	The project will spread over 15,790 ha. of land and will divert 75 tmcft water from Jurala project to Koilkonda reservoir. From there, the water will be diverted to Mahaboob Nagar and Rangareddy and Nalgonda districts. The Palamuru lift irrigation scheme is intended to irrigate seven lakh acres in Mahaboob Nagar; 2.75 lakh acre in Rangareddy; and 30,000 acres in Nalgonda district and the project will also supply drinking water to Hyderabad.	10.8 Lakh acrea	352
7	Maharashtra	Gosikhurd Irrigation Project	The Gosikhurd project under construction of the Wainganga River near village Gosikhurd in Pauni taluka of Bhandara district offers an irrigation potential of 250,800 hectares, an irrigable command area of 190,000 hectares, live storage capacity of 1,025 Mm3 (36.2 TMC) and water utilisation capacity of 1,634 Mm3 (57.7 TMC). The dam site would be 45 km from Bhandara. The work on the project is in progress, with completion re-schedule for December 2027.	2.5 Lakh acres	260

Sl. No	State	Project Name	Brief Projects description	Area	Project cost (Rs Billion)
8	Rajasthan	Indira Gandhi Nahar Project - Stage II	The IGNP Stage-II starts from the tail of stage-I i.e. from Km 189 of IGNP main canal comprises of 256 km long (km 189 to km 445) main canal and the requisite distribution system to irrigate CCA of 12.44 lakh ha consisting of 8.02 lakh ha under flow irrigation and 4.42 lakh ha under lift canals with irrigation intensity of 80 per cent for flow and around 60 per cent for lift. The project will provide irrigation to 9.01 lakh ha in multiple districts	12.45 Lakh hectares	69.22
9	Rajasthan	Mor Sagar Artificial Reservoir Project	Eastern Rajasthan Canal Project Corp. plans construction of Mor Sagar artificial reservoir and feeder from Bisalpur to Mor Sagar artificial reservoir including all components in Sawai Madhopur district of Rajasthan on Hybrid Annuity Model / EPC basis		41.39
10	Madhya Pradesh	ISP-Parwati Micro Lift Irrigation Scheme [Phase-III & IV]	Narmada Valley Devp. Authority (NVDA) was implemented ISP-Parwati Micro Lift Irrigation Scheme (Phase-III & IV) in Madhya Pradesh on EPC basis. The project envisages irrigation in 1,00,000-hectare up to 2.5 ha. Chak.	1 Lakh hectare	41.32

Note: The above list is not exhaustive and only an indicative list of projects
Source: Projects Today, CRISIL Intelligence

Focus on groundwater development

There are 112 irrigation-deprived districts in the country, particularly in the Eastern and North-Eastern States, where groundwater development is low. The government is preparing a scheme to develop groundwater-based irrigation in 96 districts, covering an area of 21.35 lakh hectare, at an estimated cost of Rs 394.76 billion. The scheme aims to provide assured irrigation in these districts and is expected to be implemented over the next three years.

Future outlook of Irrigation:

The future outlook for India's irrigation involves a multi-faceted approach, incorporating key components such as investment in irrigation infrastructure to improve efficiency, participatory irrigation management to engage farmers in optimal upkeep, and promotion of water-saving technologies like micro-irrigation. Additionally, groundwater development, particularly in irrigation-deprived districts, and agricultural diversification into high-value crops and livestock, are also crucial. These strategies aim to enhance water use efficiency, reduce the burden on groundwater resources, and contribute to the country's food security and farmers' livelihoods, ultimately driving sustainable growth and development

River interlinking projects are unlocking new opportunities for water management, including lift irrigation and canal development

The Interlinking of Rivers (ILR) scheme, also known as the National River Linking Project (NRLP), is a large-scale civil engineering initiative proposed by the Government of India to manage the country’s water resources more effectively. Conceptualized in the 1980s and advanced by the National Water Development Agency (NWDA), it aims to connect water-surplus river basins, primarily in the north and east (such as the Ganga and Brahmaputra), with water-deficit regions in the south and west through a network of approximately 30 links. These links include 14 Himalayan and 16 Peninsular components, involving the construction of canals, reservoirs, tunnels, and dams to transfer excess monsoon water and mitigate issues like floods, droughts, and uneven water distribution, As of 2025, priority links like Ken-Betwa and Mahanadi-Godavari are in advanced stages, with detailed project reports (DPRs) completed and some construction underway.

This project has the potential to provide new opportunities for reservoir development, which can store excess water during monsoons and release it during dry periods, preventing floods and ensuring a steady supply of water for irrigation, drinking, and industrial purposes. The construction of reservoirs, such as the Daudhan Dam in the Ken-Betwa link, will require expertise in dam building, earthworks, and concrete structures, creating opportunities for civil engineering firms and industries involved in heavy machinery manufacturing and material supply.

The development of canals under the ILR scheme offers lucrative prospects for the construction sector, as it entails building extensive lined and unlined channels, aqueducts, and tunnels. The project involves the construction of approximately 15,000 km of canals, which will require surveying, dredging, and lining operations to prevent seepage and ensure efficient water flow. This will create demand for geospatial technology firms for mapping and GIS services, as well as pipe and valve manufacturers for distribution systems. The scale of these projects will foster job creation in skilled labor, logistics, and maintenance, while attracting investments from global players in water management technology. Additionally, the canal development will provide opportunities for industries involved in irrigation infrastructure.

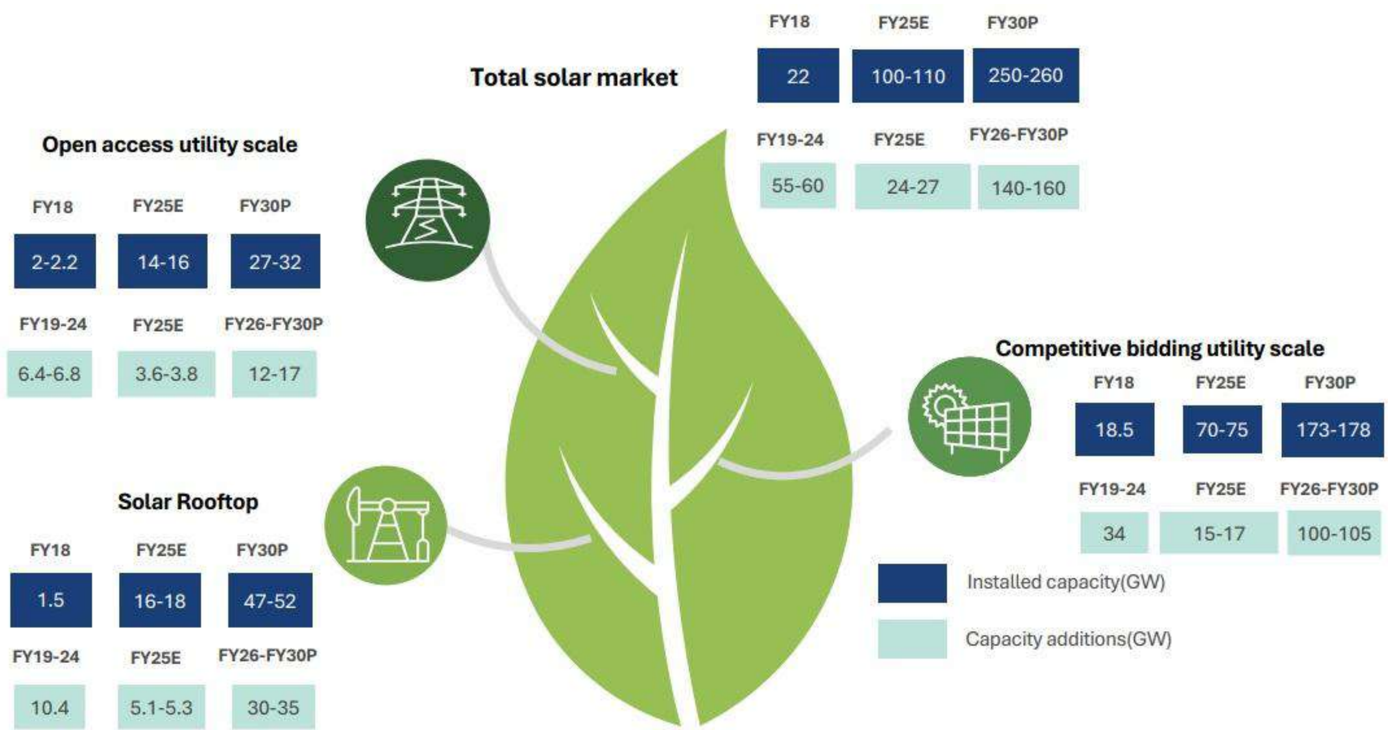
Lift irrigation schemes within the ILR provide targeted opportunities for the pumping and energy industries, involving the installation of high-capacity pumps, pipelines, and control systems to lift water over elevations. This segment benefits electrical engineering firms for automation and SCADA systems, alongside manufacturers of submersible pumps and drip irrigation components, enabling micro-level water delivery to farms and boosting agro-industry ties. The use of renewable energy, such as solar-powered pumps, can reduce costs in remote areas and provide a sustainable solution for lift irrigation. The ILR scheme also presents opportunities for industries involved in environmental consulting, water treatment, and smart technology for real-time monitoring of flows and leaks, which will be essential for the efficient operation and maintenance of the project.

The ILR scheme has the potential to unlock broader industrial opportunities in related fields, such as environmental consulting for impact assessments, water treatment for quality control, and smart technology for real-time monitoring of flows and leaks. Industries can also explore export potential by developing expertise in large-scale water infrastructure, while contributing to national goals of food security and rural development through enhanced irrigation coverage.

An overview of the Solar, wind, BESS and PSP sector in India

Solar capacity additions of 140-160 GW expected over fiscals 2026-2030

The solar additions momentum from previous fiscal has not faltered in fiscal 2025, with close to 21 GW solar capacity already added in 11M fiscal, an 235% rise compared to same duration previous fiscal. With a robust pipeline project and easing supply chain pressures, fiscal 2025 is expected to have add 24-27 GW and fiscal 2026 is expected to continue momentum adding 24-29 GW, supported by moderating raw material prices.



Source: Crisil Intelligence

CRISIL Intelligence expects 140-160 GW of solar capacity additions over fiscal 2026-2030. This will be driven by additions under:

- **Other central schemes:** The Solar Energy Corporation of India (SECI) has also started tendering projects outside the JNNSM Batch programme. It has initiated the Inter-State Transmission System (ISTS) scheme, wherein projects are planned for connection with the ISTS grid directly. Under this, the SECI has already tendered and allocated more than 35 GW (including hybrid).
- **State solar policies:** ~27 GW of projects are under construction and are expected to be commissioned over fiscal 2026-2030. Based on tendered capacities by states at the as of February, a further ~12 GW worth of solar projects are expected to be up for bidding over the same duration.

- **PSUs:** The Central Public Sector Undertaking (CPSU) programme under JNNSM has been extended to 12 GW in February 2019. The government is also encouraging cash-rich PSUs to set up renewable energy projects. In particular, NTPC has already commissioned a total of over ~3.7 GW of new capacity in fiscal 2025 so far under various schemes. It has a target of installing ~35 GW of renewable energy capacities by fiscal 2028. Similarly, NHPC had allocated 2 GW of projects in 2020, while the Indian Railways has committed to 20 GW of solar power by 2030. Other PSUs such as NLC, defence organizations, and governmental establishments are also expected to contribute to this addition.

- **Renewable Energy Expansion Plans** Indian government has set an ambitious target of achieving 500 GW of installed electricity capacity from non-fossil sources by 2030. To meet this goal, it plans to add 50 GW of renewable energy capacity every year for the next five years, from FY24 to FY28. As part of this initiative, the government will invite bids for 50 GW of renewable energy capacity annually, which will include the development of at least 10 GW of wind power capacity per annum. These projects will be connected to the Inter-State Transmission System (ISTS), enabling the efficient transmission of renewable energy across the country

- **Rooftop solar projects:** Crisil intelligence expects 30-35 GW of rooftop solar projects to be commissioned by fiscal 2030, led by by PM Surya Ghar Yojana and industrial and commercial consumers under net/gross metering schemes of various states.

- **Open-access solar projects:** Crisil intelligence expects 12-17 GW of open-access solar projects (under the capex and opex mode) to be commissioned by fiscal 2030, led by green energy open access rules 2022, sustainability initiatives/RE 100 targets of the corporate consumers, better tariff structures and policies of states such as Uttar Pradesh and Karnataka, which are more long term in nature .

- **Push for Green hydrogen:** Production for green hydrogen is expected to start from fiscal 2027 with production of 0.5 million tonnes of production. The government has set the target production of 5 million tonnes of green hydrogen by 2030. As per the announcement, we expect 2-3 MTPA of green hydrogen to commission which can lead to further upside of solar capacity of 28-30 GW, by fiscal 2029. However, developers may tie-up via grid / open access and not go to the captive route generation under this segment will remain monitorable.

- **Development of solar parks and ultra mega solar power projects:** Launched by the Ministry of New and Renewable Energy in December 2014, the Solar Park Scheme aims to promote the development of solar power in India. Initially, the scheme targeted the installation of 20,000 MW of solar power capacity through the setup of at least 25 solar parks and ultra-mega solar power projects within a five-year period, starting from 2014-15. However, the scheme's capacity was later enhanced to 40,000 MW and expanded to 58 solar parks across 13 states in March 2017, with a new target completion date of FY26. The scheme's objective is to support states and union territories in establishing solar parks with necessary infrastructure, including developed land, transmission systems, water access, road connectivity, and communication networks. By providing these facilities, the scheme facilitates the rapid installation of grid-connected solar power projects, enabling large-scale electricity generation and contributing to India's renewable energy goals.

The MNRE has amended the solar bidding guidelines, solar-wind hybrid projects guidelines, and also guidelines for procurement of round-the-clock (RTC) power. The amendments include incorporating several provisions related to

extension in commissioning timelines, the definition of force majeure, payment security, and terms of default (discussed in detail later). Overall, the amendments are positive and aimed at resolving hurdles faced by developers.
Further, an amendment to open access regulations via the green energy open access rules through energy banking regulations, changes in minimum contract demand, standardizing calculation of charges, etc will solve the key issues of high levies, absence of banking provisions, and standardization across procedures prevalent in the open access market.
CRISIL Intelligence's outlook factors in the prevailing market dynamics, where regulatory/policy support is key. The renewable energy domain is highly dependent on policy support, and any uncertainty surrounding this is considered negative.

PM Kusum scheme

Pradhan Mantri Kisan Urja Suraksha evam Utthan Mahabhiyan (PM-KUSUM) Scheme for de-dieselisation of farm sector and enhancing the income of farmers. Under the Scheme, central government subsidy upto 30% or 50% of the total cost is given for the installation of standalone solar pumps and also for the solarization of existing grid-connected agricultural pumps. Further, farmers can also install grid-connected solar power plants up to 2MW under the Scheme on their barren/fallow land and sell electricity to local DISCOM at a tariff determined by state regulator. This scheme is being implemented by the designated departments of the State Government.

The PM KUSUM Scheme has the following components:

- **Component A:** Setting up of 10,000 MW of Decentralized Ground/ Stilt Mounted Grid Connected Solar or other Renewable Energy based Power Plants by the farmers on their land.
- **Component B:** Installation of 14 Lakh Stand-alone Solar Agriculture Pumps.
- **Component C:** Solarisation of 35 Lakh Grid Connected Agriculture Pumps including Feeder Level Solarization.

Details of achievement under each component till 30th April 2025:

- **Component A:**
  - Total sanctioned solar capacity: 10,000 MW
  - Total Installed solar capacity: 587.03 MW
- **Component B:**
  - Total sanctioned standalone pumps (Nos.): 12,24,229
  - Total installed standalone pumps (Nos.): 8,114,667
- **Component C:**
  - Total Pump Sanctioned for Individual Pump Solarisation: 95,308
  - Total Pump solarised for Individual Pump Solarisation (Nos.): 7,043
  - Total Pump Sanctioned for Feeder level Solarisation: 35,78,874
  - Total Pump solarised for Feeder level Solarisation (Nos.): 4,01,666

Wind energy to see capacity additions of 34-36 GW over fiscal 2026 to 2030

The wind power sector in India has witnessed significant growth, with a record high addition of 4,151 MW in fiscal 2025. The first quarter of fiscal 2026 has already seen 1,637 MW additions, primarily in Gujarat and Karnataka. Notably, at least 34% of these additions were driven by pipeline projects from schemes where Power Purchase Agreements (PPAs) were signed between fiscal 2019 and 2022, under SECI tranches V, VIII, IX, X, and XI.

Despite the growth, the sector faces challenges such as transmission constraints, which have reduced bid response in allocations. The Central Transmission Utility (CTU) has proposed using existing and under-construction non-renewable energy substations for integrating renewable power, which is a positive step. However, adequate grid infrastructure remains a key monitorable for wind power.

On a positive note, the Solar Energy Corporation of India (SECI) has signed PPAs for approximately 16.4 GW of Inter-State Transmission Systems (ISTS) connected wind capacities over the past six years. With 34% of the allocated capacity in the pipeline and commissioning timelines of 18-24 months, capacities are expected to be commissioned over the next few fiscal years.

Considering these factors, Crisil Intelligence expects wind power capacity additions to reach approximately 34-36 GW over fiscal 2026-2030, higher than the estimated 14 GW over fiscal 2020-2025. Out of the estimated additions, 21-22 GW is expected to come from competitively bid wind projects, while the remaining 13-14 GW is expected from the open access segment.

Overview of battery energy storage system (BESS)

A battery energy storage system (BESS) is an electrochemical device that charges (or collects energy) from the grid and discharges that energy at a later time to provide electricity or other grid services when needed. The battery system comprises the battery pack, which connects multiple cells to appropriate voltage and capacity; the battery management system (BMS); and the battery thermal management system. The BMS protects the cells from harmful operation, in terms of voltage, temperature and current, to achieve reliable and safe operation and balances varying cell states-of-charge (SOCs) within a serial connection. The battery thermal management system controls the temperature of the cells according to their specifications in terms of absolute values and temperature gradients within the pack. The inverter system, also called power conversion system, converts the DC power to AC power while discharging and converts the AC power to DC power while charging the batteries.

Benefits of BESS

Benefits	Description
Grid stability	A BESS stores the excess energy that is produced during peak production time, which can be released during low demand period. This consistent flow of energy/ power helps in proper functioning of the grid and allows to maintain an optimal balance of power/energy demand and supply.
Power backup	As BESS can store excess energy within itself, it helps in providing a reliable power backup in areas with frequent power outrages or in facilities that require continuous power supply.
Potentially reduced carbon footprint	Deploying a BESS can also help in reducing carbon footprint by storing electricity, which can be used during high demand/ peak demand times.

Source: Crisil Intelligence

Types of BESS

Several battery chemistries are available or under investigation for grid-scale applications, including lithium-ion, lead acid, redox flow, nickel cadmium, and sodium sulphur. Battery chemistries differ in key technical characteristics and each battery has unique advantages and disadvantages.

Battery type	Round-trip efficiency	Life span	Advantages
Lithium-ion battery	88-90%	10-15 years	High specific energy and high load capabilities with power cell
Sodium-sulphur battery storage	75-85%	10-15 years	Low-cost potential: Inexpensive raw materials and sealed, no-maintenance requirement
Nickel-cadmium battery	60-80 %	10-15 years	Rugged, high cycle count with proper maintenance
Vanadium redox flow battery	70-75%	5-10 years	Long service, versatility
Lead-acid battery	70-75%	3-6 years	Low-cost and simple manufacture, low cost per watt-hour

Note: Round-trip efficiency, measured as a percentage, is a ratio of the energy discharged from the battery to the energy put into the battery
Source: CEA; handbook on energy storage system by ADB, December 2018; Crisil Intelligence

As per National Electricity Plan 2023 (NEP 2023), capacity of 8,640 MW or 34,720 MWh is estimated to be added between 2022 and 2027 in the BESS segment. The highest capacity addition is expected in solar energy at ~38,890 MW.

The overall capacity addition is expected to be further augmented between 2027 and 2032, during which 38,564 MW or 201,500 MWh is estimated to be added in the BESS segment. The other segments that are also expected to have notable additions are solar, wind, and coal + lignite at 179,000 MW, 49,000 MW, and 25,480 MW, respectively.

Overview of PSP sector in India

Pumped Storage Projects (PSPs) are a type of hydroelectric energy storage technology that plays a crucial role in balancing electricity supply and demand. They work by pumping water from a lower reservoir to an upper reservoir during off-peak hours, using excess energy, typically generated from renewable sources such as solar or wind power. This excess energy is used to pump water to the upper reservoir, which is usually located at a higher elevation. During peak hours, when electricity demand is high, the water is released back to the lower reservoir, passing through turbines, which generate electricity. This process helps to stabilize the grid, provide backup power, and support the integration of renewable energy sources, making PSPs a vital component of a reliable and efficient power system. Additionally, PSPs can also help to mitigate the intermittency of renewable energy sources, such as solar and wind power, by storing excess energy generated during periods of high production and releasing it during periods of low production. This makes PSPs an essential tool for ensuring a stable and reliable supply of electricity, while also supporting the transition to a more sustainable and renewable energy-based power system.

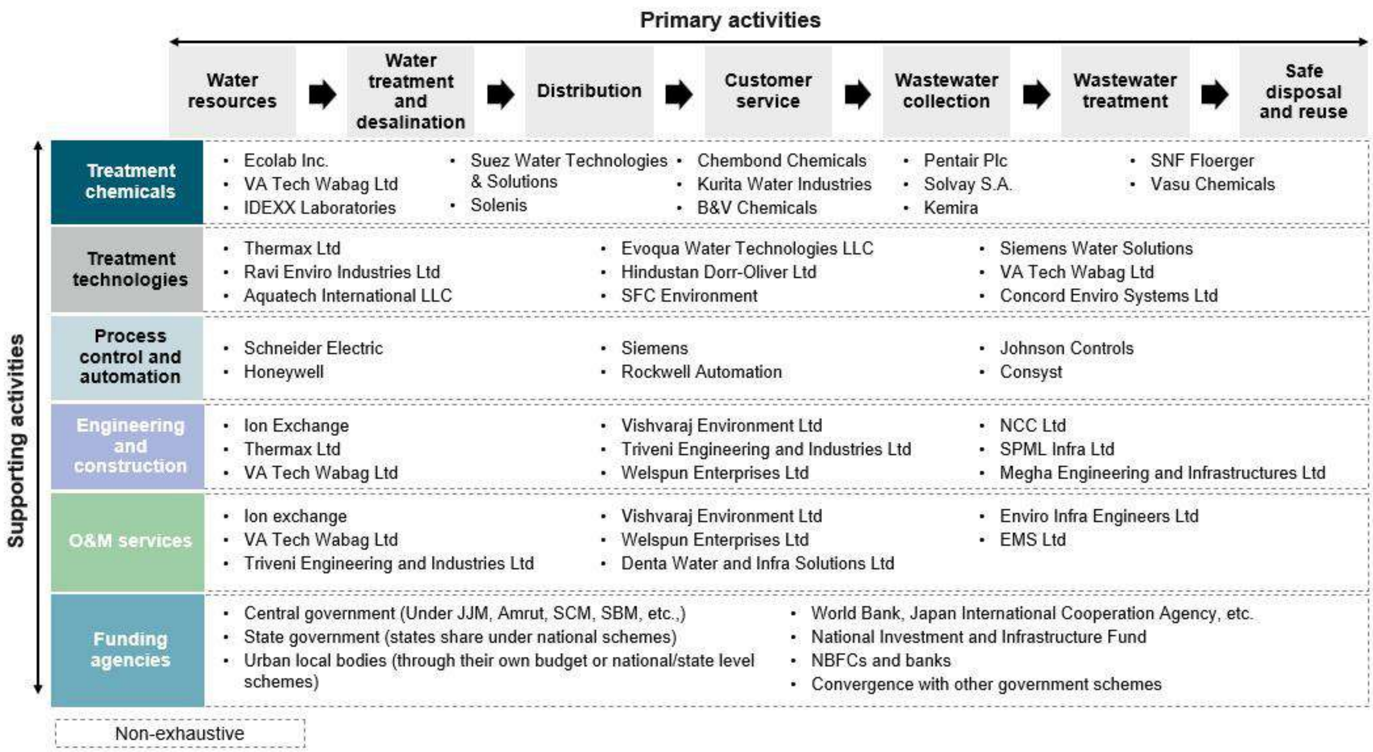
India has set ambitious plans to develop its PSP capacity, with the Central Electricity Authority (CEA) aiming to commission at least 13 PSPs with a total capacity of approximately 22 GW by 2025-26. These projects are expected to be completed within 4 years, with a target completion date of 2030. The development of these PSPs will significantly enhance the country's energy storage capacity, contributing to grid reliability and supporting India's renewable energy goals. The participation of the private sector in this segment is also encouraging, with self-identified PSPs contributing to the growing potential of PSPs in the country, which has now crossed 200 GW as per CEA and is increasing steadily.

In terms of current progress, two PSPs with a total capacity of around 3000 MW are expected to be commissioned this year. By 2035-36, the CEA has planned for a total addition of approximately 80 GW of PSP capacity. To achieve this goal, several projects are currently under development. For instance, 8 projects with a total capacity of 10 GW are under construction, and 3 projects with a total capacity of around 3 GW have had their Detailed Project Reports (DPRs) approved. Furthermore, 49 projects with a total capacity of 66 GW are under survey and investigation, indicating a strong pipeline of upcoming PSP projects in the country. Overall, India's PSP sector is poised for significant growth, with the government and private sector working together to harness the country's vast potential for pumped storage hydroelectricity.

5. An overview of the value chain, SWOT analysis and government policy of Indian water and wastewater treatment industry

Value-chain analysis of water and wastewater management in India

The water and wastewater market value chain are a complex network of activities that work together to provide clean water and sanitation services to communities. The primary activities of the value chain include sourcing of water resources, treatment and desalination, distribution, customer service, wastewater collection, treatment, and safe disposal and reuse. These activities are supported by a range of secondary activities, including raw material providers, engineering and construction, operations and maintenance (O&M) services and financial management.



Notes: The above infographic is only indicative in nature and not exhaustive representation of the sector
Source: Crisil Intelligence

Treatment chemicals: Treatment chemicals such as Corrosion inhibitors, Scale inhibitors, Biocides and disinfectants, Coagulants & Flocculants, and Chelating Agents are used to treat and manage water and wastewater. Companies like Ecolab, VA Tech Wabag, Ion exchange, among others, provide these specialized chemicals to help prevent corrosion, scaling, and microbial growth, while also improving water clarity and quality. These solutions are essential for ensuring the safety and efficiency of water treatment operations, and are used in a variety of applications, including industrial, municipal, and wastewater treatment

Treatment Technologies: Different technologies such as Membrane Bio Reactor and Activated Sludge Process are used across the landscape to improve water treatment operations. Companies like Aquatech, SFC environment, Evoqua water technologies and others provide these technologies, enabling the removal of pollutants and contaminants from water, and producing high-quality effluent that meets regulatory standards.

Process control and automation: It plays a crucial role in water and wastewater treatment plants, enabling efficient and reliable operation, as well as ensuring compliance with regulatory standards. Advanced automation systems, such as supervisory control and data acquisition (SCADA) and distributed control systems (DCS), are used to monitor and control various treatment processes, including chemical dosing, filtration, and disinfection. These systems utilize sensors, actuators, and programmable logic controllers (PLCs) to collect data, analyze trends, and make adjustments in real-time, optimizing treatment performance and minimizing energy consumption. Additionally, automation enables remote monitoring and control, allowing operators to respond quickly to changes in water quality or system conditions, and reducing the risk of human error. By leveraging process control and automation, water and wastewater treatment plants can improve treatment efficiency, reduce costs, and provide safer, more reliable services.

Engineering and construction Multiple companies like Triveni engineering and industries, Vishvaraj Environment, NCC, SPML, Megha Engineering and infrastructures, Welspun and others are responsible for designing and building the infrastructure required to support the water and wastewater market. These companies provide a range of services, either through EPC model or PPP model, to help build and upgrade water and wastewater treatment plants, distribution systems, and other infrastructure. Once the infrastructure is built, trial runs are done and detailed guidelines and regulatory checks are done then the project is transferred for maintenance in case of PPP/HAM models it is with the same company or SPV created for the project. In the case of EPC contracts, the project is typically transferred to another entity selected to manage maintenance services, as per the contractual agreement. In some instances, the contract may stipulate that the EPC contractor will provide maintenance services for an initial period of one to two years, after which the responsibility is handed over to a separate entity

Operations and maintenance (O&M) service providers in India, such as VA Tech Wabag, SUEZ, Enviro, Vishvaraj play a critical role in ensuring that water and wastewater infrastructure operates efficiently and effectively. Generally, all O&M companies in India also have significant engineering and construction capabilities and often provide integrated EPC and O&M services to their clients under PPP models such as HAM, BOT, DBOT projects. These companies provide a range of O&M services, including maintenance, repair and replacement of equipment, as well as operational support and management.

Funding agencies are vital component of the water-and-wastewater market value chain in India, providing the necessary funding and financial expertise to support the development and operation of water-and-wastewater infrastructure. The financing landscape for water-and-wastewater projects in India is diverse, with a significant portion of projects being funded through various Central and state government schemes. Additionally, international funding agencies such as the World Bank, Japan International Cooperation Agency (JICA) and Asian Development Bank (ADB), have also started providing financial support for water and wastewater projects in India, further augmenting the availability of funds for the sector.

There are multiple government bodies involved in the tendering and management of water and wastewater treatment projects, playing a vital role in ensuring access to clean water and proper sanitation facilities. For example, the Nagpur

Municipal Corporation tenders and manages projects related to water supply, wastewater treatment, and sewage management in Nagpur. Similarly, the Bangalore Water Supply and Sewerage Board (BWSSB) is responsible for tendering and managing projects focused on providing clean water and effective wastewater treatment in Bangalore. Other government bodies, such as the Delhi Jal Board, Chennai Metropolitan Water Supply and Sewerage Board, and Maharashtra Jeevan Pradhikaran, also participate in the tendering and management of water and wastewater treatment projects, including construction of water treatment plants, sewage treatment plants, and distribution networks.

List of select governmental bodies involved in the water and wastewater treatment process

Company Name	Ratings	FY24
Ahmedabad Urban Development Authority	NA	NA
Bangalore Water Supply and Sewerage Board	NA	NA
Jharkhand Urban Infrastructure Development Company Limited	NA	NA
Kolkata Metropolitan Development Authority	NA	NA
Maharashtra State Electricity Distribution Company Limited	Long Term Rating: Acuité A | Short Term Rating: Acuité A1	'18 June 2025'
Maharashtra State Power Generation Company Limited	Long Term Rating: Acuité A- | Short Term Rating: Acuité A2+	'8 May 2024'
Nagpur Metropolitan Region Development Authority	NA	NA
Nagpur Municipal Corporation	Care A	'28 March 2025'
National Mission for Clean Ganga	NA	NA
Rajasthan Jal Nigam	NA	NA

Notes: Above list is not exhaustive

Different tendering models in water and wastewater treatment

The Indian water and wastewater sector has witnessed a significant trend in project implementation, with projects across water supply, wastewater and desalination segments being implemented mainly under three models EPC, PPP, PPP – HAM models. However, PPP-HAM is emerging as a popular alternative, with increasing interest from private players even though the majority of the project in WSS segment is happening through EPC mode.

Overview of EPC mode

Over the years, the infrastructure business has seen various contracting methods evolve. Traditional contracting models have been replaced by new approaches as projects have grown more complex. Gradually, the responsibility for project management has moved from the owner or developer to the contractor.

This shift is evident in the move from owner-managed projects to Engineering, Procurement, and Construction (EPC) contracts. In EPC contracts, the contractor assumes the risks of time and cost overruns, along with the responsibilities for design, material procurement, and construction. These contracts also shield the owner/developer from currency and interest rate fluctuations.

Unlike other contracts where procurement and design are separate processes, EPC contracts integrate them, reducing the overall project duration. Contract which requires heavy financial and technically requirement generally divided into smaller EPC projects.

A typical EPC project covers design, civil works, equipment purchase and installation, and commissioning. Most of the EPC players provide integrated and customised solutions as per the client requirements through a consultative approach. Favorable government initiatives, increased infrastructure development in Water and wastewater treatment and supply sectors

Key factors influencing EPC player selection

Past experience	• Size of the projects handled and that are sucessfully running
Financial networth and credit rating	• Typically "x" times the cost of the project. Higher the credit rating the better
Workmanship and completion time	• Demostrated performance with respect to quality of the project
Usage of modern techniques and design innovation	• This aids in hasle free and on-time completion of projects
Bankability of EPC contractor	• Risk sharing, insurances, warrantes, guarenties etc

Further in India, in general, a single stage two-part system (referred to as the "Bidding Process") is used for selection of the EPC contractor in order to award the project. It includes technical evaluation and financial evaluation

Technical qualification: In this the eligibility and qualification criteria are evaluated based on years of experience and expertise of the contractor in the said industry in which EPC project is being executed, domicile of the executing contractor, availability of resources with the contractor and capabilities of such resources among others

Financial qualification: In this the average annual turnover of the EPC contractor over the past 3 financial years is considered which needs to be above the said criteria mentioned along with this the EPC contractor should have a minimum net worth (set forth in bid document) as per his financials. Further, in some cases a minimum amount of working capital as per its latest financials is also considered. In addition, the contractor is also asked to furbish financial statements for the necessary financial years.

Post this the EPC contractor with lowest bid value called the “L1 bidder” is selected to whom the contract is awarded. Further, in some of the bidding processes a weighted average of qualification criteria (technical and financial) and bid value is considered while awarding the contract.

Overview of entry barriers for EPC industry in India

The Engineering, Procurement, and Construction (EPC) industry in India is a vital part of the country's infrastructure development, encompassing sectors like infrastructure, and industrial projects. However, there are multiple challenges faced in EPC modes:

- **High Capital Requirements:** The EPC industry demands substantial initial investments for equipment, technology, and skilled manpower. Smaller firms may find it challenging to secure the necessary funding to compete with established players**.**
- **Regulatory and Compliance Issues:** The industry is heavily regulated, requiring companies to comply with various environmental, safety, and labour regulations. Navigating these regulations can be complex and costly affair, posing a significant barrier for new entrants.
- **Technical Expertise:** Some of the EPC projects often require specialized technical knowledge and expertise of the industry. Companies must possess a skilled workforce capable of handling complex engineering tasks and innovative construction techniques. Building such a team is a considerable challenge for newcomers.
- **Project Management Skills:** Managing large-scale EPC projects requires robust project management skills to ensure timely and cost-effective completion. New entrants might lack the experience and processes needed to manage such projects efficiently.
- **Financial Risks and Creditworthiness:** EPC projects often involve significant financial risks, including cost overruns and delays. New entrants must demonstrate strong financial stability and creditworthiness to secure contracts and financing, which can be challenging without a proven track record.
- **Competitive Landscape:** The EPC industry in India is highly competitive, with established players having strong market presence and relationships with key stakeholders. Breaking into this competitive landscape requires significant marketing efforts and the ability to differentiate from existing competitors.

Overview of PPP model

Under PPP, there are several models that have gained popularity but HAM (Hybrid annuity model) has gained the popularity in the water and wastewater treatment industry. Below are the few different tendering models which is taken under PPP modes

- **Design-build-operate-transfer (DBOT)**: A model where the private sector partner designs, builds, and operates the project for a specified period, after which it is transferred to the government
- **Design-build-operate (DBO)**: A model where the private sector partner designs, builds, and operates the project, but the ownership remains with the government

- **Build-own-operate-transfer (BOOT)**: A model where the private sector partner builds, owns, and operates the project for a specified period, after which it is transferred to the government
- **Design-build-finance-operate-transfer (DBFOT)**: A model where the private sector partner designs, builds, finances, and operates the project for a specified period, after which it is transferred to the government
- **Build-operate-transfer (BOT)**: A model where the private sector partner builds and operates the project for a specified period, after which it is transferred to the government
- **Hybrid annuity model (HAM)**: A model where the government provides 40% of the project capital cost as construction support, and the remaining 60% is paid as annuity payments throughout the operations phase, plus interest.

Overview of HAM Model

HAM-based model has started picking up under the Namami Gange Programme. Now, a similar model is being picked by state governments as well as ULBs. Under HAM, the government is required to provide 40% of the project capital cost as construction support, which can be provided at the end of the construction period or during the construction phase. The remaining 60% of the project cost is paid as annuity payments throughout the course of the operations phase plus interest. This model allows the private sector partner to focus on designing, building, and operating the project, while the government provides financial support and takes care of risks.

The key parameters for bidding under the HAM model include:

- **Bid parameter**: The lifecycle cost of the project, which is calculated as the net present value (NPV) of the project cost plus the NPV of O&M cost for the 15-year concession period
- **Revenue collection and O&M payments**: The toll collection is the responsibility of the government, and O&M payments will be made to the concessionaire, which will be inflation-indexed
- **Secured cash flow**: Bi-annual annuity payments are made by the government for 15 years, including interest payments (at bank rate + x%) on a reducing-balance method, and agreed O&M
- **Risk allocation**: In the HAM, the private partner assumes the construction and maintenance risks, similar to those in BOT projects. Meanwhile, the government takes on the responsibility of managing other key risks, including revenue risk, land-acquisition risk, political risk, and inflation risk. Notably, land acquisition, which was previously a significant challenge in project completion, is now handled by the government authority in PPP mode, thereby mitigating this risk for the private partner.
- **Sharing of capital cost**: About 40% of the bid project cost shall be payable to the concessionaire by the authority in five equal instalments linked to physical progress of the project. The concessionaire has to initially bear the balance 60% of the project cost through a combination of debt and equity.

Now, let us look at the advantages and disadvantages of the HAM model:

Advantages of HAM:

- **Lower upfront finance requirement**: Government agencies are required to mobilise only 40% of the initial funding upfront, while the private player arranges for the other 60% of the project cost
- **Financing risk**: The financing risk during the O&M period is fully borne by the government, and any shortfalls in the O&M cost are met by the government
- **Shorter delays**: The responsibility of all environmental and land clearances rests with the government, shortening the delays in project commencement and the private sector risks of delayed construction phase
- **Assured annuity payments**: The assured annuity payments provide comfort to potential lenders/financing institutions to provide debt to private contractors.
- **Inflation-adjusted project cost**: The model incorporates inflation-adjusted project cost over time, especially for projects with longer than one-year implementation periods and for O&M expenditure, which helps to mitigate the inflation risks
- **Performance-linked annuity payments**: The performance-linked annuity payments create the appropriate incentives for the private sector providers to deliver high-quality services

Disadvantages of HAM

- **Higher project cost**: The private concessionaire has to mobilise 60% of the costs, which may lead to higher project costs owing to incorporation of high returns on equity and higher interest on debt
- **Entry of small bidders limited**: The HAM approach may limit the entry of small bidders, as they may not be able to mobilise adequate initial capital requirement which is 60% of the total project cost
- **Long-term commitment of government funds**: The model requires a long-term commitment of government funds — for 10-15 years — which can be challenging for local governments
- **Risk of non-payment**: The risk of non-payment of annuity payments by the government can affect the bid prices and drive up the overall project costs

Emerging trends under PPP-HAM model:

The water and wastewater management sector in India is witnessing a significant increase in Public-Private Partnerships (PPPs), particularly the Hybrid Annuity Model (HAM). This trend is driven by the government's initiatives to bridge funding gaps, leverage private sector expertise, and ensure operational efficiency. Under HAM, the government funds 40% of the project cost upfront during construction, with the remaining 60% disbursed as annuities over the operational period, tied to performance indicators such as effluent quality, plant availability, and energy efficiency. This model reduces financial risks for private players and incentivizes long-term maintenance. As a result, HAM has become a preferred model for water and wastewater management projects, with a growing number of projects being awarded under this model. For instance, the Eastern Rajasthan Canal Project (ERCP) is a notable example of a large-scale project that uses HAM to irrigate 2.025 lakh hectares and supply drinking water across 13 districts, demonstrating the model's ability to attract private investment while mitigating risks.

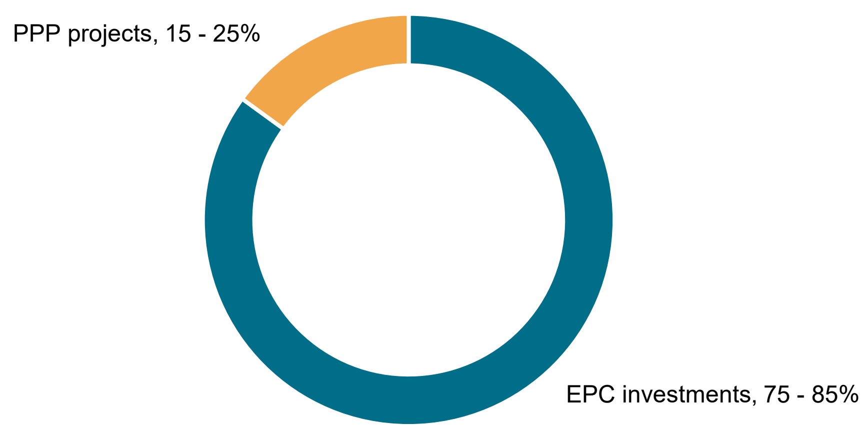
The increasing trend of PPP HAM projects in water and wastewater management sector can be attributed to the government's focus on improving water infrastructure and reducing water scarcity. The National Mission for Clean Ganga, Atal Mission for Rejuvenation and Urban Transformation (AMRUT 2.0), and Jal Jeevan Mission are some of the key initiatives driving this trend. The use of HAM in wastewater treatment has been particularly successful, with its share in Namami Gange STP projects surging from ~20% in 2020 to ~58% in 2024. Some of the other examples include Nashik's STPs upgradation to achieve bathing water quality and NGT norms & capacity upgradation from 400 MLD to 550 MLD for the 2027 Kumbh Mela, Delhi's 564 MLD Okhla STP, and Agra's 176 MLD STP. Additionally, HAM is also being used in water supply projects, such as Chennai's 400 MLD Perur desalination plant, which demonstrates the model's versatility and potential to address India's water challenges. As a result, the market for HAM projects in water and wastewater management is expected to continue growing, with private investment expected to play a significant role in bridging the funding gap and improving water infrastructure in India.

EPC projects among the overall infra investments for water supply and sanitation to remain at 75-85%

We have assessed water supply, water sanitation, wastewater management, and water treatment plant projects, to evaluate investments through the EPC (Engineering, Procurement, and Construction) route.

Purely for water supply projects, more than 95% of project investments happen via the EPC route. Considering wastewater treatment and water supply projects together, it is estimated that 80-90% of investments in the sector happen via the EPC route, while the rest happen via public private partnership (PPP).

EPC investments in the water (irrigation + WSS) sectors



Source: Crisil Intelligence

SWOT analysis of water and wastewater management sector of India

Strengths	• **Government support:** The Indian government has launched initiatives such as the National Water Mission and Swachh Bharat Abhiyan to improve water treatment and supply. It has established a Jal Shakti Ministry to look after the matters related to the water sector in the country • **Technological advancements:** Advanced technologies such as membrane bioreactors, ultraviolet treatment and desalination have improved the efficiency and effectiveness of water treatment processes • **Growing private sector participation**: Private players are increasingly participating in the development of new infrastructure and services in the water sector
Weaknesses	• **Inadequate infrastructure:** Many parts of the country lack access to safe and reliable water supply and the existing infrastructure is often inadequate to meet the growing demand • **Lack of regulation:** There is a lack of effective regulation and enforcement of water and wastewater quality standards, leading to pollution and contamination of water sources • **Inefficient operations:** Many older water treatment plants, wastewater treatment plants and supply systems are inefficient, with high energy consumption and water, sewage losses, leading to increased costs and environmental impacts.
Opportunities	• **Growing water demand:** Water demand in the country is expected to increase significantly in the coming years, driven by population growth, urbanisation and economic development, presenting opportunities for investment and innovation in the water sector • **Reuse potential:** The reuse of treated wastewater can generate higher revenue streams for water utilities and private players, while also reducing the demand for water from freshwater sources • **Increasing focus on water conservation:** The growing awareness of water conservation and the need for sustainable water management practices present opportunities for promoting water-saving technologies and practices
Threats	• **Lack of quality regulation of treated wastewater:** Lack of effective regulation and enforcement of treated wastewater quality standards pose a significant threat to

environment and human health, as it can lead to the release of untreated or partially treated wastewater into water bodies

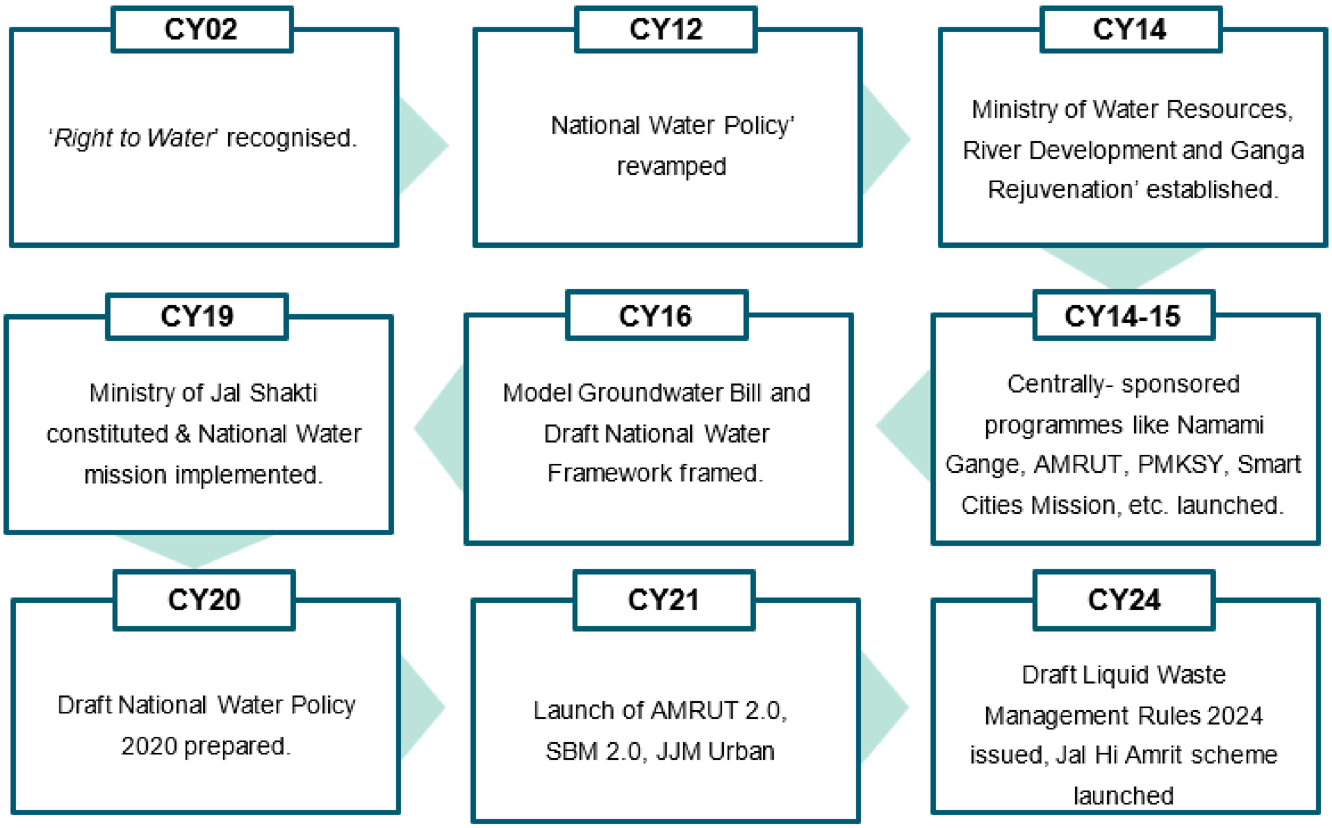
- **Economic viability of wastewater projects:** The economic viability of wastewater projects is another major issue as many projects are currently driven by government push and may not be sustainable in the long term without continued government support

- **Associated infrastructure challenges:** Lack of associated infrastructure, such as sewage and water supply line, is another problem that hinders effective management of water and wastewater in India, particularly given the high levels of non-revenue water in the country

Government policies and regulatory framework in India

Evolution of water policies and regulations over the years

The government has various policies and frameworks that supported the growth of the water management sector in the country.

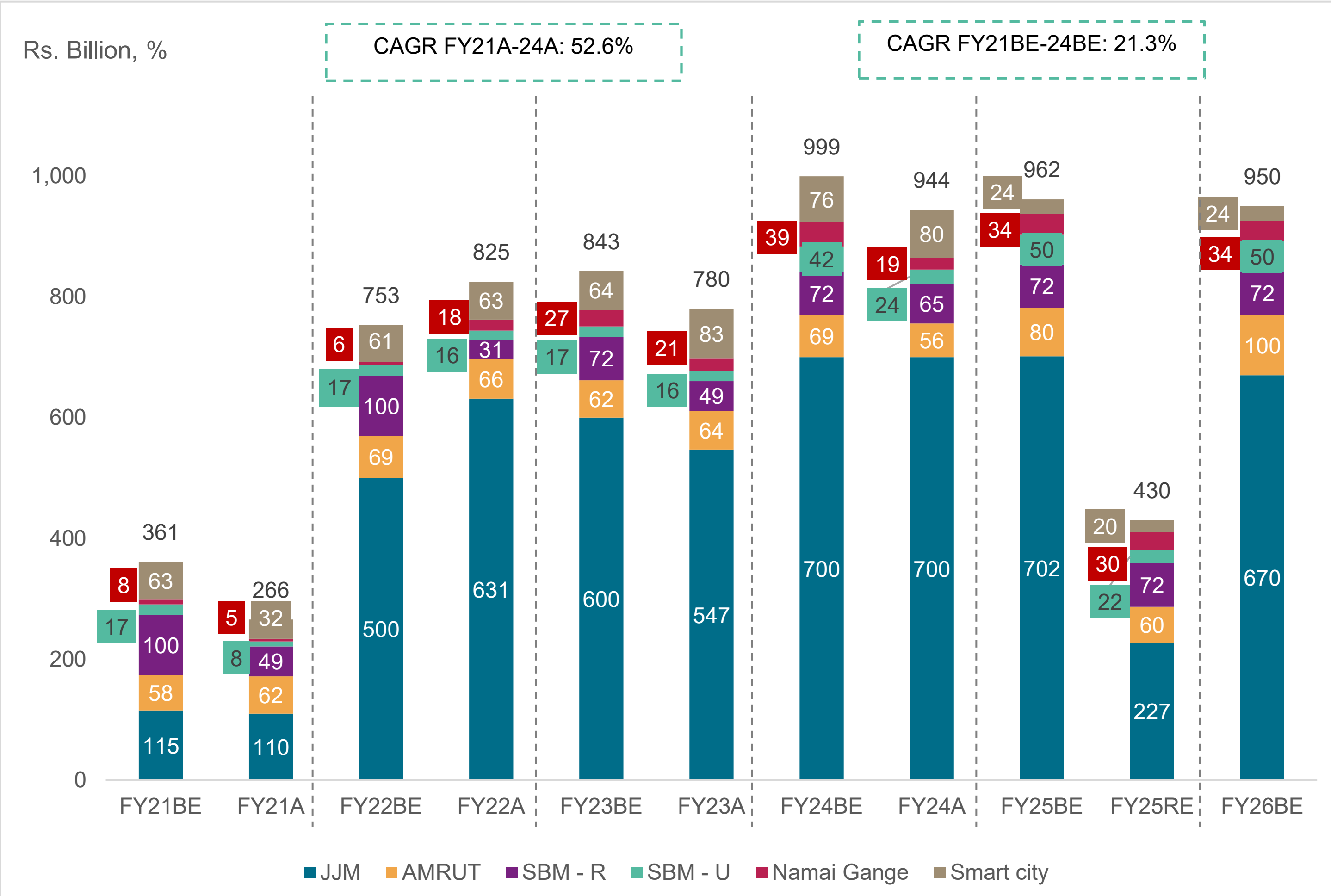


In India, water management is primarily the responsibility of state governments, with the central government providing technical and financial support. Recognising the importance of water conservation, the government has made it a top priority. Various government agencies are actively involved in managing water resources, beginning with the introduction of the National Water Policy in 1987. The policy has undergone several revisions to promote optimal water usage, reduce environmental impact and ensure water security, equitable distribution and efficient use.

The National Water Mission continues to guide the policy, prioritising water conservation, rainwater harvesting and improving efficiency to ensure long-term sustainability in water resource management. These guidelines aim to build resilient systems that ensure safe drinking water, addressing long-standing issues of competence and capacity in small water systems. By prioritising simple and affordable solutions, the WHO seeks to professionalise the sector and enhance access to clean water for vulnerable communities.

The Government of India has launched several schemes and programs focussed on water conservation, distribution and infrastructure including the Jal Jeevan Mission, Swachh Bharat Mission, Atal Mission for Rejuvenation and Urban Transformation ("AMRUT"), and Namami Gange.

Budgetary allocation across different funds



Notes: BE: Budget estimates, A: Actuals

Source: India Budget, expenditure profile, Crisil Intelligence

Launched on August 15, 2019, the Jal Jeevan Mission (JJM) is a flagship programme of the central government, with the objective of providing functional household tap connections (FHTCs) to all rural households. It aims to improve the lives of rural communities by providing them safe and adequate drinking water and promoting sustainable water management practices.

Jal Jeevan Mission

The Jal Jeevan Mission is a flagship initiative by the Government of India, launched in 2019 with the goal of providing every rural household with safe and adequate drinking water through a functional tap water connection by 2024, with an allocated budget of INR 2.8 trillion till FY26 including budget estimates and revised estimates. The mission aims to ensure that every rural household has access to 55 liters of potable water per person per day on a long-term basis. With over 155 million households already connected to tap water, Jal Jeevan Mission plays a critical role in addressing water scarcity and ensuring the long-term sustainability of water resources through rainwater harvesting, groundwater recharge, and water conservation efforts. Particularly in rural and remote areas, this mission supports improved living standards and health outcomes.

JJM uses a multi-stakeholder approach, involving the central government, state governments and local communities. It promotes community participation in water management, with a focus on sustainable and equitable use of water resources. It also emphasises on the importance of technological innovations, such as solar-powered water supply systems, to reduce cost and improve efficiency.

Community participation in water management is being promoted, with a focus on sustainable and equitable use of water resources. A comprehensive plan has been developed to achieve the mission's objectives, build resilient water supply systems and promote community-led initiatives. It also recognises the importance of community education and awareness about water management to ensure long-term sustainability of water resources.

The mission is being implemented in a phased manner by developing in-village piped water supply infrastructure. Local communities are given help in capacity building and training to ensure their active participation in water management. Community-led total sanitation (CLTS) will help improve the overall quality of life in rural areas.

A comprehensive plan has been developed to achieve the mission's objectives. The mission will continue to work towards achieving its objectives, with a focus on community participation, education and technological innovations.

In short, the highlights of the mission are:

- Providing FHTCs to all rural households
- Promoting community participation in water management
- Ensuring sustainable and equitable use of water resources
- Developing a comprehensive plan to achieve the mission's objectives
- Providing community education and creating awareness about water management
- Promoting technological innovations, such as solar-powered water supply systems, to reduce cost and improve efficiency

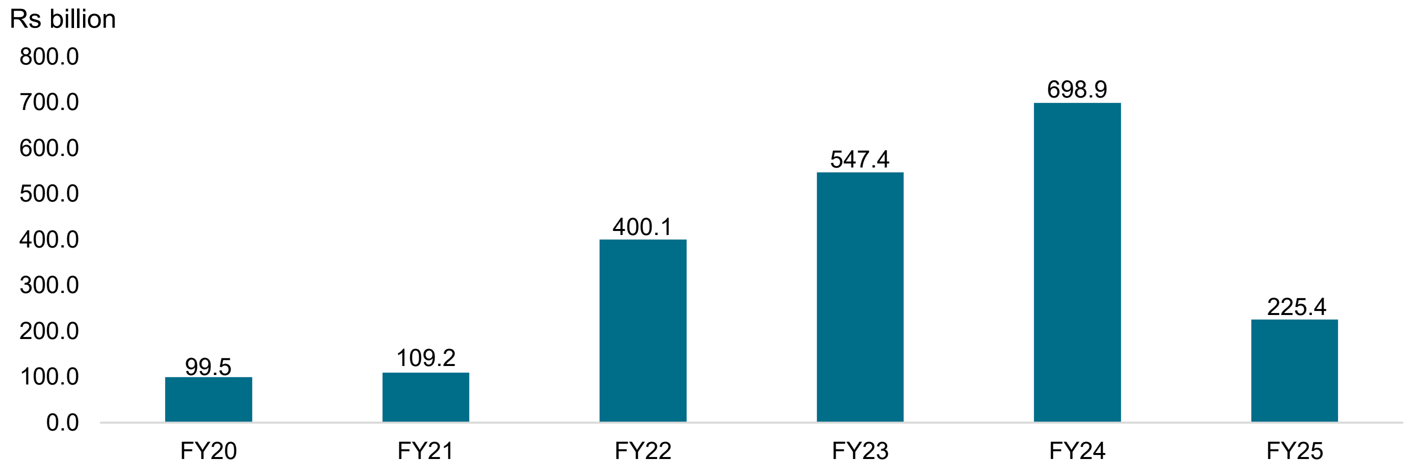
Fund distribution ratio for different states/ UTs

State/UTs	Central share (%)	State share (%)
Himalayan and northeastern sates	90	10
Other states	50	50
UT with legislature	90	10
UT without legislature	100	0

Source: JJM toolkit, Crisil Intelligence

JJM’s fund distribution ratio varies with states and Union Territories (UT), with Himalayan and northeastern states receiving 90% central funding, other states 50% and UTs without legislature receiving 100% central funding.

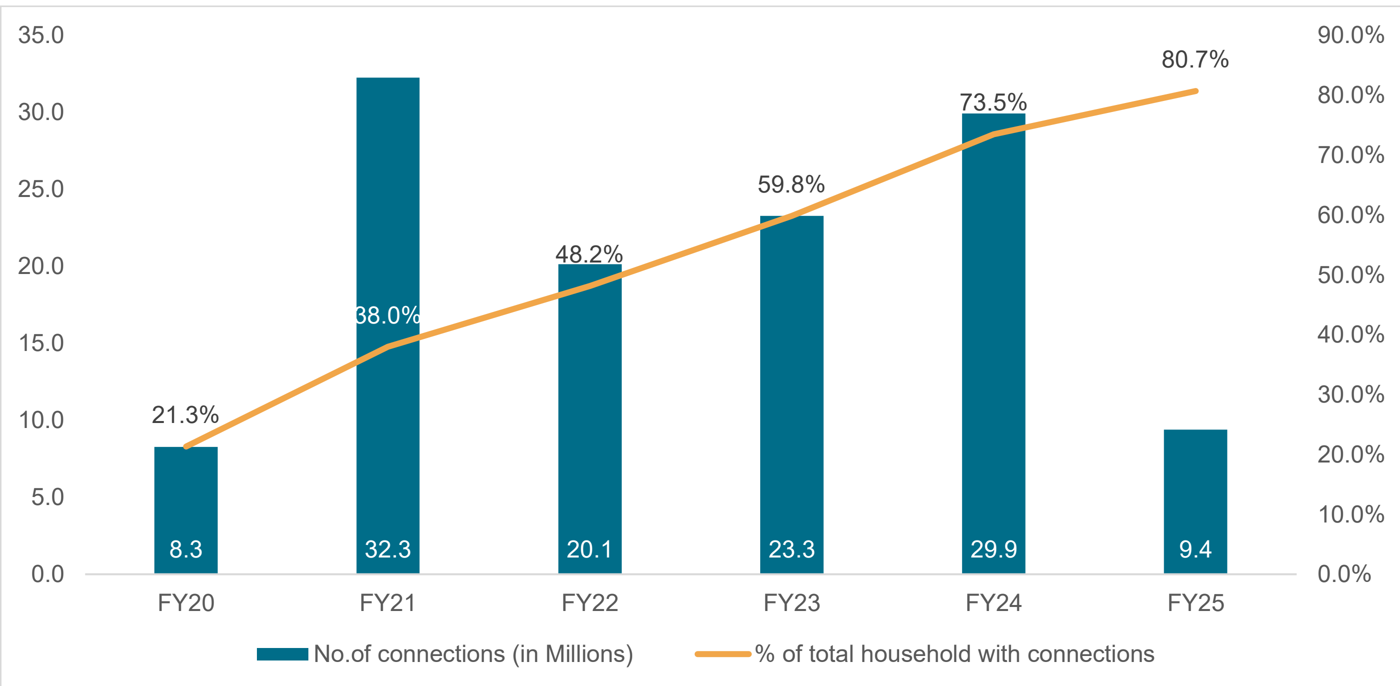
Funds drawn by states/ UTs



Source: JJM dashboard, Crisil Intelligence

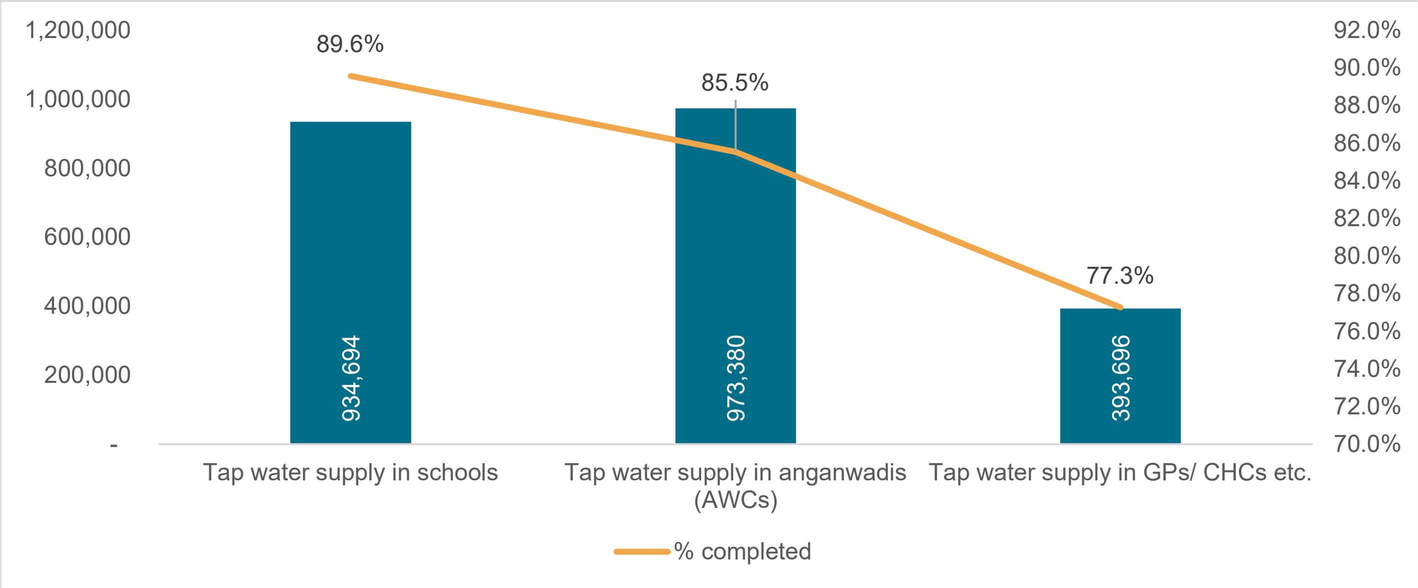
The mission has made significant progress in providing tap water supply to households across the country. Funds utilized by states under JJM have shown a steady increase over the years, indicating a growing commitment to the mission. The trend suggests that the mission is gaining momentum. The increased fund offtake boosted tap water supply to households as there has been a notable increase in connections provided over the years.

Households provided with tap water supply



Note: As on May 2025
Source: JJM dashboard, Crisil Intelligence

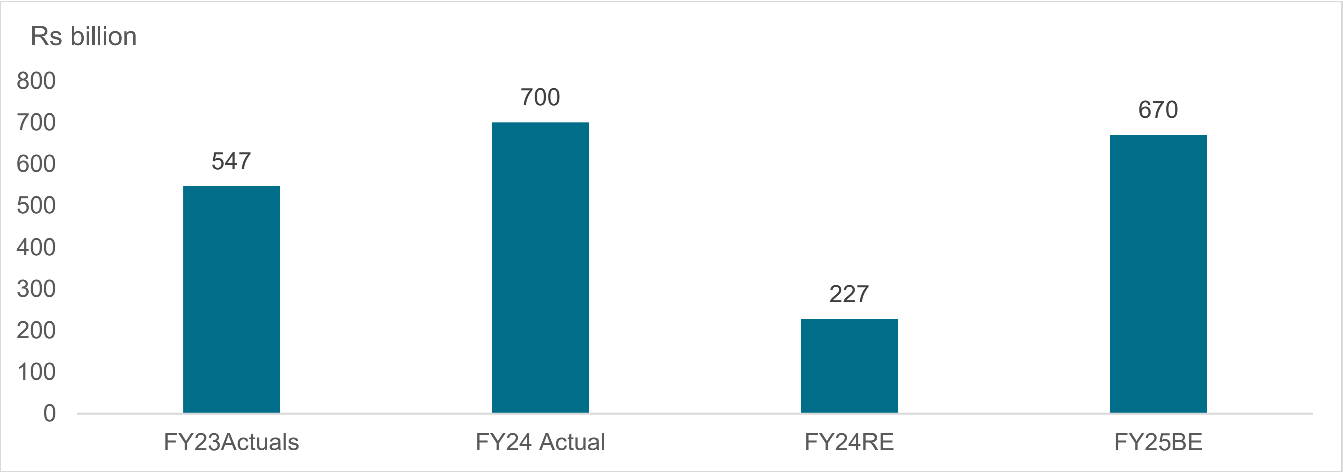
Status of Tap water connections in schools, Anganwadi centres, Gram panchayat, etc.



Note: As on May 2025

Source: JJM dashboard, Crisil Intelligence

Budgetary allocation for JJM



Source: Ministry of finance, Crisil Intelligence

The substantial budget allocation for JJM, though with some fluctuation over the years, also reflects the government's commitment to providing adequate funding to support the mission's objectives. The funds allocated to are utilised to provide tap water supply to households and to maintain and upgrade existing water supply infrastructure. The steady increase in household connections provided under the mission suggests it is on track to achieve its targets. Overall, the data suggests that JJM is making progress towards its objectives and the government is committed to supporting the mission through adequate funding.

AMRUT 2.0

The AMRUT 2.0 scheme was launched on October 1, 2021, by the Ministry of Housing and Urban Affairs (MoHUA) with the aim of making cities self-reliant and water secure. The scheme is a continuation of the previous AMRUT scheme, which was launched in 2015. Under AMRUT 1.0, the primary focus was on ensuring universal access to potable water, whereas AMRUT 2.0 prioritises comprehensive" sanitation and wastewater management

It is designed to provide basic services such as water supply, sewerage and urban transport to households and build amenities in cities to improve the quality of life for all citizens, especially the poor and disadvantaged.

The AMRUT 2.0 is an urban renewal initiative launched by the Government of India in 2021. AMRUT Mission 2.0 aims to improve the quality of life in cities across India by upgrading infrastructure, enhancing basic services and promoting sustainable urban development. The primary objectives of AMRUT Mission 2.0 includes ensuring functional tap and sewerage connections to all households in towns across India, and promoting the recycling and reuse of treated sewage, rejuvenation of water bodies, and water conservation through the development of city water balance plans.

The main objectives of AMRUT 2.0 are:

- **Universal piped water supply:** Giving water tap connections to all households to ensure every household has access to clean and safe drinking water
- **Universal coverage of sewerage and septage management:** To provide universal coverage of sewerage and septage management in 500 AMRUT cities, ensuring that every household has access to proper sanitation facilities
- **Promoting circular economy of water:** Recycling and reusing treated sewage, reducing the burden on freshwater resources and minimising the environmental impact of wastewater disposal
- **Rejuvenation of water bodies:** To augment water availability, enhance amenity value and develop green spaces, which will, in turn, improve the overall aesthetic and environmental quality of urban areas
- **Making cities *atmanirbhar* and water secure:** By ensuring they have necessary infrastructure and resources to manage their water needs sustainably

The AMRUT 2.0 scheme has several key components, including:

- **Water supply:** The scheme aims to provide universal piped water supply with household water tap connections, ensuring that every household has access to clean and safe drinking water
- **Sewerage and septage management:** It aims to provide sewerage and septage management in 500 AMRUT cities, ensuring every household has access to proper sanitation facilities
- **Rejuvenation of water bodies:** It seeks to rejuvenate water bodies to augment water and enhance amenity value and develop green spaces, improving the overall aesthetic and environmental quality of urban areas
- **Technology sub-mission:** It will leverage latest technologies in the field of water to improve the efficiency and effectiveness of water supply and sewerage systems.
- **Public-private partnerships (PPPs):** The scheme encourages PPP projects in million-plus cities, with a minimum of 10% of total fund allocation at the city level committed to such project

The AMRUT 2.0 scheme has a multi-level governance structure as follows:

- **State high powered steering committees (SHPSCs):** Headed by the state chief secretaries, SHPSCs monitor and supervise the implementation of the scheme at the state/UT level
- **State level technical committee (SLTC):** Headed by the state secretary of Urban Development and Housing Department, the SLTC provides technical support to the SHPSC in monitoring and supervising the scheme at the State level
- **Apex committee:** The apex committee reviews and monitors the mission periodically
- **Independent review and monitoring agencies (IRMAs):** IRMAs assess and monitor the work done under AMRUT in states/UTs. Funds are released to States/UTs basis compliance reports by these monitoring agencies

Funds distribution ratio:

States/UTs	Central share (%)
Union Territories	100%
Northeastern states and Himalayan states	90%
Cities of states with less than one lakh population	50%
Cities of states with population one lakh to 10 lakh (both included)	On-third of the project cost
Cities of states with population more than 10 lakh	25% of the project funds by the Centre (except for projects taken up under PPP mode) *

Note: PPP projects amounting to at least 10% of total project allocation for all cities with population above 10 lakh in a state will be mandatorily taken up under this scheme

Source: AMRUT 2 guidelines (MoHUA), Crisil Intelligence

The total indicative outlay for AMRUT 2.0 is Rs 2,990 billion, including the total Central assistance of Rs 767.6 billion, for five years (FY22 to FY26). As on November 15, 2024, Central assistance of Rs 639.77 billion was approved to states/UTs, of which Rs 117.56 billion has been released so far. The states/UTs have reported utilisation of Rs 65,40 billion of central share, and cumulatively, with state's share, the total expenditure reported by states/UTs is Rs 170.89 billion.

Tentative distribution of central fund allocation among project components of Mission planned during launch of AMRUT 2.0

Description	Central share (Rs. Billion)
Water supply projects	352.5
Rejuvenation of water bodies and developing green spaces & parks projects	39
Sewerage and septage management projects	276
Total tentative central allocation (CA) on projects	667.5

Source: AMRUT 2 guidelines (MoHUA), Crisil Intelligence

Budget allocation under the scheme

Mission component	Allocation (Rs billion)
Projects	667.50
Incentive for reforms (8% of CA allocation)	53.40
Administrative and other expenses (A&OE) for states/ UTs (3.25% of project CA allocation)	21.69
Administrative and Other Expenses for MoHUA (1.75% of project CA allocation)	11.68
Technology sub-mission (1% of project CA allocation)	6.67
IEC activities (1% of project CA allocation)	6.67

Source: AMRUT 2 guidelines (MoHUA), Crisil Intelligence

As reported by states/UTs on the AMRUT 2.0 portal (as on November 15, 2024), tenders have been issued for 5,886 projects worth Rs 1,158.73 billion, of which contracts have been awarded for 4,916 projects worth Rs 851.14 billion. Rest of the projects are at various stages of implementation. Works worth Rs 230.17 billion have been physically completed.

Jal Hi Amrit scheme: In October 2024, the Jal Hi Amrit (JHA) scheme was launched as an extension of AMRUT 2.0, with the aim of transforming STPs into resource recovery facilities. The JHA programme aims to incentivise states and UTs to ensure the optimal functioning of Used-water Treatment Plants (UWTPs). These plants must consistently meet environmental standards while producing recyclable treated water. As part of this initiative, UWTPs will be awarded clean water credits through a star rating system. Incentives will be provided to urban local bodies (ULBs)/ parastatal agencies based on a comprehensive evaluation process detailed in the following section. Additionally, the JHA programme focuses on enhancing the skills of UWTP operators/ULB officials. Through customised capacity-building programmes, the initiative aims to equip these personnel with the knowledge and expertise needed to manage the facilities efficiently and consistently meet discharge standards.

The AMRUT 2.0 scheme is expected to have several benefits, including:

- **Improved water supply:** The scheme will ensure that every household has access to clean and safe drinking water, improving the overall health and well-being of citizens
- **Better sanitation:** The scheme will ensure that every household has access to proper sanitation facilities, reducing the risk of water-borne diseases and improving the overall environmental quality of urban areas
- **Increased water security:** The scheme will promote the circular economy of water, reducing the burden on freshwater resources and minimising the environmental impact of wastewater disposal
- **Higher aesthetic and environmental quality:** The scheme will rejuvenate water bodies and develop green spaces, improving the overall aesthetic and environmental quality of urban areas
- **Increased economic opportunities:** The scheme will create new economic opportunities in the water sector, including the development of new technologies and industries related to water management

AMRUT 2.0 is a comprehensive scheme aimed at making cities self-reliant and water secure by providing universal piped water supply, sewerage and septage management, and promoting the circular economy of water. The scheme has made significant progress since its launch and it is expected to have a positive impact on the urban life. However, the scheme faces several challenges, including financial, technical, institutional and environmental, which need to be addressed to ensure the successful implementation of the scheme.

Namami Gange Programme

The Namami Gange Programme is an integrated conservation mission launched by the Government of India in 2014 to rejuvenate the Ganga River through initiatives such as sewerage treatment, river-front development, and biodiversity enhancement. This project is implemented by the National Mission for Clean Ganga with an estimated budget outlay of Rs 2,000 million. Key components of the mission include river-surface cleaning, afforestation, public awareness, industrial effluent monitoring, and the development of Ganga Gram. Under this mission, various programs and projects are implemented to improve water quality and enhance the ecosystem.

Payment assurance and the subsequent disbursement of funds are provided in full by the NMCG under the Ministry of Jal Shakti, Government of India, while the programme implementation is undertaken by the respective state-level bodies such as the UP Jal Nigam, KMDA and JUIDCO

The programme was initially set to run until March 2021, but was subsequently extended to March 2026. The 100% centrally funded programme adopts a hybrid annuity-based PPP model.

The Ganga flows more than 2,500 km through the plains of north and eastern India, with the Ganga basin comprising 26% of India's landmass, making it a key source of livelihood and water for many citizens.

The NPG covers eight states, 47 towns and 12 rivers, comprising the main river and its tributaries.

The second phase of the programme, which runs from fiscal 2021 to 2026, aims to build on the success of the first phase.

The key features of the NGP 2 are:

- Empanelment of agencies to support the preparation of Detailed project reports (DPR)
- Standardisation of the DPRs and instituting trainings ahead of its preparation
- Mapping and monthly monitoring of the drains by the SPCBs
- Characterisation of sludge and its monetisation
- Monthly reports and review of activities to improve monitoring
- Institutional strengthening of the SPMGs by filling up of vacancies
- Stringent monitoring of the DPRs and procurement process
- Strengthening of the DGCs (District ganga committees) through capacity building
- Fixed day, mandated monthly DGCs meetings along with minutes

- Increase participation in Namami Gange programmes – Arth Ganga, etc

To be sure, the programme has made significant progress in achieving its objectives.

The first phase of the programme, which ended in 2021, saw the completion of several key projects, including the creation of sewerage infrastructure, control of industrial pollution and improvement with regard to rural sanitation.

For instance, all 4,465 villages along the bank of the Ganga have been declared open defecation-free and significant reduction in pollution from industries has been achieved. Paper and pulp facilities have installed advanced process technologies, resulting in lower freshwater consumption and wastewater discharge, and zero black liquor discharge. In fact, the industrial sector has been a key focus area, with CETPs provided to tanneries located along the riverbank to transition to cleaner processes and reduce water consumption.

In addition to these efforts, the government has also promoted sustainable agricultural practices, such as organic farming, to reduce pollution and improve the overall health of the Ganga basin. The introduction of new technologies, such as the use of GIS and remote sensing, has helped monitor the health of the river as well. Public awareness and community participation have been crucial components, with initiatives such as Ganga Utsav, which aims to promote awareness and education about the river among the general public, successful in engaging the community. Ganga Amantran, a 34-day river rafting expedition, has also been instrumental in promoting community participation and public awareness.

The programme has also seen significant investment in infrastructure development, including the creation of sewerage, industrial pollution control and rural sanitation infrastructure, which has improved the overall quality of life for people living in proximity to the Ganga basin.

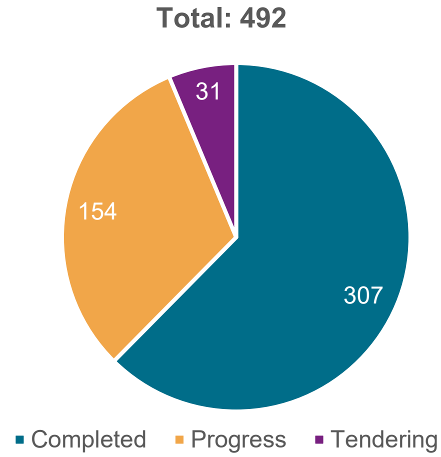
Furthermore, initiatives such as Arth Ganga aim to promote sustainable agriculture and reduce pollution in the basin area – this has seen significant success, with the adoption of sustainable agricultural practices by farmers in the Ganga basin, and the reduction of pollution from industrial and agricultural sources.

As the programme moves forward, there are plans to restore the ‘wholesomeness’ of the river, defined in terms of ensuring continuous flow, unpolluted flow, geologic and ecological integrity, and climatic and spatial understanding.

Towards this, the programme will continue to focus on creation of sewerage, industrial pollution control and rural sanitation infrastructure, and will introduce advanced technologies to monitor and further improve the health of the river.

Overall, of a total of 492 under NGP, 307 projects have been completed, which represents a completion rate of ~62%, which is a notable achievement, considering the complexity and scale of the programme. The fact that 154 projects are still in progress and 31 are at the tendering stage indicates that the programme continues to have a strong pipeline of projects. As of May 31, 2025, 211 sewage infrastructure projects have been sanctioned under the Namami Gange Programme, with 133 projects completed and operational.

Projects under NGP segregated by status



Source: NGP dashboard, Crisil Intelligence

Uttar Pradesh has the highest number of projects, totalling 161. The state has also made significant progress, with 101 projects completed. Uttarakhand has made significant progress as well, with 60 projects of a total of 87 completed, representing a completion rate of ~69%. In contrast, Jharkhand, Delhi and Madhya Pradesh have relatively fewer projects and will need to accelerate the pace of project implementation to meet the overall objectives of the NGP.

State-wise NGP project split by status

States	Completed	Progress	Tendering	Total
Uttar Pradesh	101	48	12	161
Uttarakhand	60	26	1	87
West Bengal	52	15	9	76
Bihar	41	22	6	69
Jharkhand	13	6		19
Delhi	10	6		16
Madhya Pradesh		4	3	7
Haryana	3	1		4
Himachal Pradesh	1	1		2
Rajasthan		1		1
Telangana		1		1
Other projects[1]	26	23		49

Notes:
1: Other projects are R&D, study, reports, etc. projects given to institutions
2: Numbers are as of January 30, 2025
Source: NGP dashboard, Crisil Intelligence

Still, despite the variations, data suggests that NGP is making progress, in terms of project completion, and with continued efforts, it is likely to achieve the overall objective.

A look at the project status reveals that the majority of completed projects are in the categories of ghats, crematoria and River front development (84 projects), sewage infrastructure (127 projects), and interception and diversion (64 projects), indicating that the programme has made substantial progress in improving the sewage infrastructure and creating new ghats and crematoria along the river.

The completion of these projects is expected to have a positive impact on the river's water quality and the overall environment.

Data also shows that there are still significant number of projects in progress, particularly in the categories of interception and diversion (52 projects), R&D (37 projects) and industrial pollution abatement (11 projects). The tendering stage also has a notable number of sewage infrastructure (22 projects), interception and diversion (20 projects), and bioremediation (two projects) projects.

Project type split as per status

Type of projects	Completed	Progress	Tendering	Total
Sewage infrastructure	133	55	23	**211**
Interception and diversion	69	50	22	**141**
Laying of new sewerage networks	25	3		**28**
Construction of new STPs	19	1		**20**
Repair/restoration/upgradation works	17			**17**
Rehabilitation of existing STPs	3	1	1	**5**
Ghats, crematoria and RFD (River front development)	84	23	2	**109**
R&D	25	37		**62**
Afforestation	32	5		**37**
Industrial pollution abatement	9	12	1	**22**
Bioremediation	11	6	2	**19**
Biodiversity conservation	8	8		**16**
IEC activities and institutional development	3	6		**9**
Solid waste management	6	1	1	**8**
Composite ecological task force	6	1		**7**
Sanitation	1			**1**

Note: As of May 30, 2025
Source: NGP dashboard, Crisil Intelligence

Ongoing and upcoming projects will continue to build on the momentum of the completed projects, and their successful implementation will be crucial in achieving the programme's objectives of restoring the river

On the funding front, data reveals that of the total sanctioned amount of ~Rs 400.5 billion, Rs 197.3 billion has been released and Rs 194.1 billion has been expended. Majority of the sanctioned amount is allocated to sewage infrastructure (Rs 330.0 billion), interception and diversion (Rs 216.5 billion) and laying of new sewerage networks (Rs 55.8 billion).

The fact that these categories account for a significant portion of the total expenditure indicates that the programme is prioritising the development of sewage infrastructure and interception and diversion systems to improve the water quality.

Category wise project update

Type of project	Sanctioned Amount (Rs billion)	Funds released (Rs billion)	Total expenditure (Rs billion)
Sewage infrastructure	330.0	156.8	155.9
Interception and diversion	216.5	73.5	73.2
Laying of new sewerage networks	55.8	44.8	44.5
Construction of new STPs	37.6	24.7	24.7
Rehabilitation of existing STPs	14.8	7.7	7.6
Repair/restoration/upgradation works	5.4	6.1	5.9
Ghats, Crematoria and RFD	18.1	13.1	13.1
Industrial pollution abatement	17.2	5.8	5.1
Sanitation	10.2	9.9	9.9
R&D	7.3	2.0	1.9
Afforestation	5.4	4.5	3.7
Bioremediation	3.9	0.4	0.4
Composite ecological task force	3.4	2.0	2.0
Biodiversity conservation	2.5	1.3	1.1
IEC (Information, Education, and Communication) activities and institutional development	1.9	1.0	0.5
Solid waste management	0.6	0.5	0.5
Total	**400.5**	**197.3**	**194.1**

Note: As of January 30, 2025

Source: NGP dashboard, Crisil Intelligence

Smart Cities Mission

The Smart Cities Mission launched in June 25th, 2015, is an initiative of the government to promote core infrastructure and quality of life for citizens in cities by ensuring a clean and sustainable environment and the application of 'smart' solutions. The focus is on sustainable and inclusive development, which can be replicated within as well as outside the ‘smart city’, catalysing the creation of similar smart cities in various regions and parts of the country.

The core infrastructure elements in a smart city include adequate water supply, assured electricity supply, sanitation, efficient urban mobility and public transport, affordable housing, robust IT connectivity and digitalisation, good governance, sustainable environment, safety and security of citizens, and health and education.

The mission involves the strategic components of area-based development, which includes city improvement, city renewal and city extension, as well as a pan city initiative that applies smart solutions to larger parts of the city.

Government funds and matching contribution by the states/ULBs meet only part of the project cost, with the balance funding to be mobilised from various sources, including own resources of the states/ULBs, and via innovative finance mechanisms and private sector participation through PPPs.

The distribution of funds under the scheme is:

- 93% project funds
- 5% administrative and office expenses (A&OE) funds for states/ULBs (towards preparation of Smart city proposals and for Project management consultants, pilot studies connected to area-based developments, and deployment and generation of smart solutions and capacity building)
- 2% A&OE funds for the Mission Directorate and connected activities/structures, research, pilot studies, capacity building, and concurrent evaluation

The Smart Cities Mission also involves convergence with other schemes, such as AMRUT, Swachh Bharat Mission, National Heritage City Development and Augmentation Yojana, Digital India, and other programmes connected to social infrastructure.

By integrating these schemes, comprehensive development can occur, achieving urban transformation and improving the quality of life for citizens.

As of February 7, 2025, the mission has undertaken 8,058 projects, which cost a cumulative Rs 1,645.14 billion. Of these, a significant 7,491 projects have been successfully completed, comprising a total investment of Rs 1,501.57 billion. Another 567 projects totalling Rs 143.57 billion are ongoing.

The Smart Cities Mission has achieved milestones across sectors, with a total of 8,058 projects initiated. Notably, the WASH (water, sanitation, and hygiene) sector has been a major focus area, with 1,440 projects completed at a total cost of Rs 467.30 billion. The projects include significant initiatives such as the 120 MLD WTP and ZLD system under 590 MLD WTPs at Sarthana Water Works in Surat, as well as 2 MLD water treatment plant, pumping station and pipeline for conveying water from Narsinghghat and Kshipra rivers to Rudrasagar. The primary objective of these projects has been to enhance the water supply, sanitation and hygiene infrastructure in urban areas, tackling pressing concerns such as sewage management, water treatment and sewage treatment.

With 106 ongoing WASH projects valued at Rs 30.05 billion, the mission continues to prioritise health and well-being of citizens.

Swachh Bharat Mission - Urban (SBM-U)

The Swachh Bharat Mission - Urban (SBM-U), was launched on 2nd October 2014 aimed at making urban India free from open defecation and achieving 100% scientific management of municipal solid waste in 4,041 statutory towns in the country. The Swachh Bharat Mission Urban 2.0 was launched in October 2021 with the aim to achieve garbage free cities by 2026. The primary objectives of the mission include ensuring that all sewage is safely managed and treated, promoting the collection, treatment, recycling and reuse of used water to prevent environmental pollution. In order to achieve these objectives, the mission aims to establish and upgrade STPs to ensure scientific processing of sewage and septage Rs.1588.3 million has been allocated to States/UTs for wastewater/used water management, including setting up of STPs and FSTPs (fecal sludge treatment plants. The mission also implements systems for the collection, transportation and treatment of used water and promotes the reuse of treated sewage to support a circular economy

Below are the key components under SBM (Urban) – 2.0:

Key focus segments	Objective	Key components
Used water management	To ensure that no untreated fecal sludge or used water is discharged into the environment, and all used water (including sewerage and septage, grey water and black water) is safely contained, transported and treated, along with maximum reuse of treated used water, in all cities with less than 1 lakh population.	• Setting up of waste processing facilities such as MRFs, transfer stations, composting plants, bio methanation plants, RDF processing facilities, plastic waste processing facilities, waste to electricity, sanitary landfill, etc. • Procuring mechanized sweeping equipment and setting up processing facilities for effective management of Construction and Demolition (C&D) waste (in 154 cities) • Bioremediation/ capping of all legacy dumpsites in all ULBs
Sustainable solid waste management	To make all cities clean and garbage free,with 100% scientific processing of Municipal Solid Waste	• Setting up of waste processing facilities such as MRF's, transfer stations, composting plants, bio methanation plants, RDF processing facilities, Plastic waste processing facilities, waste to electricity, sanitary landfill, etc • Procuring mechanized sweeping equipment and setting up processing facilities for effective management of Construction and Demolition (C&D) waste (in 154 cities) • Bio-remediation / capping of all legacy dumpsites in all ULB's

Key focus segments	Objective	Key components
Sustainable Sanitation	To sustain Open Defecation Free status in all Statutory towns.	• Construction of Individual Household toilets • Construction of Community and Public Toilet (CT and PT) seats • Construction of urinals, along with retrofitting of unsanitary toilets • Aspirational toilets ULBs will have to provide additional pts in all tourist destinations/ places with high footfall/ iconic cities/ religious destinations
IEC / BCC	To ensure awareness creation along with large scale citizen outreach to intensify 'Jan Andolan' and institutionalize swachh behavior and related set of actions, towards achieving the vision of "Garbage Free" cities.	• National level support for agencies, campaign management, promotion of national level initiatives, and advocacy • State/ ULB level support for campaign management, onboarding of grassroots organisations, promotion of good practices, and events
Capacity Building (CB)	To create institutional capacity to effectively implement programmatic interventions to achieve mission objectives.	• National level support for centres of Excellence, academic funding, capacity building and training, knowledge management, e-learning, various training and innovation related initiatives, and digital outreach programmes • State level support for program management units, ICT initiatives, human resources and grassroots capacity building, and training

Crisil Intelligence

6. Assessment of competitive landscape of water and wastewater treatment market in India

Overview of key players

In this section, CRISIL has analysed some key players operating in the water and wastewater treatment industry in India. Data has been sourced from publicly available information, including annual reports and investor presentations of listed players, regulatory filings, rating rationales, and/or company websites. The financials in the competitive section have been re-classified by Crisil Intelligence, based on annual reports and filings by the players. Financial ratios used in this report may not match with the reported financial ratios by the players on account of standardization and re-classification done by Crisil.

Note: The list of competitive landscape peers considered in this section is not exhaustive but an indicative list

Operational overview

Overview of key players in water and wastewater treatment industry in India

Company Name	Established	Geographical presence	Overview
EMS Limited	1998	**India**: Uttar Pradesh, Uttarakhand, Rajasthan, Bihar, Haryana, Madhya Pradesh, and Maharashtra	EMS Limited a multi-disciplinary EPC company with a presence across multiple business segments. The company's expertise spans Integrated Water and Wastewater Solutions, Electrical Transmission and Distribution, and Building and Road Construction. With a comprehensive range of services, EMS Limited offers turnkey solutions that cater to the needs of various industries, from design and engineering to construction and installation to operation and maintenance. The company's capabilities extend to undertaking EPC and HAM contracts, making it a complete solution provider for the projects
Enviro Infra Engineers Ltd	2009	**India:** Uttar Pradesh, Rajasthan, Haryana, Madhya Pradesh, Chhattisgarh, Delhi, Gujarat, Karnataka, Punjab, Jharkhand	Enviro Infra Engineers provides services related to environmental infrastructure. The company's offerings include Sewage Treatment Plants (STP) and Sewage Systems (SS), Common Effluent Treatment Plants (CETP), and Water Supply Scheme Projects (WSSP). Enviro Infra Engineers delivers its projects through various models, including Engineering, Procurement, and Construction (EPC), Hybrid Annuity Model (HAM), and Operation and Maintenance (O&M) contracts.

Company Name	Established	Geographical presence	Overview
GA Infra Private Limited	1994	**India:** Haryana, Rajasthan, Uttar Pradesh, Madhya Pradesh, Delhi	GA Infra Private Limited (GAIPL) was founded by Mr. Gajendra Agarwal and was initially a proprietorship firm. It was later reconstituted as a private limited company in March 2012. The company takes on turnkey projects that involve setting up water distribution systems, water purification plants, and solar pumps. GAIPL primarily operated in Rajasthan, but it has also expanded its presence to other states.
Gaja Engineering Private Limited	2011	**India:** West Bengal, Orissa, Andhra Pradesh, Uttar Pradesh, Jharkhand, Telangana, Maharashtra, Goa, Karnataka, Jammu	Gaja Engineering Private Limited is a construction company that executes various types of contracts, including civil, mechanical, electrical, water, irrigation, railways, roads, and building projects. The company undertakes turnkey works and is currently involved in projects related to water, electrical, irrigation, tunnels, industrial buildings, environmental engineering, and operational maintenance, among others
Ion Exchange (India) Ltd	1964	**Pan India** **Global:** APAC, Africa, Europe, Middle east and North america	Ion Exchange (India) Ltd provides water, wastewater treatment, and environmental solutions. The company is headquartered in Mumbai and has multiple manufacturing and assembly facilities in India and abroad, including Portugal, UAE, Indonesia, Bangladesh, and Saudi Arabia, with a presence in other key geographies as well. The company provides comprehensive and integrated services and solutions in water and wastewater treatment, including sea water desalination, recycle, and zero liquid discharge plants to diverse industries. Additionally, it offers a comprehensive range of resins, specialty chemicals, and customized chemical treatment programs for water, non-water, and specialty applications
VA Tech Wabag Limited	1995	**Pan India** **Global:** Bangladesh, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Vietnam, Bahrain, Oman, Qatar, Saudi	VA Tech Wabag Limited provides water treatment solutions, offering a range of services including desalination, wastewater treatment, recycle and reuse, effluent treatment, drinking water, zero liquid discharge, sludge treatment, and energy recovery. The company's expertise spans various aspects of water management, making it a solution provider for industries and communities.

Company Name	Established	Geographical presence	Overview
		Arabia, UAE, Kuwait, Egypt, Ethiopia, Libya, Namibia, Nigeria, Tunisia, Senegal, Zambia, Tanzania, Austria, Russia, Turkey, CIS Countries	VA Tech Wabag Limited pursues partnerships across various project models, including EPC, EP, DBO, BOOT, HAM and O&M. The company is deepening its focus on key regions, including the Middle East, GCC, CIS, and Southeast Asia, as it continues to expand its global presence and deliver water treatment solutions.
Vishnu Prakash R Punglia Limited (VPRPL)	1986	**India:** Uttar Pradesh, Uttarakhand, Assam, Haryana, Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Manipur, Daman and Diu	VPRPL is a certified EPC company with experience in designing and constructing infrastructure projects. The company's business operations are divided into four categories: Water Supply Projects, Railway Projects, Road Projects, and Irrigation Network Projects. It undertakes projects on an EPC basis, with or without operation and maintenance services. The company's Water Supply Projects division offers services, including survey, design, construction, and operation of water supply projects. This includes pipeline laying, water tank construction, and provision of household tap connections. The company also provides design, operation, and maintenance services, and undertakes augmentation and reorganization of water supply projects on a turnkey basis.
Vishvaraj Environment Limited	2008	**India:** Maharashtra, West Bengal, Karnataka, Chhattisgarh, Uttar Pradesh, Jharkhand, Punjab , Rajasthan, Gujarat, Madhya Pradesh and Odisha **Global:** Maldives	Vishvaraj Environment Limited offers a range of services in the water management sector, including water treatment and supply, wastewater treatment and reuse, automation, and urban and rural water management. The company executes projects through various models, such as PPP, HAM, and EPC contracting, for government entities. Vishvaraj Environment Limited has developed India's first and largest wastewater reuse plant (as of FY25) with a capacity of 190 MLD in Nagpur under the PPP model, treating secondary treated municipal wastewater to industrial-grade standards, and is further expanding its footprint through similar PPP-based projects, including 110 MLD Reuse at New Koradi TPS, and 80 MLD Reuse at Bhusawal TPS Vishvaraj Environment Limited was also part of Nagpur’s 24x7 water supply project (India’s first full city 24x7 water supply

Company Name	Established	Geographical presence	Overview
			PPP project) in 2011, along with Veolia India Private Limited in a 50:50 JV called as Orange City Water Pvt. Ltd.
Welspun Enterprises Ltd	1994	**India:** Uttar Pradesh, Maharashtra, Uttarakhand, Bihar, Tamil Nadu, Punjab, etc.	Welspun Enterprise Limited operates in the infrastructure sector, with a focus on the development and operation of roads, highways, water, and wastewater projects across India. The company is involved in various PPP models in rural and urban areas. In addition to its infrastructure business, Welspun Enterprise Limited has investments in oil and gas exploration assets through a joint venture with the Adani Group, called Adani Welspun Exploration Limited (AWEL). The company has also expanded its water infrastructure business through the acquisition of Welspun Michigan Engineers Limited, a trenchless technology-based EPC company, which enables it to provide services in tunnelling, sewer rehabilitation, and allied areas.

Source: CRISIL Intelligence, company websites, and company annual reports

Type of project segments selected players operates

Company Name	HAM Projects	PPP Projects	EPC projects	O&M Projects
EMS Limited				
Enviro Infra Engineers Ltd				
GA Infra Private Limited	N.A.	N.A.	N.A.	N.A.
Gaja Engineering Private Limited	N.A.	N.A.	N.A.	N.A.
Ion Exchange (India) Ltd				
VA Tech Wabag Limited				
Vishnu Prakash R Punglia Limited				
Vishvaraj Environment Limited				
Welspun Enterprises Ltd				

Note: N.A. – Not Available; N.Ap. – Not Applicable, Above table is only indicative of the presence of the respective companies across project segments and not exhaustive

Operating segment

Source: CRISIL Intelligence, company websites, and company annual reports

Domestic business share (FY24)

Company Name	Domestic business	International business
EMS Limited	100%	0%
Enviro Infra Engineers Ltd	100%	0%
GA Infra Private Limited	100%	0%
Gaja Engineering Private Limited	100%	0%
Ion Exchange (India) Ltd	78%	22%
VA Tech Wabag Limited	60%	40%
Vishnu Prakash R Punglia Limited	100%	0%
Vishvaraj Environment Private Limited	100%	0%
Welspun Enterprises Ltd	100%	0%

Note: N.A. – Not Available; N.Ap. – Not Applicable
Source: Company annual reports, quarterly financials and investor presentation available in the public domain, CRISIL Intelligence

Financial parameters

VA Tech Wabag Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	136,670.00	114,480.00	132,190.00
Assets Under Management	*INR Millions*	NA	NA	NA
Revenue from Operations	*INR Millions*	32,940.00	28,564.00	29,605.00
YoY Revenue Growth	*%*	15.32%	-3.52%	NA
EBITDA	*INR Millions*	4,302.00	3,768.00	3,547.00
EBITDA Margin	*%*	13.10	13.20	12.50
PAT	*INR Millions*	2,948.00	2,504.00	110.00
YoY PAT Growth	*%*	17.73%	2,176.36%	NA
PAT Margin	*%*	9.00	8.60	0.30
Net Debt	*INR Millions*	-5,889.00	-2,355.00	-1,007.00
Total Equity	*INR Millions*	21,450.00	18,239.00	15,746.00
Net Debt to Total Equity Ratio	*Times*	NA	NA	NA
ROCE	*%*	19.50	19.50	0.03
ROE	*%*	14.90	14.70	0.01
Debtor Days	*Days*	NA	NA	NA
Net Working Capital Days	*Days*	110.00	NA	NA

Note:
All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

ION Exchange India Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	27,620.30	35,460.00	34,300.00
Assets Under Management	*INR Millions*	NA	NA	NA
Revenue from Operations	*INR Millions*	27,371.08	23,478.49	19,896.09
YoY Revenue Growth	*%*	16.58%	18.01%	NA
EBITDA	*INR Millions*	3,424.17	3,158.20	2,960.55
EBITDA Margin	*%*	12.30	13.20	14.60
PAT	*INR Millions*	2,082.55	1,953.52	1,949.66
YoY PAT Growth	*%*	6.60%	0.20%	NA
PAT Margin	*%*	7.50	8.20	9.60
Net Debt	*INR Millions*	NA	NA	NA
Total Equity	*INR Millions*	12,094.86	10,198.06	8,358.00
Net Debt to Total Equity Ratio	*Times*	NA	NA	NA
ROCE	*%*	NA	NA	NA
ROE	*%*	NA	NA	NA
Debtor Days	*Days*	NA	NA	NA
Net Working Capital Days	*Days*	NA	NA	NA

Note:
All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

Welspun Enterprises Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	143,540.00	122,000.00	101,000.00
Assets Under Management	*INR Millions*	NA	NA	NA
Revenue from Operations	*INR Millions*	35,841.00	28,742.10	27,581.90
YoY Revenue Growth	*%*	24.70%	4.21%	NA
EBITDA	*INR Millions*	7,301.80	6,164.70	3,910.90
EBITDA Margin	*%*	19.25	20.12	13.48
PAT	*INR Millions*	3,538.30	3,194.00	7,260.60
YoY PAT Growth	*%*	10.78%	-56.01%	NA
PAT Margin	*%*	NA	NA	NA
Net Debt	*INR Millions*	5,143.60	218.80	-10,182.10
Total Equity	*INR Millions*	27,092.70	24,901.80	23,619.90
Net Debt to Total Equity Ratio	*Times*	NA	NA	NA
ROCE	*%*	16.60	18.80	18.30
ROE	*%*	14.60	13.70	35.00
Debtor Days	*Days*	NA	NA	NA
Net Working Capital Days	*Days*	NA	NA	NA

Note:
All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

Enviro Infra Engineers Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	19,921.00	21,255.86	14,966.86
Assets Under Management	*INR Millions*	NA	NA	NA
Revenue from Operations	*INR Millions*	10,660.56	7,289.15	3,381.02
YoY Revenue Growth	*%*	46.25%	115.59%	NA
EBITDA	*INR Millions*	2,678.00	1,665.00	817.00
EBITDA Margin	*%*	25.10	22.80	24.20
PAT	*INR Millions*	1,771.48	1,064.56	574.52
YoY PAT Growth	*%*	66.40%	85.30%	NA
PAT Margin	*%*	16.30	14.40	16.20
Net Debt	*INR Millions*	717.44	2,334.90	621.68
Total Equity	*INR Millions*	9,937.92	2,905.94	1,289.99
Net Debt to Total Equity Ratio	*Times*	NA	NA	NA
ROCE	*%*	22.60	32.20	43.40
ROE	*%*	17.80	36.50	43.70
Debtor Days	*Days*	NA	NA	NA
Net Working Capital Days	*Days*	NA	NA	NA

Note:
All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

EMS Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	22,364.30	18,000.00	13,890.80
Assets Under Management	*INR Millions*	NA	NA	NA
Revenue from Operations	*INR Millions*	9,658.32	7,933.11	5,381.62
YoY Revenue Growth	*%*	21.75%	47.41%	NA
EBITDA	*INR Millions*	2,670.34	2,196.05	1,551.23
EBITDA Margin	*%*	26.01	25.07	27.87
PAT	*INR Millions*	1,837.84	1,526.63	1,088.51
YoY PAT Growth	*%*	20.38%	40.25%	NA
PAT Margin	*%*	18.72	18.87	20.04
Net Debt	*INR Millions*	-757.44	-407.22	-758.26
Total Equity	*INR Millions*	9,783.09	8,005.17	4,928.28
Net Debt to Total Equity Ratio	*Times*	NA	NA	NA
ROCE	*%*	26.00	30.00	32.00
ROE	*%*	21.00	24.00	25.00
Debtor Days	*Days*	NA	NA	NA
Net Working Capital Days	*Days*	NA	NA	NA

Note:
All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

Vishnu Prakash R Punglia Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	53,634.00	47,169.57	NA
Assets Under Management	*INR Millions*	NA	NA	NA
Revenue from Operations	*INR Millions*	12,374.18	14,738.65	11,684.04
YoY Revenue Growth	*%*	-16.04%	26.14%	NA
EBITDA	*INR Millions*	1,554.00	2,098.90	1,565.83
EBITDA Margin	*%*	12.56	14.24	13.40
PAT	*INR Millions*	585.96	1,221.85	906.43
YoY PAT Growth	*%*	-52.04%	34.80%	NA
PAT Margin	*%*	4.74	8.29	7.75
Net Debt	*INR Millions*	7,018.87	3,424.32	2,353.73
Total Equity	*INR Millions*	7,793.10	7,210.64	3,145.07
Net Debt to Total Equity Ratio	*Times*	NA	NA	NA
ROCE	*%*	11.40	24.58	33.72
ROE	*%*	7.81	23.60	38.31
Debtor Days	*Days*	NA	NA	NA
Net Working Capital Days	*Days*	NA	NA	NA

Note:
All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

Vishvaraj Environment Limited

Particulars	Units	FY 25	FY 24	FY23
Order Book	*INR Millions*	160,113.44	34,534.32	42,717.33
Assets Under Management	*INR Millions*	66,779.00	14,517.40	14,517.40
Revenue from Operations	*INR Millions*	17,587.11	12,554.41	6,699.92
YoY Revenue Growth	*%*	40.09%	87.38%	NA
EBITDA	*INR Millions*	4,239.61	2,686.06	1,618.28
EBITDA Margin	*%*	24.11%	21.40%	24.15%
PAT	*INR Millions*	2,662.69	1,657.86	960.58
YoY PAT Growth	*%*	60.61%	72.59%	NA
PAT Margin	*%*	14.95%	12.83%	13.86%
Net Debt	*INR Millions*	7,692.74	2,791.73	4,252.53
Total Equity	*INR Millions*	7,821.57	5,559.23	4,301.36
Net Debt to Total Equity Ratio	*Times*	0.98	0.50	0.99
ROCE	*%*	24.04%	26.81%	18.07%
ROE	*%*	39.80%	33.63%	25.58%
Debtor Days	*Days*	115.01	98.37	151.28
Net Working Capital Days	*Days*	NA	NA	46.67

All values have been considered on a consolidated basis
All values have been considered as reported by the companies, except YoY revenue growth and YoY PAT growth

Key observations:

- According to the order book published by the selected peers, Vishvaraj Environment Limited stands out as the top-ranked company among them in FY25, and the published order book reveals ~4 times increase in the order book for FY25 compared to FY23.
- As of March 31, 2025, Vishvaraj Environment Limited water treatment and supply portfolio consists of 30 water treatment plants with a combined treatment capacity of 2090.10 MLD, including 19 O&M projects, and a network of 9,984 kilometres of water distribution pipelines
- As of March 31, 2025, Vishvaraj Environment Limited wastewater portfolio consists of 60 Sewage Treatment Plants (STPs) with a total treatment capacity of 1706.57 MLD, including 16 O&M projects
- Vishvaraj Environment Limited is one of the leading developers of water utility and wastewater management projects with a focus on the recycling of treated sewage water for industrial use with an Order Book of INR 160,113.44 million, as of March 31, 2025
- After 190 MLD wastewater reuse project in Nagpur, Vishvaraj Environment Limited has executed a 50 MLD tertiary treatment plant in Chandrapur, Maharashtra in December 2023
- As of 2021, the top 6 states in India in terms of sewage generation are Maharashtra, Uttar Pradesh, Tamil Nadu, West Bengal, Gujarat, and Karnataka. Notably, Vishvaraj Environment Limited has successfully executed water treatment projects in 5 out of these 6 leading states.
- As of March 31, 2025 - Vishvaraj Environment Limited started executing PDN (Pipe Distribution Network) Irrigation project for a 20,887 Ha Culturable Command Area ("CCA")
- In FY2025, Vishvaraj Environment Limited started a process of establishing four solar power projects in Maharashtra, totalling a capacity of 201 megawatts (MW)
- As of March 31, 2025, Vishvaraj Environment Limited's Assets Under Management (AUM) stand at INR 66,779.00 million out of which INR 7,251.00 million has been executed and INR 59,528.00 million is under execution
- Vishvaraj Environment Limited's ranked 24th globally among the top 50 private water operators in the world by Global Water Intelligence and were the fourth Indian company in such list, as of March 31, 2025, based on number of people served.
- Vishvaraj Environment Limited ranks second among the peer set in terms of revenue growth, with a CAGR of 62.02% between FY23 and FY25

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