# Industry Report

on

Engineering, Procurement, and Construction (EPC) in Water and Wastewater Distribution Infrastructure In India

2nd April 2025

Contents

## Annexure for Abbreviation used

| | |
|---|---|
| GDP | Gross Domestic Product |
| GVA | Gross Value Added |
| IIP | Index of Industrial Production |
| PFCE | Private Final Consumption Expenditure |
| GFCF | Gross fixed capital formation |
| WPI | Wholesale Price Index |
| CPI | Consumer Price Index |
| y-o-y | Year on Year |
| m-o-m | Month on Month |
| IMF | International Monetary Fund |
| RBI | Reserve Bank of India |
| MOSPI | The Ministry of Statistics and Programme Implementation |
| Est., Adv. Est | Estimated, Advance Estimates |
| P, F | Projected, Forecast |
| USD | US Dollar |
| INR | Indian Rupee |
| Mn, Bn, Tn, Cr | Million, Billion, Trillion, Crore |
| PLI | Production Linked Incentive |
| QSR | Quick Service Restaurant |
| CAGR | Compound Annual Growth Rate |

| | |
|---|---|
| FDI | Foreign Direct Investment |
| EPC | Engineering, Procurement, and Construction |
| WSS | Water Supply Schemes |
| BCM | Billion Cubic Meters |
| NCIWRD | National Commission on Integrated Water Resources Development |
| ICAR | Indian Council for Agriculture Research |
| BOD | Biological Oxygen Demand |
| SCM | Smart City Mission |
| AMRUT | Atal Mission for Rejuvenation and Urban Transformation |
| NMCG | National Mission for Clean Ganga |
| JJM | Jal Jeevan Mission |
| FHTCs | functional household tap connections |
| HDPE | High-Density Polyethylene |
| SCADA | Supervisory Control and Data Acquisition |
| PPPs | Public-Private Partnerships |
| AI | Artificial intelligence |
| CWSS | Combined Water Supply Scheme |
| NRDWP | National Rural Drinking Water Programme |
| PMKSY | Pradhan Mantri Krishi Sinchayee Yojana |
| ATAL JAL | Atal Bhujal Yojana |
| NHP | National Hydrology Project |
| NWM | National Water Mission |
| DRIP | Dam Rehabilitation and Improvement Programme |

| | |
|---|---|
| MLD | Million Liters per Day |
| JICA | Japan International Cooperation Agency |
| ADB | Asian Development Bank |
| STPs | Sewage Treatment Plants |
| ETPs | Effluent Treatment Plants |
| CETPs | Common Effluent Treatment Plants |
| ETPs | Effluent Treatment Plants |
| NIP | National Infrastructure Pipeline |
| EBITDA | Earnings Before Interest, Taxes, Depreciation, and Amortization |
| PAT | Profit After Tax |
| ROA | Return on Assets |

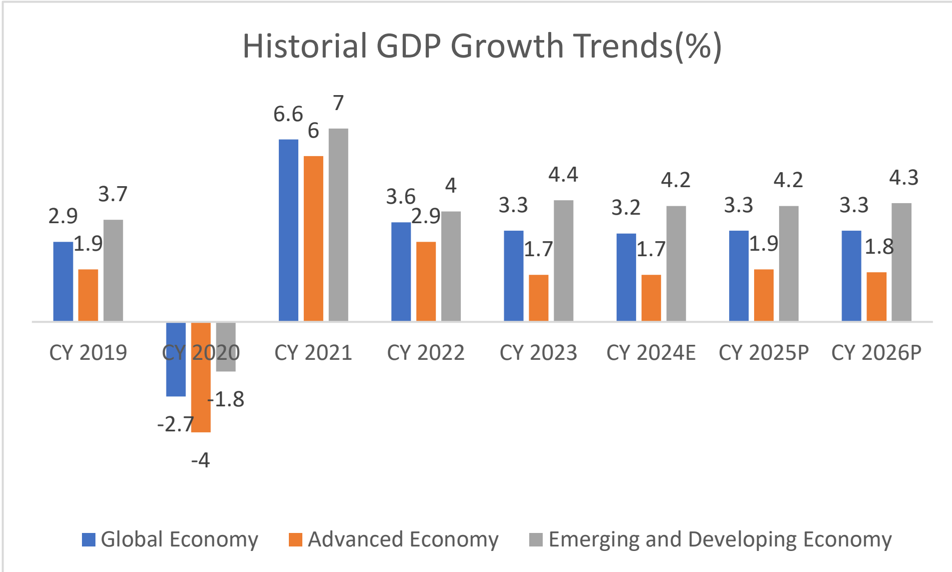
# Global Macroeconomic Landscape

## Global Economic Overview

The global economy, which grew by 3.3% in 2023, is expected to record a sluggish growth of 3.2% in 2024 before rising modestly to 3.3% in 2025. Between 2021-2022, global banks were carrying a historically high debt burden after COVID-19. Central banks took tight monetary measures to control inflation and spike in commodity prices. Russia's war with Ukraine further affected the global supply chains and inflated the prices of energy and other food items. These factors coupled with war-related economic sanctions impacted the economic activities in Europe. Any further escalation in the war may further affect the rebound of the economy in Europe.

While China, the largest manufacturing hub of world, was facing a crisis in the real estate sector and prices of properties were declining between 2020 - 2023, with the reopening of the economy, consumer demand is picking up again. The Chinese Government took several steps to help the real estate sector including cracking down on debt-ridden developers, announcing stimulus for the sector and measures to encourage the completion and delivery of unfinished real estate projects. The sector is now witnessing investments from developers and demand from buyers.

The year 2024 continued to remain a challenging year marked by uncertainties and transformative shifts. Numerous factors such as high inflation in many economies despite central bank effort to curb inflation, continuing energy market volatility driven by geopolitical tensions particularly in Ukraine and Middle East, and the re-election of Donald Trump as US President extended uncertainty around the trade policies as well as overall global economic growth. High inflation and rising borrowing costs affected the private consumption on one hand while fiscal consolidation impacted the government consumption on the other hand.  As a result, global GDP growth is estimated to grow by 3.2% in CY 2024 as compared to 3.3% in CY 2023.

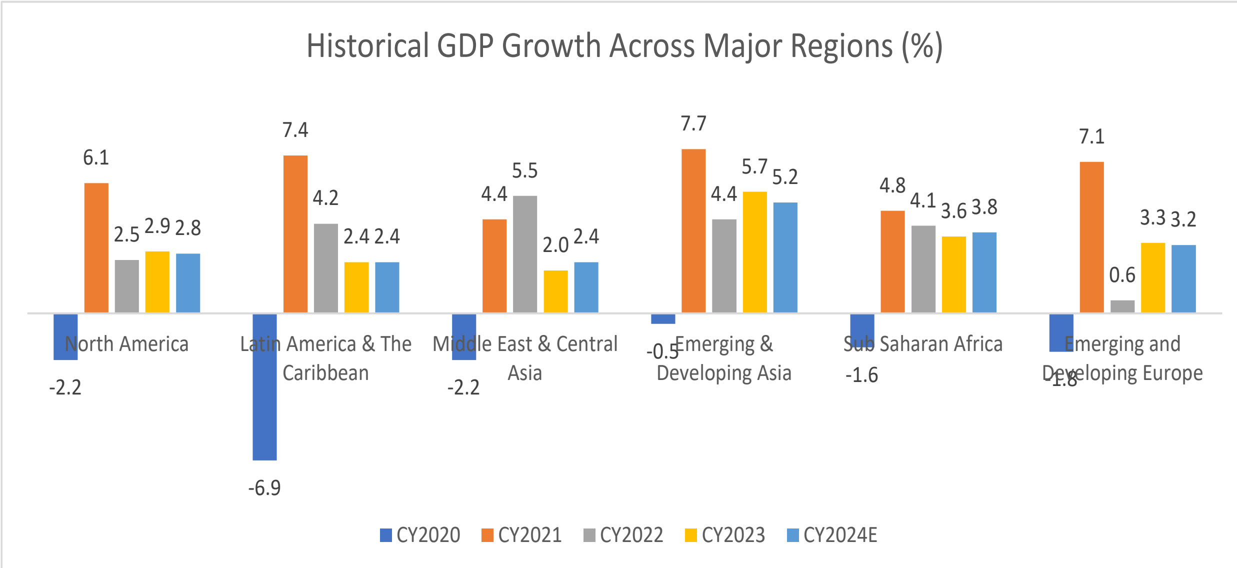



Source – IMF Global GDP Forecast Release January 2025

*Note: Advanced Economies and Emerging & Developing Economies are as per the classification of the World Economic Outlook (WEO). This classification is not based on strict criteria, economic or otherwise, and it has evolved over time. It comprises of 40 countries under the Advanced Economies including the G7 (the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada) and selected countries from the Euro Zone (Germany, Italy, France etc.). The group of emerging market and developing economies (156) includes all those that are not classified as Advanced Economies (India, China, Brazil, Malaysia etc.)*

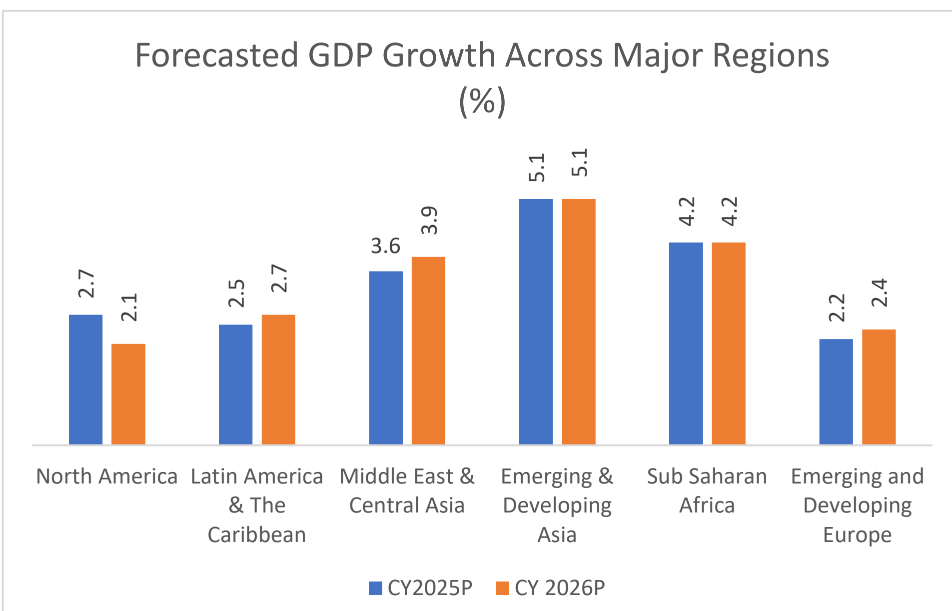
## GDP Growth Across Major Regions

GDP growth of major regions including Emerging and Developing Europe, Latin America & The Caribbean, Middle East & Central Asia, and Sub-Saharan Africa, were showing signs of slow growth and recession between 2020 – 2023, but leaving Latin America & The Caribbean, 2024 is expected to show resilience and growth. Meanwhile, GDP growth in Emerging and Developing Asia (India, China, Indonesia, Malaysia, etc.) is expected to decrease from 5.2% in CY 2024 to 5.1% in CY 2025, while in the North America, it is expected to decrease from 2.8% in CY 2024 to 2.7% in CY 2025.




Source-IMF World Economic Outlook January 2025 update.

Except for Emerging and Developing Asia, Emerging and Developing Europe and North America, all other regions are expected to record an increase in GDP growth rate in CY 2025 as compared to CY 2024. Further, growth in the United States is expected to come down at 2.7% in CY 2025 due to lagged effects of monetary policy tightening, gradual fiscal tightening, and a softening in labour markets slowing aggregate demand. India and China saw greater-than-anticipated growth in 2023 due to heightened government spending and robust domestic demand, respectively. Sub-Saharan Africa's expected growth in 2024 is attributed to the diminishing negative impacts of previous weather shocks and gradual improvements in supply issues.



Source-IMF, OECD, and World Bank, D&B Estimates

## Global Economic Outlook

As 2025 begins, there is some uncertainty due to the likely shift in policy following numerous elections around the world. New policies could lead to new trajectories for inflation, borrowing costs, and currency values, as well as trade flows, capital flows, and costs of production. Meanwhile, governments and central banks continue to navigate a balance between a desire to suppress inflation and a goal to boost growth.

Real GDP in advanced economies is projected to grow 1.9% in 2025, up from 1.7% in 2024. In the US, economic activity is expected to remain robust, supported by solid income and productivity, even as real GDP growth slips from 2.8% in 2024 to 2.1% in 2025. In Europe, steady income growth and falling interest rates should drive stronger consumer spending growth and a modest recovery in investment. Real GDP growth in Japan is likely to rebound toward 1.1% driven by a gradual acceleration in real wages and consumer spending. Additionally, real GDP growth in mainland China slowing to 4.6% in 2025 as structural property sector and demographic challenges will restrain economic activity despite fiscal and monetary policy support. India should remain a bright spot, with real GDP growth expected at 6.5%, driven by public investment and strong domestic demand. Latin America is expected to see a mildly stronger expansion, despite a notable slowdown in growth in Brazil.

The emerging markets that have advantageous locations and preferential trade agreements across major blocs will grow. India, Saudi Arabia, Mexico, Brazil, the United Arab Emirates and Southeast Asian economies will benefit from maintaining or developing strong trade and investment relations across geopolitical blocs. India will continue to foster trade and investment ties across geopolitical divides while being a critical driver of South-South trade. Southeast Asia is likely to remain the top destination for foreign investment among emerging markets. In the US, protectionist measures will be used in a transactional manner to extract trade, immigration, drug traffic control, defense spending and other political concessions from trading partners. We anticipate targeted tariffs on trading partners. However, we note that a scenario factoring 60% tariffs on Chinese imports and a 10% universal tariff on all imports from other US trading partners (assuming proportional retaliation against US exports) would reduce global GDP by 1.4% after two years, with GDP in the US, mainland China, Mexico and Canada reduced by 2.0% to 3.0%.

In Europe, the European Commission will also make increasing use of trade-defensive tools such as tariffs and step up scrutiny of foreign direct investments in strategic sectors. And, in emerging countries, this trend will increasingly manifest in resource nationalism, as governments from Mexico to Indonesia seek greater state involvement in the resources sector or higher value-added process to occur domestically.

Global inflation is expected to decline steadily, to 4.2% in 2025 and to 3.5% in 2026 still somewhat higher than the 3.1% pace in 2019. In advanced economies, where inflation surged to multidecade highs following the pandemic, price pressures are expected to moderate but remain uneven. Wage cost pressures, potential tariffs and limited innovation undermining global competitiveness in some sectors are likely to persist across European economies and the UK. In the US, we expect the moderating trend in inflation will remain in place through early 2025, though it could then change as deregulation, potential immigration restrictions and tariffs lead to a renewed inflation impulse. In contrast to President-elect Trump's first term, these inflationary pressures would come in a new paradigm defined by fragile supply conditions, elevated geopolitical tensions and structural upside risks to inflation. Geopolitical tensions such as the wars in Ukraine and the Middle East could further exacerbate inflation volatility, particularly in energy and agricultural commodities.

Mainland China will face a different macroeconomic challenge: the risk of deflation due to subdued consumer spending trends, cautious business investment and ongoing deleveraging in the property sector. This has prompted authorities to announce stimulus measures to prevent exacerbating deflationary pressures. Indeed, deflation could slow the economic recovery by delaying consumer purchases, eroding corporate revenues and worsening real debt burdens, particularly if property sector weakness and slowing exports continue to weigh on private sector confidence. Emerging markets will grapple with the challenge of curbing inflation while contending with fragile supply chains, volatile commodity prices and foreign exchange fluctuations. Several Asian emerging economies, including India and Indonesia, are better positioned to maintain price stability due to proactive fiscal measures and monetary prudence. The combination of a diversified supply base that mitigates reliance on external inputs and importing deflation from China should further support disinflation.

## India Macroeconomic Analysis

In India, growth is expected to decelerate to 6.5% in FY 2024 from 8.2% in FY 2023, reflecting a slowdown in investment and weak manufacturing growth. However, services activity has been steady, while growth in the agricultural sector has recovered. Private consumption growth has remained resilient, primarily driven by improved rural incomes accompanied by a recovery of agricultural output. In contrast, higher inflation and slower credit growth have curbed consumption in urban areas

| Country | Real GDP Growth (CY 2023) | Estimated GDP Growth (CY 2024) | Projected GDP Growth (CY 2025) | Projected GDP Growth (CY 2026) |
|---|---|---|---|---|
| India | 8.2% | 6.5% | 6.5% | 6.5% |
| China | 5.2% | 4.8% | 4.6% | 4.5% |
| Russia | 3.6% | 3.8% | 1.4% | 1.2% |
| Brazil | 3.2% | 3.7% | 2.2% | 2.2% |
| United States | 2.9% | 2.8% | 2.7% | 2.1% |
| Japan | 1.5% | -0.2% | 1.1% | 0.8% |
| Canada | 1.5% | 1.3% | 2.0% | 2.0% |
| France | 1.1% | 1.1% | 0.8% | 1.1% |
| Italy | 0.7% | 0.6% | 0.7% | 0.9% |
| South Africa | 0.7% | 0.8% | 1.5% | 1.6% |
| United Kingdom | 0.3% | 0.9% | 1.6% | 1.5% |
| Germany | -0.3% | -0.2% | 0.3% | 1.1% |

Source-IMF World Economic Outlook January 2025 update.

Countries considered include - Largest Developed Economies and BRICS (Brazil, Russia, India, China, and South)

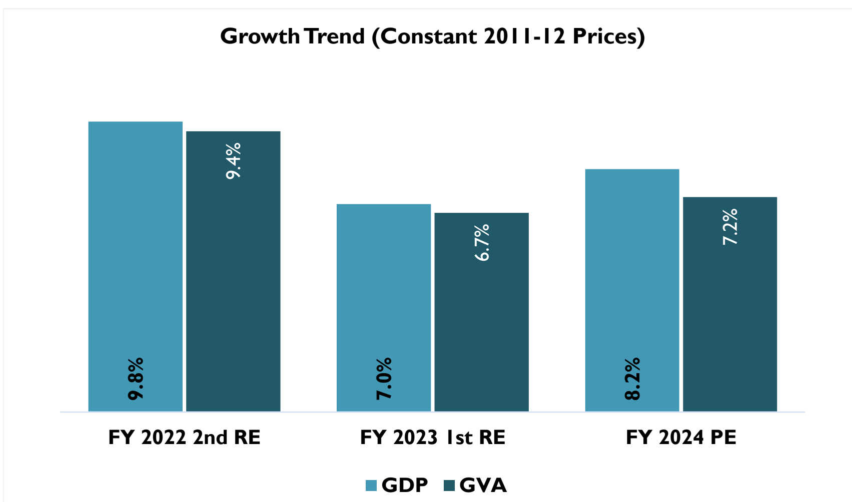
Countries have been arranged in descending order of GDP growth in 2023).

There are few factors aiding India's economic recovery – notably its resilience to external shocks and rebound in private consumption. This rebound in private consumption is bringing back the focus on improvements in domestic demand, which together with revival in export demand is a precursor to higher industrial activity. Already the capacity utilization rates in Indian manufacturing sector are recovering as industries have stepped up their production volumes. As this momentum sustains, the country may enter a new capex (capital expenditure) cycle. The universal vaccination program by the Government has played a big part in reinstating confidence among the population, in turn helped to revive private consumption.

Realizing the need to impart external stimuli, the Government stepped up its spending on infrastructure projects which in turn had a positive impact on economic growth. The capital expenditure of the central government increased by 11.1% increase in capital expenditure (budget estimates), to the tune of INR 11.11 trillion in the Union Budget 2024-2025 constituting 3.4% of the GDP. The improvement was accentuated further as the Budget 2025-2026 announced an 10% increase in capital expenditure, coupled with INR 1.5 trillion in interest-free loans to states. This has provided much-needed confidence to the private sector, and in turn, expected to attract the private investment.

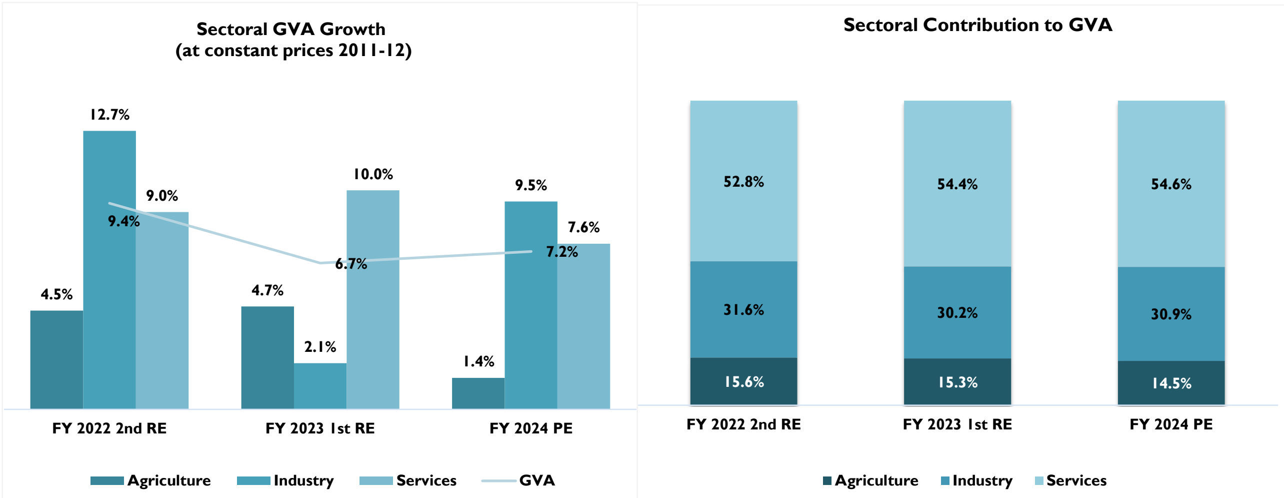
## Historical GDP and GVA Growth trend

As per the provisional estimates 2023-24, India's GDP in FY 2024 grew by 8.2% compared to 7.0% in the previous fiscal on the back of solid performances in manufacturing, mining, and construction sectors. The year-on-year increase in growth rate is also partly due to by a strong growth in investment demand led by public capital expenditure.




Source: Ministry of Statistics & Programme Implementation (MOSPI), National Account Statistics, 2023-24

## Sectoral Contribution to GVA and annual growth trend




Source: Ministry of Statistics & Programme Implementation (MOSPI)

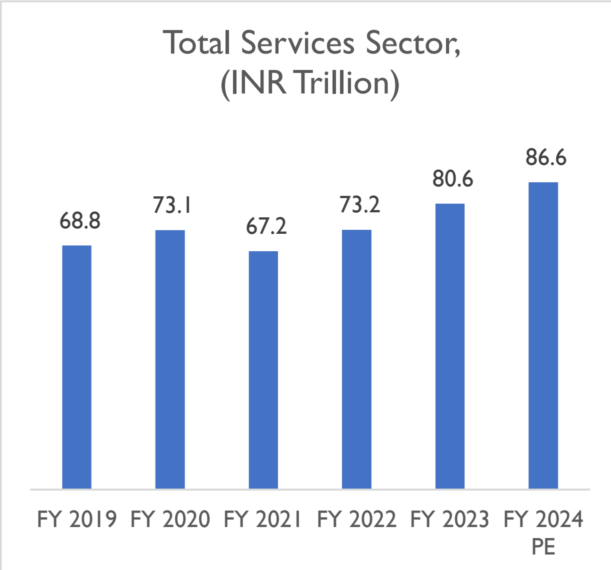
Sectoral analysis of GVA reveals industrial sector recovered sharply registering 9.5% y-o-y increase in FY 2024 against 2.1% in the previous fiscal. In the industrial sector, growth across major economic activity such as mining, manufacturing and construction sector rose significantly and it registered a growth of 7.1%, 9.9% and 9.9% in FY 2024 against a y-o-y change of 1.9%, -2.20%, and 9.44% in FY 2023, respectively. Utilities sector observed a marginal moderation in y-o-y growth to 7.5% against 9.44% in the previous years.

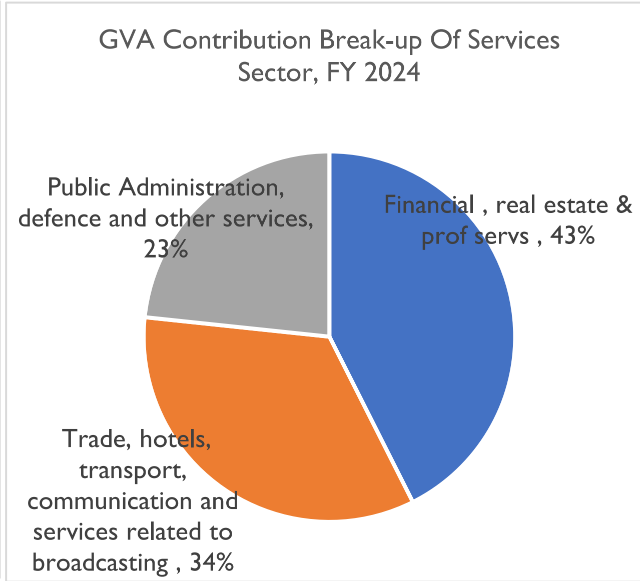
Talking about the services sector's performance, with major relaxation in covid restriction, progress on COVID-19 vaccination and living with virus attitude, business in the service sector gradually returned to normalcy in FY 2023. Economic recovery was supported by the service sector as individual mobility returned to the pre-pandemic level. The trade, hotel, transport, communication, and broadcasting segment continued to strengthen in FY 2023 and grow in FY 2024, although the growth hasn't shown substantial increases. In FY 2024, services sector grew by 7.6% against 10% y-o-y growth in the previous year.

## Expansion in Service Sector

Services sector is a major contributor to the country's overall economic growth. In absolute terms, services sector GVA has increased from INR 68.78 trillion in FY 2019 to INR 86.6 trillion in FY 2024 (as per the provisional estimated), registering a CAGR of nearly 5%. Within Services sector, the GVA by financial, real estate and professional services-the largest contributing segment observed 6.3% CAGR while

Public Administration, defence and other services1 observed 4.5% CAGR and Trade, hotels, transport, communication, and services related to broadcasting witnessed 3.1% CAGR between FY 2019-24.



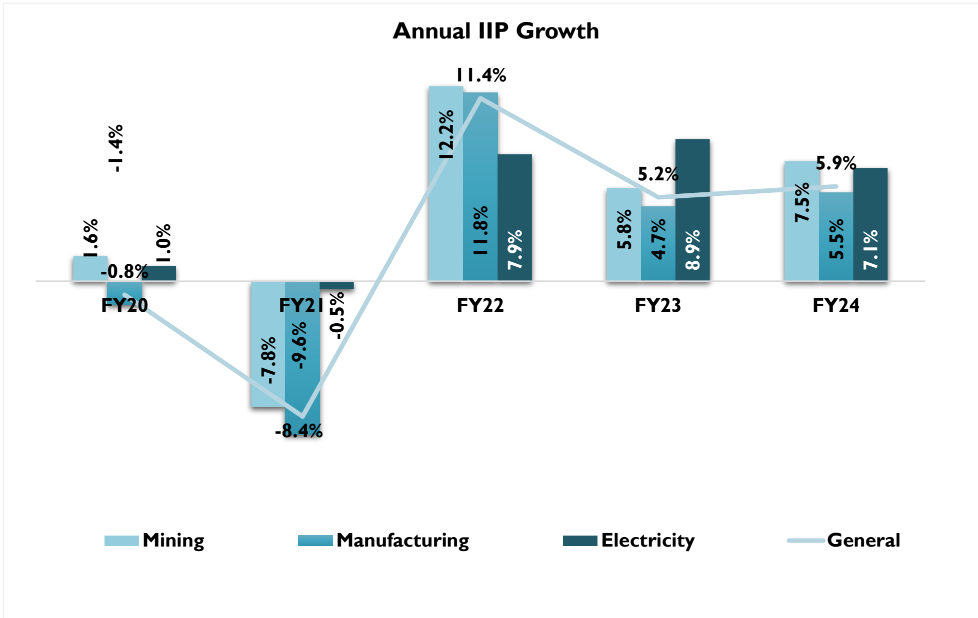

Sources: MOSPI, CMIE Economic Outlook and Dun & Bradstreet Research Estimates2F[2]

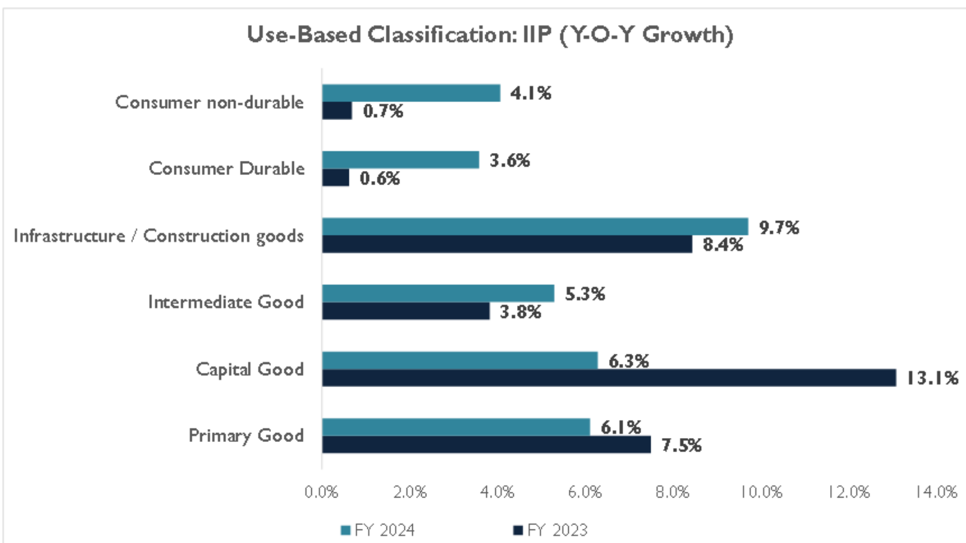
India's HSBC Services Purchasing Managers' Index**,** an important indicator to track service sector performance, measured 60.3 in July 2024 against 60.5 in the previous month. Since August 2021, the services sector has consistently remained above the threshold of 50, which distinguishes growth from contraction.

## IIP Growth

Industrial sector performance as measured by IIP index; in FY 2024 it is growing at 5.9% (against 5.2% in FY 2023). Previously IIP index exhibited temporary recovery in FY 2022 from the low of Covid induced slowdown in industrial growth during FY 2020 and FY 2021. Manufacturing index, with 77.6% weightage in overall index, grew by 5.5% in FY 2024 against 4.7% y-o-y growth in FY 2023 while mining sector index too grew by 7.5% in FY 2024 against 5.8% in the previous years. Mining & manufacturing both shown improvement according to previous except the Electricity sector Index, witnessed an improvement of 7.1% in FY 2024 against 8.9% in the previous year.

[1] Other services include Education, Health, Recreation, and other personal services.
[2] Projection as Based on CMIE Growth rate till FY 2029 and FY 2030 is based on Dun & Bradstreet assumption.

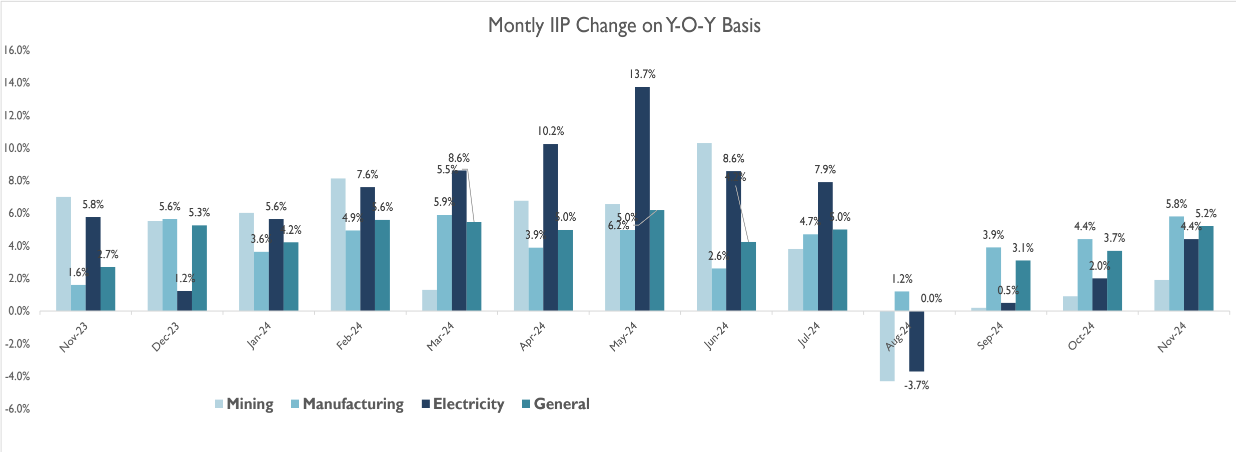



Source: Ministry of Statistics & Programme Implementation (MOSPI)

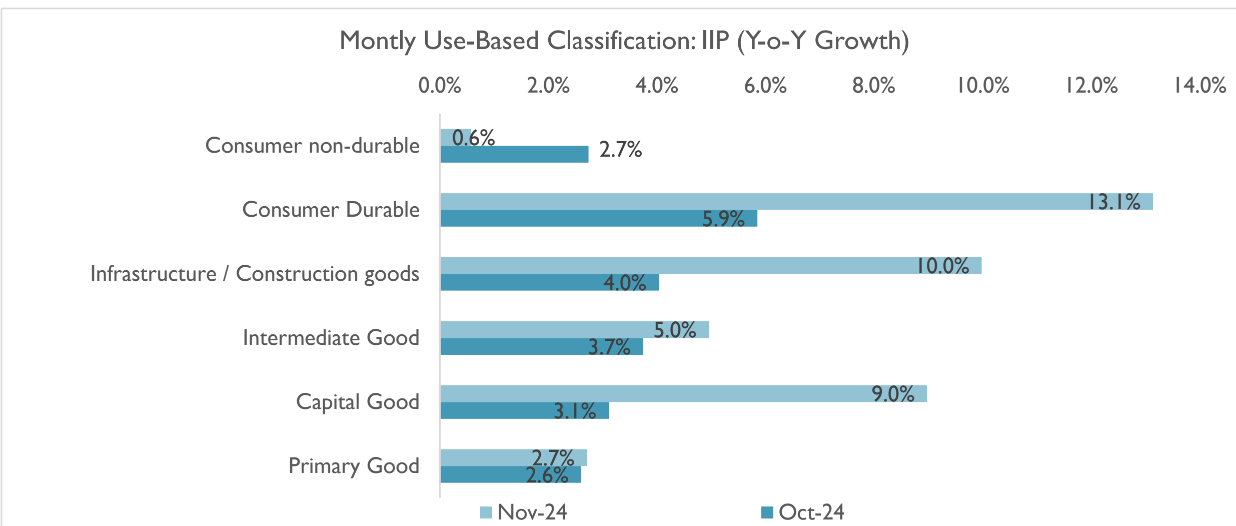
As per the use-based classification, most segments have shown growth for FY 2024 compared to FY 2023. Capital good and primary goods were segments which faced less growth as compared to previous year. The contracting IIP data points towards adverse operating business climate as global headwinds, high inflation, and monetary tightening cumulatively impacted the broader industrial sector performance. In contrast all the segments except the above two have shown growth.

## Monthly IIP Growth Trend




Source: Ministry of Statistics & Programme Implementation (MOSPI)

In the current fiscal FY 2025, the monthly IIP measured index has reported steady improvement over the last fiscal. Overall IIP index grew by 5.2% in November 2024 against 2.3% y-o-y growth observed in November 2023. However, the mining sector index growth slowed to 1.9% in November 2024, against 7.0% y-o-y growth in November 2023 while the manufacturing sector index exhibited substantial improvement and they grew by 5.8% in November 2024 against 1.6% in November 2023, respectively.



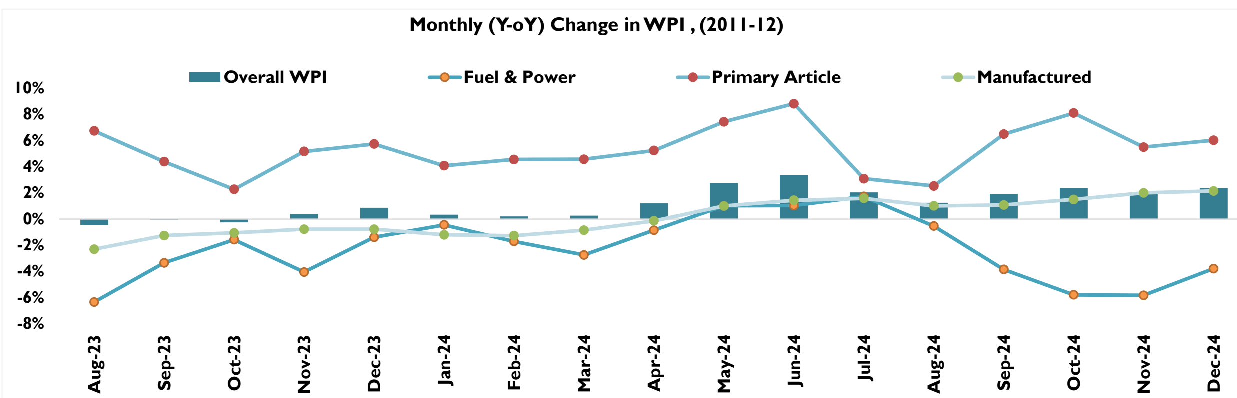

Sources: MOSPI

As per the use-based classification, growth in all segments excluding consumer non- durable increased in November 2024 as compared to the previous month. Growth in consumer non-durable segment slowed in November 2024 to 0.6% as against 2.7% in October 2024.

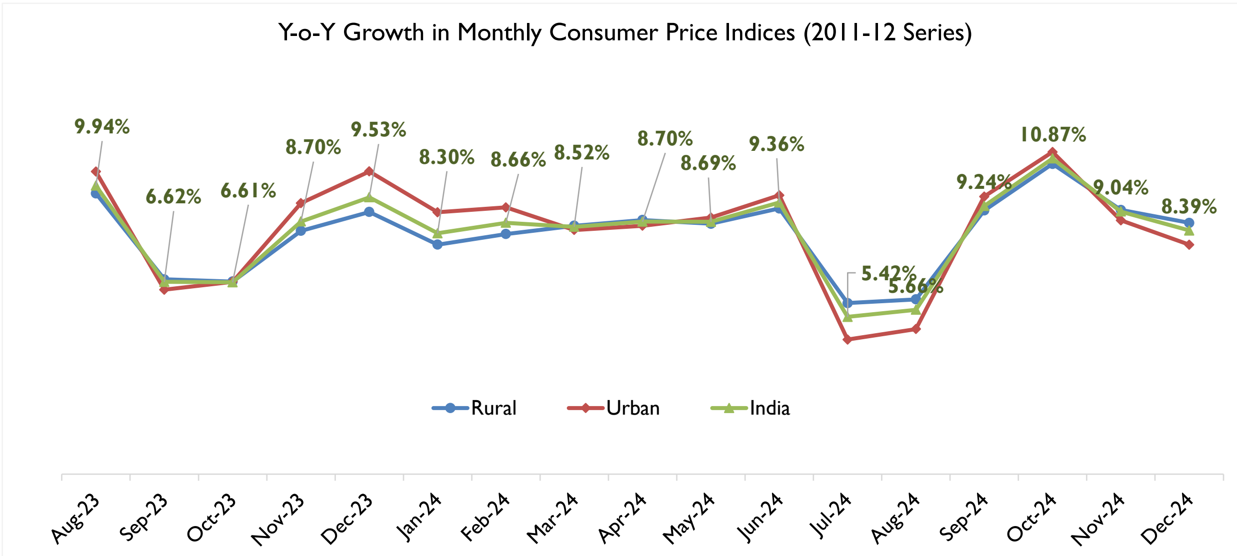
## Inflation Scenario

The inflation rate based on India's Wholesale Price Index (WPI) exhibited significant fluctuations across different sectors from August 2023 to December 2024. Overall WPI number measured 2.4% in December 2024. Positive rate of inflation in December 2024 is primarily due to increase in prices of food articles, manufacture of food products, other manufacturing, manufacture of textiles and non-food articles etc. By December 2024, Primary Articles WPI inflation moderated compared to October prices level but increase marginally compared to the previous month and measured 6.0%. The Price of food articles (-3.08%) and crude petroleum & natural gas (- 2.87%) decreased in December 2024 compared to the previous month i.e. November 2024. However, the Price of non-food articles grew by 2.53% and minerals by 0.48% in December 2024 as compared to November 2024.

Moreover, power & fuel, the index for this major group increased by 1.90% to 149.9 in December 2024 from 147.1 in the month of November 2024. Price of electricity (8.81%) and coal (0.07%) increased in December 2024. The price of mineral oils (-0.06%) decreased in December 2024 as compared to November 2024.




Source: MOSPI, Office of Economic Advisor.




Source: MOSPI, Office of Economic Advisor

Retail inflation rate (as measured by the Consumer Price Index) in India showed notable fluctuations between August 2023 and December 2024. Rural CPI inflation peaked at 9.67% in August 2023, declining to 8.65 % in December 2024. Urban CPI inflation followed a similar trend, rising to 10.42% in August 2023 and then dropping to 7.90% in December 2024. Overall, the national CPI inflation rate increased to 9.94% in August 2023 but moderated to 8.39% by December 2024, indicating a gradual easing of inflationary pressures across both rural and urban areas. CPI measured above 6% tolerance limit of the central bank since July 2023. As a part of an anti-inflationary measure, the RBI has hiked the repo rate by 250 bps since May 2022 to the current 6.5% while it has been holding the rate at 6.5% since 8 Feb 2023.

## Growth Outlook

India's H1 FY2024-25 GDP slowdown is cyclical, driven by credit tightening and delayed fiscal spending, but strong fundamentals should support growth in the second half of the fiscal year. Politically, the continuation of the National Democratic Alliance (NDA) government signals sustained reforms, with optimism around labour and land reforms. The government is also taking steps to control retail inflation by managing food prices and import duties. Retail inflation eased to 5.2% y/y in December, down from 5.5% in November as vegetable prices moderated following a bumper summer harvest and favorable monsoon. Still-high food prices and geopolitical tensions continue to pose risks to inflation and growth. High retail credit and rising unsecured loans signal consumption-driven borrowing, yet urban demand remains under pressure. Rural demand has shown resilience, benefitting from favorable monsoons, robust agricultural output and elevated food prices. The RBI's September economic review highlighted a contrasting trend in rural and urban consumption demand in H1 FY2024- 25, with rural demand remaining robust, while urban demand showed weakness.

On external front, the global business environment remains cautious, with geopolitical tensions, particularly in Gaza, posing potential risks to global stability. In mid-January 2025, the Indian rupee dropped below INR 86.6 USD, due to strong dollar demand from foreign banks, likely due to outflows from equities and the weakness in regional peers as the dollar strengthened. Rupee continued to face pressure due to sustained foreign fund outflows and the broad strength of the American currency in the overseas markets due to unabated dollar demand from oil importers and weak risk appetite

Looking ahead to 2025, India's projected GDP growth of 6.5% stands out as the fastest among major emerging markets, significantly outpacing China's 4.6%, and Brazil's 2.2%. This robust growth trajectory is expected to sustain at 6.5% annually from 2025 to 2026, reflecting strong economic fundamentals and continued momentum.

This decent growth momentum in near term CY 2025 is accompanied by a slowdown in inflation, as well as various other factors in the medium to long term that will support the economy. These include enhancements in physical infrastructure, advancements in digital and payment technology, improvements in the ease of doing business and a higher quality of fiscal expenditure to foster sustained growth.

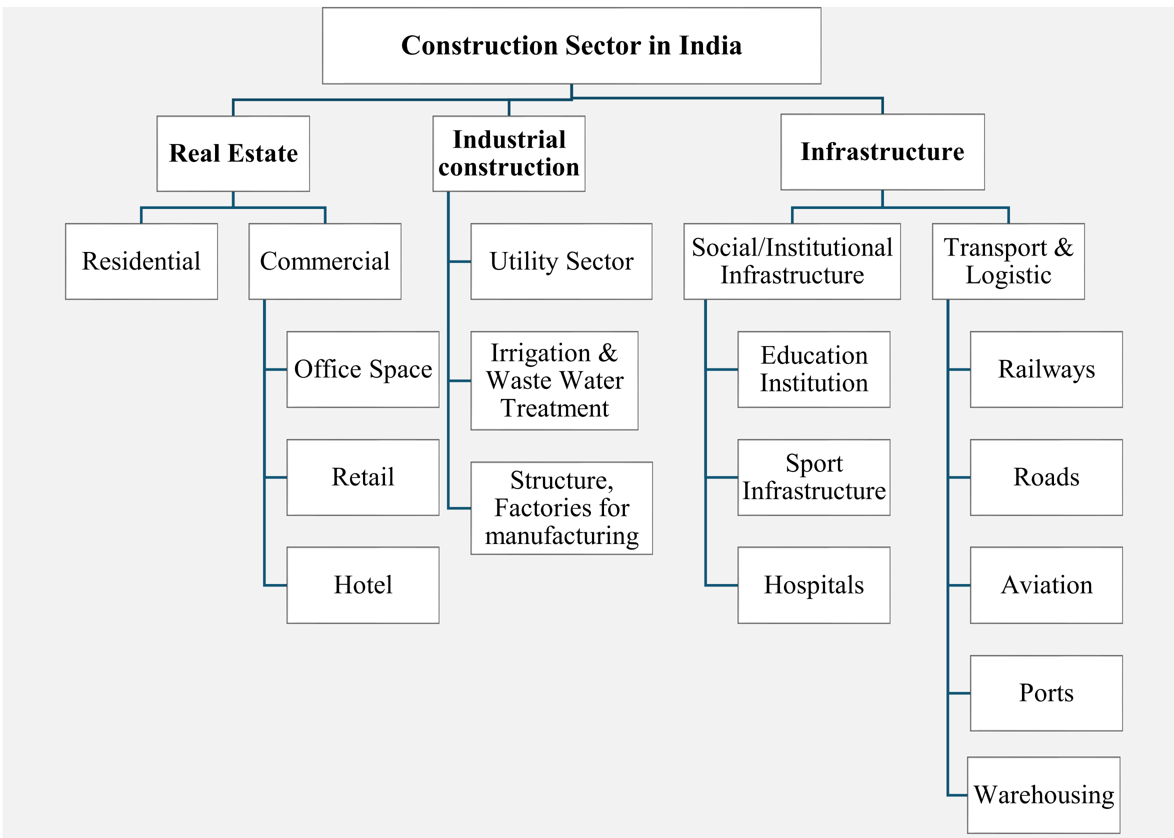
On the demand side, improving employment conditions and moderating inflation are expected to stimulate household consumption. Further, the investment cycle is gaining traction, propelled by sustained government capital expenditure, increased capacity utilization and rising credit flow.

From uplifting the underprivileged to energizing the nation's infrastructure development, the Government has outlined its vision to propel India's advancement and achieve a 'Viksit Bharat' by 2047 in the interim budget announced on 1st Feb 2024. The Union Budget for FY26, which takes a balanced approach to sustaining economic momentum. With a focus on stimulating demand, driving investment and ensuring inclusive development, the budget introduces measures such as tax relief, increased infrastructure spending and incentives for manufacturing and clean energy. These initiatives aim to accelerate growth while maintaining fiscal discipline, reinforcing India’s long-term economic resilience. The expansion of tax relief i.e zero tax liability for individuals earning up to INR 12 lacs annually under the new tax regime is expected to strengthen household finances and, consequently, boost consumption.

## Overview of the Construction Sector and Role of EPC Industry in India

Construction sector is one of the major segments that drives an economy. A unit increase in expenditure in construction sector has a multiplier effect on other sectors with a capacity to generate income as high as five times in other sectors.

Construction projects are often categorized based on their scale, the types of structures being built, and the purpose of the project. The sector is broadly divided into real estate construction, Industrial, and Civil & infrastructure construction. According to the "Harmonized Master List of Infrastructure Sub-sectors" published by the Ministry of Finance, Infrastructure segment is segmented as transport and logistics segment and Social and Commercial Infrastructure.




Source: Dun & Bradstreet Desk Research

Growth in the number of construction projects creates as well as strengthens the demand for a myriad range of products and services. These include project management services, EPC services and architecture consulting services, to name a few.

## EPC Services

### An Overview of Engineering, Procurement, and Construction (EPC)

The EPC (Engineering, Procurement, and Construction) industry in India is a key contributor for country's infrastructure and industrial sector growth. It involves the full scope of services, including engineering design, procurement of materials and equipment, and the construction of projects. EPC is a prominent form of contracting agreement in the construction industry and is the most sought method of executing projects globally. Companies that deliver EPC Projects are commonly referred to as EPC Contractors. EPC contracts are pivotal agreements in the construction industry, designed to streamline project execution by transferring substantial project risks from the owner to the contractor. These contracts encompass the full scope of project responsibilities, including design, procurement, and construction, ensuring a single point of accountability for the project's completion. The primary appeal of EPC contracts lies in their ability to provide cost certainty, making them particularly attractive to developers who lack the financial or technical resources to manage unexpected expenses and project intricacies. By transferring risks associated with workplace accidents, labour and material shortages, and critical schedule milestones, developers can mitigate potential disruptions and focus on other strategic priorities.

One of the significant advantages of EPC contracts is the reduced level of engagement required from developers. This hands-off approach allows developers to save on time, labour, and resources, relying on the contractor to meet project deadlines and specifications. Establishing clear design and construction standards before entering an EPC contract can further enhance project outcomes by ensuring consistency and quality while minimizing the need for developer intervention. However, the transfer of all project risks to the contractor can come at a premium cost. Contractors must account for all known and unknown contingencies, which can significantly inflate the contract price. To strike a balance, developers may negotiate shared responsibilities for unforeseen circumstances, such as fluctuating material costs, thereby achieving better financial terms and fostering a more cooperative relationship with the contractor.

Third-party reviews of EPC designs are highly recommended for developers lacking in-house expertise or bandwidth. Engaging an independent engineering firm to assess the contractor's designs can safeguard the developer's interests and ensure that the final project aligns with the specified requirements. These reviews are particularly crucial when millions of dollars are at stake, offering an additional layer of oversight and assurance. It is important to note that EPC contracts can alter the dynamics between developers and contractors. The contractual focus on financial transactions and risk management can strain relationships, particularly if there were pre-existing collaborative ties. Developers must be mindful of this potential shift and consider limiting the use of EPC contracts to specific project types where the benefits outweigh the relational costs. In addition to traditional EPC contracts, developers might explore alternative models such as Cost-Plus contracts and Hybrid EPC contracts. Cost-Plus contracts allow developers to maintain greater involvement and oversight, reimbursing contractors for project costs plus a percentage for overhead and profit. Hybrid EPC contracts offer a blend of flexibility and fixed pricing, with the initial stages of the project managed on a time-and-material basis before transitioning to a fixed-price arrangement.

### Types Of EPC Contracts

**Lump Sum EPC Contract:** In this model, the contractor commits to completing the project for a fixed price. This contract type is typically employed for projects with well-defined scopes and timelines, facilitating straightforward cost and budget management. For instance, a residential complex construction project might use a lump sum contract to ensure cost certainty for the developer.

**Unit Price EPC Contract:** This arrangement involves pricing based on the actual units of work completed. It is particularly suited for projects where the scope is uncertain, offering flexibility in pricing and resource allocation. Road construction projects are a common example of unit price contracts, as the quantity of materials required can vary depending on site conditions.

**Cost-Plus EPC Contract:** Under this contract, the contractor is reimbursed for actual costs incurred plus an agreed-upon fee. This model is advantageous for projects with undefined requirements, providing a safety net for contractors. It is especially useful in research and development projects where project specifications may evolve over time.

**Design and Build EPC Contract:** In this model, the contractor oversees both the design and construction phases of the project. This integrated approach can expedite project completion and enhance coordination between design and construction. Large-scale infrastructure projects, such as airports, often utilize this contract type to ensure seamless integration and timely delivery.

**Turnkey EPC Contract:** This comprehensive contract requires the contractor to deliver a fully operational facility to the client upon project completion. Common in sectors such as energy and water supply, the turnkey model ensures that the product meets specific operational standards from the outset, providing a complete solution to the client.

## Engineering, Procurement, and Construction (EPC) Company in Water Resource Management

An Engineering, Procurement, and Construction (EPC) company specializing in water resource management solutions is responsible for delivering end-to-end water infrastructure projects. This includes designing, procuring, constructing, and commissioning Water Supply Schemes (WSS) that incorporate underground and overhead tanks, ensuring efficient water distribution and storage.

EPC companies play a crucial role in engineering and design, conducting feasibility studies, site surveys, and hydraulic modeling to develop optimal water supply solutions. They design underground reservoirs, elevated storage tanks, pipelines, and pumping stations while ensuring compliance with water quality and safety standards. In the procurement phase, they source high-quality materials such as pipes, pumps, valves, and filtration systems. They also manage vendor selection, supply chain logistics, and cost control to ensure the timely delivery of equipment to the construction site.

During the construction and installation phase, EPC contractors build underground and overhead water storage systems, pipeline networks, and pumping stations. They also install treatment plants, automation systems, and monitoring technology while conducting safety inspections and quality control checks. Once construction is completed, the commissioning and handover process begins, where the system is tested for operational efficiency, leak detection, and seamless water distribution. EPC contractors ensure proper pressure management, provide maintenance guidelines, and officially hand over the completed system to the client.

The EPC model offers several advantages for water infrastructure projects. It provides turnkey solutions, covering all phases from planning to commissioning under a single contract. The model is also cost- and time-efficient, as optimized procurement and streamlined project execution help reduce expenses and delays. EPC companies bring technical expertise and innovation, integrating advanced water treatment technologies, automation, and smart monitoring solutions. Furthermore, they ensure regulatory compliance by adhering to local and international water management standards. Many EPC companies also focus on sustainability, incorporating renewable energy solutions such as solar-powered water pumping and energy-efficient treatment processes.

Water Supply Schemes (WSS) with underground and overhead tanks have diverse applications across multiple sectors. In municipal water supply, they ensure access to clean drinking water for both urban and rural communities. In industrial water systems, they support manufacturing, energy production, and mining operations by providing process water. Agricultural irrigation also benefits from these schemes as they facilitate efficient water distribution for sustainable farming. Additionally, EPC companies contribute to smart city projects by implementing IoT-based monitoring and automation for enhanced water management.

By integrating engineering expertise, efficient procurement strategies, and precise construction management, EPC companies play a vital role in developing reliable and sustainable water infrastructure, addressing the increasing global demand for clean and accessible water.

## Scope of EPC Services in Water Distribution and Wastewater distribution Infrastructure

Engineering, Procurement, and Construction (EPC) services are essential for the development of water distribution and wastewater infrastructure. In India, where rapid urbanization and industrial growth have significantly increased the water demand, EPC services provide a structured, comprehensive approach to building and maintaining critical water distribution networks and wastewater treatment. These services include everything from design to procurement, construction, and commissioning, ensuring effective and efficient delivery of both water and wastewater systems.

### *EPC Services in Water Distribution Infrastructure*

EPC services in the water distribution sector focus on designing, building, and commissioning systems that ensure the efficient supply of clean water for domestic, industrial, and agricultural purposes. These services encompass the full lifecycle of water distribution infrastructure projects, including pipelines, reservoirs, treatment plants, and water storage facilities.

**Key Components of Water Distribution EPC Services:**

- **Water Pipelines and Networks:** EPC contractors design and install water pipelines that ensure the efficient transportation of potable water from treatment plants to end-users, whether urban or rural areas. This includes both primary and secondary pipelines, and the design focuses on minimizing water loss, leakage, and contamination.
- **Pressurized Water Supply Systems:** In many parts of India, particularly urban areas, the focus is on developing pressurized water supply systems to ensure the consistent and reliable delivery of water across vast networks. EPC contractors design these systems, ensuring they are optimally engineered to deliver water efficiently while minimizing operational costs.
- **Water Treatment and Filtration Systems:** To ensure that water meets required quality standards for consumption, EPC contractors design and build water treatment plants. These plants typically integrate multiple stages of filtration, including sedimentation, coagulation, flocculation, and disinfection (such as chlorine or UV), depending on the source water quality.

- **Water Storage and Distribution Infrastructure:** Storage facilities such as water tanks and reservoirs are integral to ensuring a steady water supply. EPC services also include the development of efficient distribution networks that deliver treated water to homes, industries, and agricultural areas.
- **Urban and Rural Water Supply Solutions:** The EPC approach in water distribution caters to both urban and rural areas, providing clean, potable water to growing populations while focusing on water conservation and efficient management practices.
- **Water Intake and Pumping Stations:** EPC contractors also handle the construction of intake wells and pumping stations that draw water from natural sources (rivers, lakes, groundwater) and transport it to water treatment plants or storage systems.
- **Pipe Rehabilitation and Replacement:** For older, deteriorating pipelines, EPC contractors provide solutions for rehabilitation or replacement to restore water supply efficiency and prevent leakage or contamination.

## EPC Services in Wastewater distribution Infrastructure

Wastewater distribution infrastructure focuses on managing and transporting wastewater from households, industries, and commercial establishments to treatment plants or disposal systems. EPC contractors play a crucial role in developing, upgrading, and maintaining these networks, ensuring that wastewater is efficiently collected, transported, and treated before being safely returned to the environment or reused.

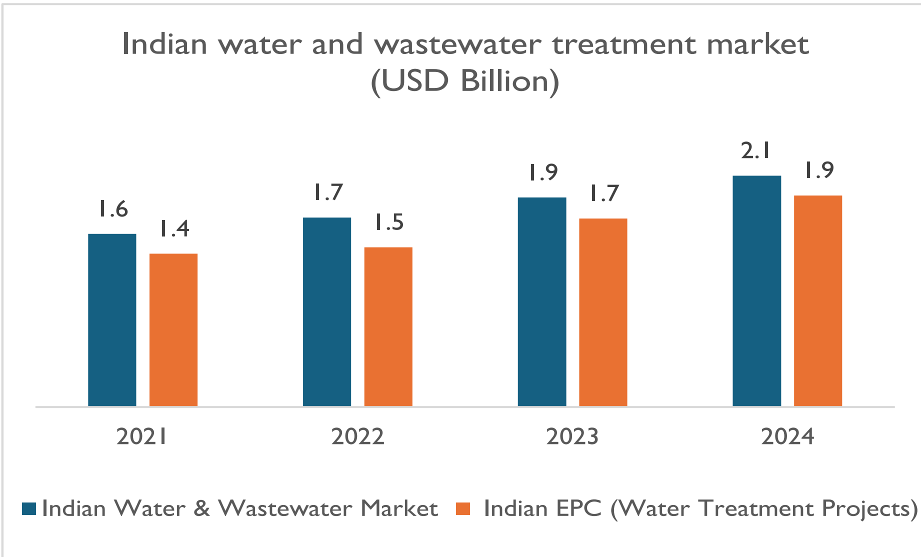
**Key Components of Wastewater Distribution EPC Services:**

- **Sewage Collection and Treatment Systems:** EPC contractors design and install sewer lines and treatment plants to collect and treat wastewater. This includes everything from household sewage systems to large-scale municipal sewer networks that transport wastewater to treatment plants, where it is processed to meet environmental discharge standards.
- **Wastewater Pipelines and Networks:** Sewage and wastewater pipelines are designed to transport waste from residential, industrial, and commercial areas to treatment facilities. The design ensures that the systems are capable of handling varying sewage loads and prevent blockages, leaks, or overflows.

- **Sewerage and Drainage Networks:** EPC services also cover the construction of combined sewer systems, stormwater drains, and underground drainage infrastructure to effectively manage both sewage and rainwater, preventing flooding and contamination.
- **Wastewater Pumping Stations:** Wastewater treatment systems often require pumping stations to move wastewater through the distribution network. EPC contractors are responsible for designing and constructing these stations, which are critical for maintaining efficient flow and pressure in the system.
- **Wastewater Treatment Plants:** Although technically part of treatment, the design, construction, and integration of wastewater treatment plants into the broader distribution network are vital. These plants use various technologies like activated sludge systems, anaerobic digestion, and chemical treatments to treat wastewater to meet environmental standards.
- **Industrial Effluent Management Systems:** In industries, wastewater treatment requirements often differ. EPC contractors provide customized solutions for industries like hospitals, dairies, tanneries, and refineries, incorporating technologies such as physical-chemical treatment, biological processes, and advanced filtration systems to handle unique wastewater challenges.
- **Pumping Stations and Lift Stations:** In areas where gravity-based flow is insufficient, pumping or lift stations are necessary to maintain the flow of wastewater through the system to treatment plants. EPC contractors design and install these systems to ensure consistent and efficient wastewater transport.
- **Sewer Rehabilitation and Maintenance:** EPC contractors also focus on the rehabilitation and upgrading of existing sewer systems, replacing aging infrastructure and ensuring that wastewater continues to be safely and efficiently managed.

## Market Size of water and wastewater treatment market in India

The Indian water and wastewater treatment market is experiencing significant growth, driven by increasing water pollution, rapid urbanization, and a growing population. Water and wastewater management is a promising subsector in India's environmental technology segment.




Sources: 6Wresearch

Demand for high-end treatment technologies is growing in India. Backed by increasing infrastructure development, the India water and wastewater market grew from USD 1.6 billion in 2021 to USD 2.1 billion in 2024, with a CAGR of 10.1% between 2021-24. Simultaneously, the India EPC industry market for water treatment projects grew is estimated to have grown from USD 1.4 billion in 2021 to USD 1.9 billion in 2024, with a CAGR of 11.4%.

As per **National Infrastructure Pipeline (India Investment Grid), about 1,419 projects of the total 1,527 water treatment plants (opportunities) are being implemented on EPC mode** which translate into about 93% of the projects.

Various governmental initiatives, such as the Atal Mission for Rejuvenation and Urban Transformation, National Mission for Clean Ganga, Jal Jeevan Mission, and Community Drinking Water Schemes, contribute to the growth of the Indian water and wastewater treatment market. In May 2019, the Indian government created the Jal Shakti Ministry, bringing all water-related agencies under one ministry to provide safe drinking water to the people of India.  Soon after it was founded, the Jal Shakti Ministry launched the Jal Jeevan Mission, designed to provide piped drinking water to 146 million households in 700,000 villages by 2024.  The mission earmarked a budget of USD 51 billion for states to increase household water connection coverage from 18.33 percent in 2019 to 100 percent by 2024.  This ambitious project is creating opportunities for suppliers of water meters, water quality monitoring systems, water management-related IT systems, tertiary treatment technology, and water-related Engineering, Procurement, and Construction companies will benefit from this ambitious undertaking.

The private sector power, food and beverage, chemicals, pharmaceuticals, refineries, and textiles industries prefer advanced treatment technological systems such as reverse osmosis membranes for treating their wastewater. These water treatment markets are gradually shifting from chemical treatment and demineralization plants to membrane technology. The concept of wastewater recycling and zero discharge systems is becoming more widely accepted as new technologies such as sequencing batch reactor (SBR) and membrane bioreactor (MBR) based treatment gain in adoption.

The coastal states of Tamil Nadu and Gujarat are frontrunners in setting up desalination plants to bolster drinking water supply. Some industries are also setting up desalination plants to meet process water requirements. As examples, some power plants, oil refineries, iron and steel plants, distilleries, cement plants, and fertilizer plants are pursuing the principle of Reuse, Recycle, and Zero Liquid Discharge to better manage water usage and improve their environmental footprint.

## Water Scenario in India overview

India is experiencing a severe water crisis due to rising demand, depleting resources, and uneven distribution. Per capita water availability has been steadily declining, pushing the country toward water stress. Although India has significant annual water resource potential, effective availability remains low due to wastage, pollution, and inefficient management. Water scarcity affects a large portion of the population, leading to widespread health and economic consequences. Groundwater, a crucial resource for agriculture, industry, and domestic use, is being overexploited, causing a steady decline in water levels. Additionally, pollution from industrial waste, agricultural runoff, and untreated sewage has further degraded water quality. In the coming years, water demand is expected to far exceed supply, posing a serious threat to livelihoods and economic stability. To address these challenges, efforts are being made to promote water conservation, improve management practices, enhance wastewater treatment, and expand access to clean water. However, sustainable water management remains a pressing concern, requiring efficient policies, infrastructure development, conservation efforts, technological innovation, and active community participation.

### Water Availability Scenario

| Status on Average Annual Water Availability in India | |
|---|---|
| **Precipitation received** | **4000 BCM (100%)** |
| **1. Water Resources Potential** | **1869 BCM (46.7%)** |
| **2. Utilizable Water Resources** | **1123 BCM (28.1%)** |
| ***2a. Ground Water*** | ***433BCM (10.8%)*** |
| ***2b. Surface Water*** | ***690 BCM (17.2%)*** |

Source: NITI Aayog, Central Water Commission, % figure as % of Precipitation received

According to the Central Water Commission, annual water requirement of India is 3,000 BCM while it receives 4,000 BCM of precipitation in form of rain and snowfall every year on an average but effectively utilizes only 28% of it.

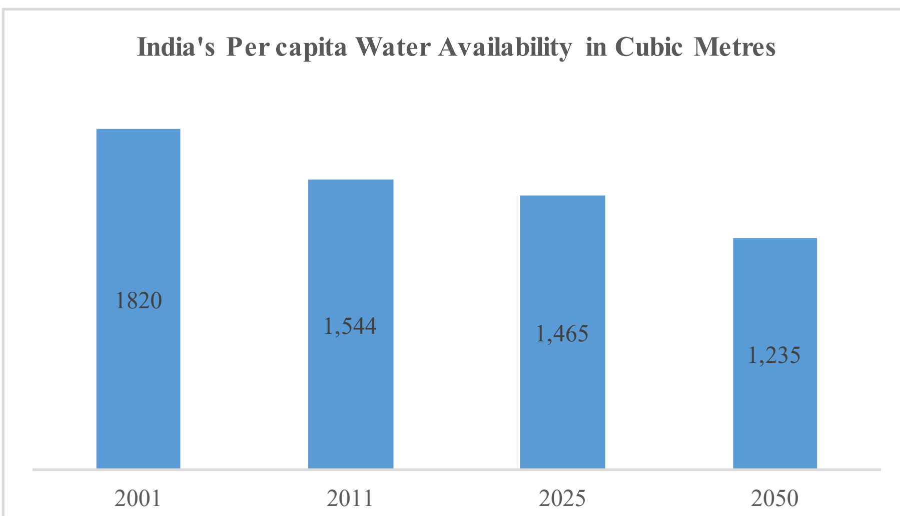
However, the country fails to utilize nearly three-fourth of water it receives from the sky. Most of this rainwater returns to the seas and ocean via many large rivers flowing across the subcontinent. About 53 per cent of the total precipitation is lost due to evapotranspiration, which leaves a balance of 1,869 bcm water in the country. As per The National Commission on Integrated Water Resources Development (NCIWRD) report, the utilizable water is 1,123 BCM a year i.e. just 28% of precipitation, comprising 690 BCM of surface water and 433 BCM of replenishable groundwater. Regions and states in India with higher populations tend to have less accessible water. Additionally, water availability in India varies significantly across regions due to differences in rainfall patterns, geographical features, and hydrological factors.

Despite having an extensive surface water network with major rivers like the Ganges, Yamuna, Brahmaputra, and Godavari, surface water availability fluctuates by region and season. Some areas face water scarcity during dry seasons, while others experience seasonal flooding.

Water resources supply availability is a significant concern for urban India, potentially leading to a severe crisis in the future as the urban population is projected to grow from 377 million in 2011 to 600 million by 2031. Despite having abundant surface water resources, India is increasingly facing the challenge of water scarcity. Currently, India hosts about 18% of the global population while covering only 2.4% of the

## Water Availability Scenario in India

The country has observed nearly 70% decline in the per capita water availability10F[3] between 1950 to 2010 i.e. from 5177 cubic metres till 1544 cubic metres. While between 2001- 2011, it has steadily declined at 1.6% CAGR, from 1820 cubic metres to 1544 cubic metres. With 1,545 $m^3$ per capita water availability, India is already a water-stressed country and is steadily moving towards water scarcity.

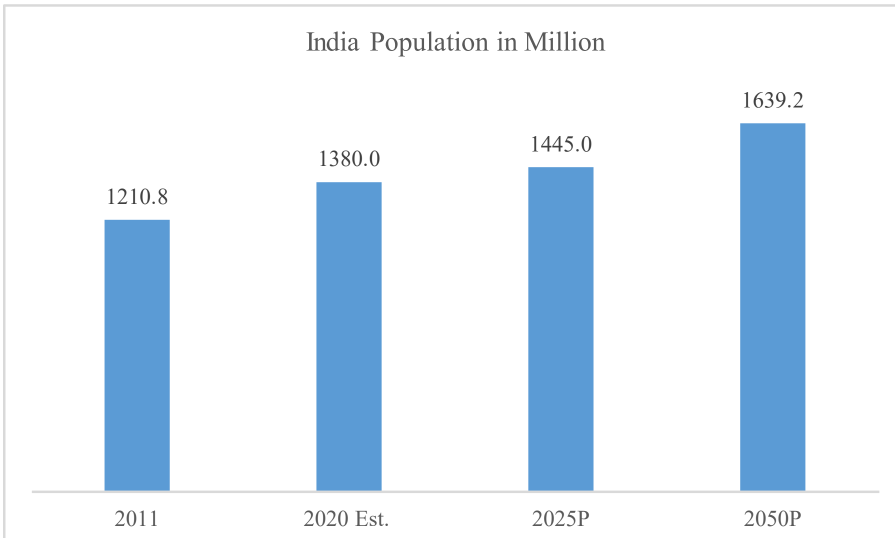



Sources: Ministry of Jal Shakti, Indian Council for Agriculture Research (ICAR)

[3] *Per-capita annual water availability of less than 1,700 cubic metres is defined as a water-stressed condition while below 1,000 cubic metres is defined as scarcity*

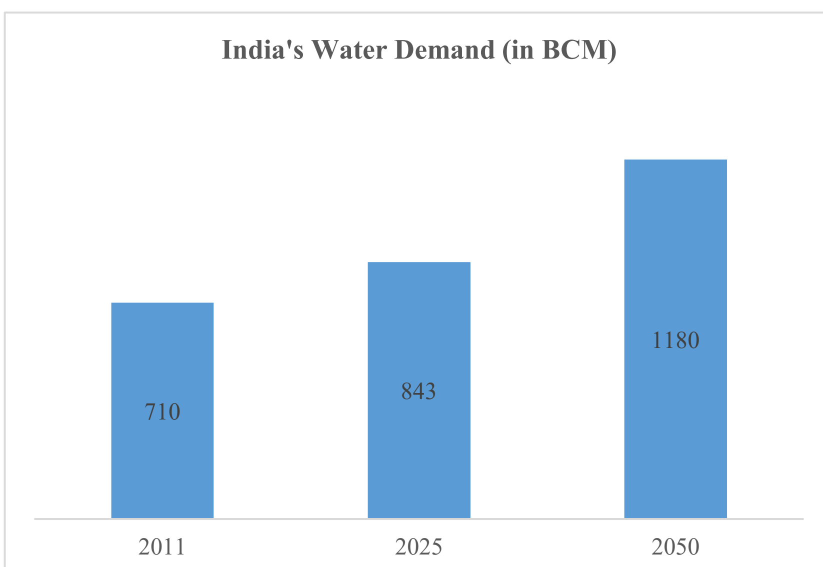
## Water Demand Scenario

India's population is estimated to have been growing a 1.5% CAGR between 2011-2020 and is likely to cross 1.4 billion by 2025 and 1.6 Bn by 2050. With rising population, demand for food and other manufactured products is also increasing. It is also increasing the demand for potable water from domestic, agriculture and industrial segments.




Sources: MOSPI

As per government sources, the water demand was estimated at 710 in India Billion Cubic Metres (BCM) in 1999 which estimated to grow to 843 BCM in 2025 and further to 1,180 BCM by 2050. To support growing water demand, India needs secure and safe supplies of water for sustained growth.




Sources: National Commission on Integrated Water Resources Development (NCIWRD)

### Water Demand Pattern - India (Billion Cubic Meters)

As per estimates of National Commission on Integrated Water Resources Development (NCIWRD)-1999, India has following demand pattern for water for coming decades:

| Uses | Year 2010 | | Year 2025 | | Year 2050 | |
|---|---|---|---|---|---|---|
| Total Water Use | Requirement | % | Requirement | % | Requirement | % |
| Irrigation | 557 | 78.5% | 611 | 72.5% | 807 | 68 |
| Domestic | 43 | 6.1% | 62 | 7.4% | 111 | 9 |
| Industries | 37 | 5.2% | 67 | 7.9% | 81 | 7 |
| Energy | 19 | 2.7% | 33 | 3.9% | 70 | 6 |
| Other uses (incl environmental losses) | 54 | 7.6% | 70 | 8.3% | 111 | 10 |
| **Total** | **710** | **100** | **843** | **100** | **1,180** | **100** |

**Agricultural Sector:** The largest consumer of water, with demand expected to increase due to population growth and the need for more food production.

**Industrial Sector:** Growing industrialization will lead to higher water demand.

**Domestic Use:** Urbanization and improved living standards will increase domestic water consumption.

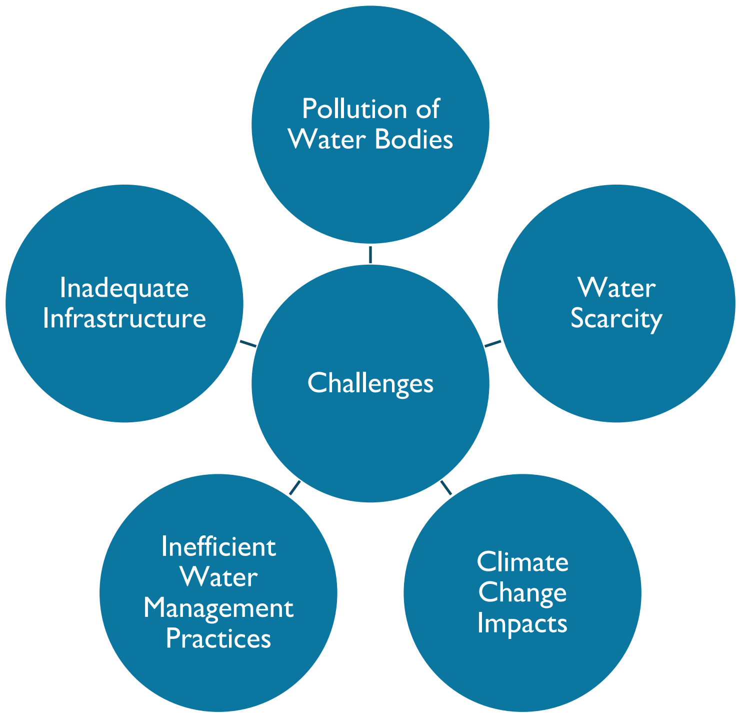
Groundwater which is just 10.8% of the total precipitation that the country receive, is the major source of potable or drinking water in the country. With 24% share in the total global consumption, India is the largest consumer of groundwater. It is also the third largest exporter of ground water with 12% share in global ground water trade. India accounts for almost one-fourth of the total groundwater extracted globally, more than that of China and US combined.

Irrigation alone consumes upto 80% of the water extracted from the aquifers. Amongst the various sources of irrigation such as rainwater, rivers, ponds and other reservoirs, the ground water fulfills about 60% of the irrigation requirement in the country (as per the World Bank Report) while only 8% of the extracted water is extracted groundwater in India is used for drinking purposes.

Water being a universal solvent, coolant and cleaning agent is also extensively used in various manufacturing industries such as Power, paper and pulp, textiles and automobiles sectors which are major users of extracted ground water. Most industrial units use own borewell extracting groundwater to meet their water requirements.

## Key Challenges associated with Water Management Industry in India

India's water management industry is threatened by several challenges: over-extraction of groundwater, water pollution, unequal distribution, inadequate water management, climate change, and conflicts over water.




**Water Scarcity:** Dependence on rivers and reservoirs, which are subject to seasonal variations and climate change impacts. India is home to about 18% of the world's population but has only 4% of global freshwater resources. Rising demand and low per capita availability are increasing the over exploitation of ground water. With per capita water availability around 1,100 cubic meters, it is dangerously close to the threshold for water scarcity (1,000 cubic meters). Rapid population growth, urbanization, and industrialization have intensified the demand for water, leading to significant shortages in both rural and urban areas. This scarcity is particularly acute in regions like Rajasthan and Gujarat, where low rainfall exacerbates the situation. India's rate of groundwater *depletion has increased by 23% between 2000 and 2010.*

### State wise ground water extraction

| State | Category | Stage of GW extraction (%) | % of over-exploited & critical blocks |
|---|---|---|---|
| Punjab | Overexploited | 166% | 80% |

| | | | |
|---|---|---|---|
| Rajasthan | | 140% | 74% |
| Haryana | | 137% | 63% |
| Delhi | | 120% | 71% |
| Himachal Pradesh | SemiCritical | 86% | 50% |
| Tamil Nadu | | 81% | 46% |
| Puducherry | | 74% | 25% |
| Uttar Pradesh | | 70% | 17% |
| Karnataka | Safe | 70% | 30% |
| Telangana | | 66% | 23% |
| Gujarat | | 64% | 12% |
| N.E. States | | < 10% | 0% |

Source: Central Groundwater Board, 2017.

Groundwater is being rapidly depleted due to excessive use for irrigation, industry, and domestic purposes. Industrialization and urbanization have led to significant water pollution, making water unsafe for consumption. There is a stark disparity in water availability across regions, with some areas facing severe scarcity. Inefficient irrigation, leaky supply networks, and poor wastewater treatment highlight the lack of proper water management. Climate change exacerbates the situation with irregular monsoons and more frequent natural disasters. These issues further lead to conflicts over water distribution among states, communities, and sectors.

While extraction is a significant concern, leading to declining water levels in many regions. In India, the demand for freshwater resources has been steadily growing over the past few decades, making it one of the most water-challenged countries in the world. *According to water organization, India population of 1.4 billion out of which 35 million people lack access to safe water.*

**Pollution of Water Bodies:** Waste management has not been as efficient as required to manage increasing volume of waste generated daily in India, especially in cities. Domestic effluents contribute a substantial proportion of water pollution in India. More than 70% of domestic untreated effluents are disposed of to environmental media. Water quality data from CPCB shows that organic and bacterial contamination is becoming increasingly critical in water bodies leading to gradual degradation of water quality. Biological Oxygen Demand (BOD) for most of the rivers of India are increasing and exceeding the standards. Approximately 163 million people lack access to safe drinking water, and many rivers are rendered unfit for consumption. This pollution not only reduces the availability of clean water but also poses serious health risks, contributing to waterborne diseases that disproportionately affect vulnerable populations.

**Inadequate Infrastructure:** The existing water management infrastructure in India is often insufficient and poorly maintained. Many urban areas experience significant losses due to leaks and inefficient distribution systems, with non-revenue water (water that is produced but not billed) averaging around 40%. The lack of adequate wastewater treatment facilities further complicates the situation, as only a small fraction of municipal wastewater is treated before being discharged into water bodies.

**Climate Change Impacts:** Climate change poses a significant threat to India's water resources by altering precipitation patterns and increasing the frequency of extreme weather events such as floods and droughts. These changes impact both surface and groundwater availability, making it more challenging to manage water resources effectively. The variability in rainfall can lead to both excess water during monsoons and severe shortages during dry spells, complicating agricultural practices and urban planning.

**Inefficient Water Management Practices:** Current water management policies often lack integration and coherence, leading to fragmented approaches that fail to address the complexities of water resource management. Inefficient agricultural practices contribute significantly to water wastage, with excessive groundwater extraction for irrigation being a common issue. Additionally, government policies may inadvertently promote wasteful usage rather than sustainable practices, further straining available resources.

Addressing these challenges requires comprehensive strategies that include improving water management including water distribution infrastructure, enhancing wastewater treatment capabilities, implementing integrated water resource management policies, and promoting sustainable agricultural practices.

### Key Growth Drivers

The water management industry in India is witnessing significant growth due to several key factors. **Increasing water scarcity and depleting groundwater levels** are driving the demand for efficient water conservation, recycling, and desalination technologies. **Government-led initiatives** such as the Jal Jeevan Mission and AMRUT are boosting investments in water infrastructure and rural-urban water supply projects. **Rapid urbanization and industrial expansion** are further accelerating the need for advanced wastewater treatment, reuse, and smart water management solutions. Additionally, **technological advancements**, including IoT-enabled water monitoring systems and AI-driven leak detection, are enhancing operational efficiency. **Rising private sector participation and PPP models** are also playing a crucial role in scaling up sustainable water management solutions.

- **Population Growth and Urbanization**: India's rapid population growth, which is projected to surpass 1.5 billion by 2030, along with its accelerating urbanization, are key factors driving the demand for water treatment solutions. As the population grows, especially in urban areas, the need for potable water increases, accompanied by a rise in wastewater generation. This rapid urban expansion further emphasizes the need for robust water treatment infrastructure to ensure a steady supply of clean water and efficient management of sewage and industrial effluents. The growing population and urban spread create an urgent need for sustainable water management practices across the country.
- **Industrialization and Water Usage:** India's industrial sector, including pharmaceuticals, textiles, chemicals, and food & beverages, accounts for 40-45% of the country's total water consumption. For example, the textile industry uses 93 billion liters of water annually. As industrial growth continues, the demand for efficient water treatment solutions rises. To comply with stringent regulations, industries need advanced technologies to treat wastewater, recycle water, and manage effluents sustainably. This shift towards responsible water management is critical for environmental compliance and long-term sustainability.
- **Government Regulations and Initiatives:** The Indian government has implemented stringent regulations to combat water pollution and promote sustainable water management. Key policies, such as the **National Water Policy** and **Swachh Bharat Mission**, focus on water conservation, wastewater treatment, and pollution reduction. Programs like the **Smart Cities Mission** are accelerating the adoption of modern water treatment technologies. To support urban water and wastewater infrastructure, the government has invested in initiatives like the **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)**, **SBM 2.0**, the **National Mission for Clean Ganga (NMCG)**, and the **Smart City Mission (SCM)**. These programs are driving the

growth of the water management industry, ensuring sustainable solutions for urban areas' water and sanitation needs.

- **Climate Change:** Climate change is increasingly impacting water availability across India. Changing rainfall patterns, rising temperatures, and extreme weather events, such as floods and droughts, are disrupting traditional water cycles. These shifts are making water resources more unpredictable and difficult to manage. As a result, there is a growing need for adaptive water management strategies that can handle these environmental shifts and ensure a reliable water supply. The rising awareness of climate change's impact is driving the demand for innovative water treatment technologies and climate-resilient water systems.
- **Water Scarcity:** Water scarcity is becoming an urgent challenge for India, with many regions facing severe shortages due to over-extraction of groundwater, inefficient water management, and population growth. Prolonged droughts, coupled with depleting freshwater resources, have made it clear that traditional water systems are no longer sufficient. To address these challenges, there is an increasing demand for water conservation practices, efficient water reuse, and technologies like desalination and rainwater harvesting. These solutions are critical to ensuring the sustainability of water supply in water-scarce regions and mitigating the impact of water shortages on urban and agricultural sectors.
- **Technological Advancements:** Innovations in water treatment technologies, such as membrane filtration, reverse osmosis, and advanced oxidation processes, are improving efficiency and water quality while reducing costs. The integration of AI-driven monitoring systems and real-time data analytics enhances decision-making and optimizes water management. Additionally, smart meters and automated water management systems are driving adoption in urban and industrial sectors, reducing water wastage, and improving resource allocation. These advancements are shaping the future of sustainable water management.

## Key Trends & Innovations

As the global demand for water rises alongside the impacts of climate change and aging infrastructure, the water management industry is undergoing rapid transformations. Here are the top trends and innovations reshaping the industry in 2024:

| | |
|---|---|
| Decentralised Infrastructure | • The shift toward decentralized water infrastructure is gaining momentum, particularly in rural and underserved areas. Modular, mobile systems like electrocoagulation treatment allow users to operate independently of centralized water networks. Off-grid systems, supported by real-time digital technologies, provide personalized water solutions, ensuring access to clean water without relying on traditional infrastructure. |
| Water-Saving Technologies | • With growing concerns over freshwater scarcity, there is an increasing focus on water-saving technologies. Innovations in water recycling, intelligent irrigation systems, and smart water fixtures are helping optimize water usage across homes, agriculture, and industries. Precision irrigation and water-saving appliances are reducing wastage, promoting water conservation, and enabling the more efficient use of resources. |
| Eco-Friendly Desalination | • With the increasing demand for freshwater, desalination plays a crucial role in addressing water scarcity, especially in coastal areas. Traditional desalination processes are energy-intensive and costly, but new solar-powered desalination, biomimicry, and aquaporin-based technologies are making the process more sustainable and affordable. These eco-friendly alternatives reduce the carbon footprint, providing a more efficient solution for freshwater production. |
| Wastewater Processing Innovations | • Innovative wastewater processing technologies are helping industries and municipalities effectively recover and treat wastewater. Techniques such as advanced oxidation, biosorption, and microbial treatments are improving the efficiency of wastewater treatment. The integration of solar irradiation in these processes also reduces sludge production and contaminants, ensuring cleaner water and a more sustainable approach to water management. |
| Digital Water Management | • As the need for efficient water management grows, digital water technologies are emerging as a game-changer. Using AI, IoT sensors, and advanced metering systems, utilities can monitor water quality and consumption in real-time, enhance decision-making, and ensure efficient resource allocation. Additionally, technologies like digital twins, AR/VR, and 5G are providing advanced tools for real-time modeling, scenario visualization, and faster data processing. |
| Advanced Filtration Techniques | • The growing need for clean water has spurred the development of advanced filtration systems. Nanotechnology is enabling the creation of membranes that remove hard-to-capture pollutants with improved permeability and selectivity. Biological filtration, which uses bacteria for purification, and self-cleaning filters are offering energy-efficient and cost-effective alternatives to traditional filtration methods, contributing to a sustainable solution for water purification. |
| Flood Prevention and Risk Management | • With the rising threat of extreme weather events, flood prevention technologies are evolving. Innovations in catastrophe modeling, drone systems, and satellite-based data are improving the ability to predict and manage floods. Enhanced water gates, dams, and LiDAR mapping technologies are allowing for quicker response times, better flood risk management, and more effective disaster preparedness. |
| Innovative Materials for Water Management | • Material science innovations are advancing water management by introducing new solutions with enhanced efficiency. Technologies like modular adsorbents, electrode-based reactors, and nanoparticles are improving water filtration and treatment processes. These advanced materials offer better chemical properties, greater efficiency, and reliability, reducing the environmental footprint of water treatment while improving overall system performance. |

## Water Distribution Infrastructure in India

India's drinking water distribution infrastructure is undergoing significant transformation, driven by government initiatives aimed at providing universal access to safe and reliable drinking water. The Jal Jeevan Mission (JJM), launched in 2019, is a flagship program with the ambitious goal of delivering piped water connections to every rural household by 2024. The Government of India, through the Jal Jeevan Mission (JJM) launched in August 2019, is committed to ensuring the provision of safe and potable tap water supply to every rural household in the country. This ambitious mission, implemented in partnership with the State and Union Territory (UT) governments, aims to deliver adequate, quality-assured water on a regular and long-term basis to rural India. At the time of the mission's announcement in 2019, only 3.23 crore rural households (17%) had tap water connections. By February 2024, significant progress had been achieved, with an additional INR11.01 crore households receiving functional household tap connections (FHTCs). This brought the total to INR 14.24 crore households, accounting for 73.93% of the 19.27 crore rural households in India. The initiative emphasizes grassroots involvement, with villages being certified as 'Har Ghar Jal' through Gram Sabha resolutions after water supply works are completed. In urban areas, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) focuses on enhancing water supply and distribution systems. This initiative aims to improve infrastructure, reduce water losses, and ensure equitable distribution across urban centres.

Additionally, state-specific projects like Mission Bhagiratha in Telangana exemplify localized efforts to provide safe drinking water. Launched in 2016, Mission Bhagiratha aims to supply piped water to 2.32 crore people across 20 lakh households in both urban and rural areas of Telangana. The project sources water from the Godavari and Krishna rivers, with the bulk supply expected to be completed by May 2018.

Despite these advancements, challenges persist challenges persist in certain areas. States face issues such as:

- Limited dependable water sources in water-stressed regions,
- Presence of geo-genic contaminants like arsenic and fluoride in groundwater,
- Difficult terrain and scattered rural habitations, and
- Limited capacity of local communities to manage and maintain water supply systems.

Additionally, delays in the release of matching state funds have impacted progress in some areas.

To ensure quality and transparency, the mission has implemented measures like third-party inspections, IoT-based monitoring systems, and geo-tagging of assets. The Jal Jeevan Mission(JJM) Dashboard and mobile app provide real-time data on progress, enhancing accountability and public access to information.

Despite the challenges, the Jal Jeevan Mission has significantly improved access to safe drinking water across rural India, with a continued focus on universal coverage, effective monitoring, and capacity-building to sustain this progress. The government continues to prioritize investments in water infrastructure to address these challenges and ensure sustainable access to safe drinking water for all citizens.

## Water Supply Scheme (WSS): Ensuring Efficient Water Storage and Distribution

The Water Supply Scheme (WSS) plays a vital role in ensuring access to clean, potable drinking water, particularly in rapidly urbanizing and industrializing regions. A Water Supply Scheme (WSS) is a comprehensive system designed to provide safe, reliable, and sufficient water to consumers cost-effectively and sustainably. The scheme integrates various infrastructure components, including water sources, intake structures, treatment facilities, storage systems, and distribution networks, ensuring an efficient supply of potable water to households, industries, and other consumers.

These schemes are designed to provide communities, industries, and institutions with a reliable and uninterrupted water supply by constructing both underground and overhead storage tanks, which are integral to the overall efficiency and functionality of the system. Storage infrastructure is paramount, as it ensures that treated water always remains available, even during periods of high demand or unforeseen disruptions. The design of these tanks is critical, as they need to be structurally sound, leak-proof, and durable to prevent contamination and ensure the safety of stored water. Regulatory compliance with local and international standards ensures that water quality is maintained from source to consumption.

Beyond storage, pump houses are strategically established to manage the water pressure across the distribution network and facilitate the efficient movement of water from the tanks to various sectors. The pumps, which are often high-efficiency, energy-saving models, play a significant role in minimizing energy consumption while maintaining optimal water flow throughout the system. The integration of advanced pumping technology, such as variable speed drives, not only optimizes energy use but also helps in preventing over-pressurization and water hammer effects, which can damage pipelines and other infrastructure.

The pipeline network is another key component, extending from storage facilities to households, commercial complexes, and industrial hubs. This network is designed to minimize water loss due to leakage and inefficiency by using corrosion-resistant materials, such as HDPE (High-Density Polyethylene) pipes or ductile iron, to enhance durability and reduce maintenance costs. Additionally, the design of the pipeline system must ensure adequate flow capacity to meet peak demand, which fluctuates during different times of the day or season. The introduction of smart meters and flow meters at various points in the system allows for real-time monitoring of water usage and the detection of anomalies such as leaks or pressure imbalances.

To ensure effective management and efficient distribution, electromechanical systems are deployed throughout the water supply infrastructure. These include automated valves, motors, pumps, and control panels, which facilitate remote operation and monitoring. The integration of a Supervisory Control and Data Acquisition (SCADA) system provides operators with real-time data on system performance, enabling rapid responses to faults or inefficiencies. The SCADA system, through its data analytics capabilities, can detect leaks, predict maintenance needs, and optimize water flow to minimize energy consumption and operational costs. This data-driven approach supports both preventive maintenance and rapid decision-making in the event of a system failure.

From an economic and business perspective, the implementation and expansion of Water Supply Schemes provide a significant revenue opportunity for engineering, procurement, and construction (EPC) companies. The water supply sector is projected to contribute 70-80% of the total earnings of EPC firms engaged in infrastructure development. As India continues to urbanize and industrialize, there is an increasing need for modern, scalable, and sustainable water infrastructure to meet the rising demand for potable water. Government initiatives such as the Jal Jeevan Mission, which aims to provide universal access to clean water in rural areas, and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), focusing on urban water infrastructure, further underscore the importance of WSS development.

The demand for reliable water infrastructure is not only driven by population growth but also by environmental concerns such as water scarcity, droughts, and pollution. As a result, there is growing emphasis on sustainable water management practices, including rainwater harvesting, wastewater recycling, and the use of desalination technologies in coastal areas. Furthermore, solar-powered pumping systems and energy-efficient solutions help to reduce the carbon footprint of water supply systems, aligning with broader environmental goals.

## Key Objectives of a Water Supply Scheme

**Safe Water Supply:** A key objective of a WSS is to ensure that the supplied water meets national and international drinking water quality standards to prevent contamination and health hazards. This involves proper treatment and regular quality monitoring.

**Reliability & Availability:** A water supply scheme must provide a **continuous or sufficient intermittent supply** to meet consumer demands throughout the year, ensuring access to water in all seasons and under varying conditions.

**Affordability:** The scheme ensures that water remains **economically accessible** to all sections of society, preventing excessive financial burdens on consumers while maintaining operational sustainability.

**Sustainability:** WSS promotes environmentally friendly and energy-efficient methods for water extraction, treatment, and distribution. Sustainable management of water resources helps ensure long-term viability.

**Equitable Distribution:** Water supply schemes are designed to ensure fair water allocation among different consumer categories, including urban, rural, domestic, agricultural, and industrial users, preventing shortages and disparities.

## Scope of Activities for a Water Supply Scheme

The scope of a Water Supply Scheme encompasses several key components and phases, beginning with the selection of a water source, such as groundwater, lakes, reservoirs, rivers, canals, rainwater, or saltwater. The next step involves collecting and conveying raw water from the chosen source to treatment facilities. Depending on the water source, water purification and treatment are essential, employing processes like clarification, filtration, and disinfection.

Once treated, water is transported to end-users through transmission and distribution systems, including water mains and sub-mains. Pumping stations help maintain optimal water pressure, while storage facilities like reservoirs, tanks, and towers ensure a continuous supply. Smaller systems may use cisterns or pressure vessels, and tall buildings often require local storage solutions to guarantee water reaches upper floors.

The distribution system delivers water to households and other consumers, though sewer connections—typically located downstream—are managed separately. The institutional framework governing water supply varies by region and includes policy formulation, regulation, service provision, and standardization.

The cost structure primarily consists of fixed costs (capital and personnel), with variable costs such as energy and chemicals playing a smaller role.

## Components of a Water Supply Scheme

**Water Source Selection:** Water supply schemes utilize surface water sources (rivers, lakes, reservoirs) and groundwater sources (wells, boreholes) to meet demand. The selection depends on availability, sustainability, and quality considerations.

**Intake Structures:** These structures are designed to withdraw raw water from the source while preventing contamination and sediment inflow, ensuring clean and efficient water extraction.

**Water Treatment Facilities:** Treatment processes such as sedimentation, filtration, disinfection (chlorination/UV treatment), and pH balancing are employed to remove impurities and make the water safe for consumption.

**Storage Systems:** Water is stored in overhead tanks, underground reservoirs, and service reservoirs to maintain pressure and ensure continuous water availability during peak demand periods.

**Distribution Network:** A well-structured network of pipelines, pumping stations, and valves regulates the flow and pressure of water, ensuring efficient delivery to consumers.

**Metering & Monitoring Systems:** Modern water supply schemes integrate smart meters and IoT-based monitoring systems to track consumption, detect leaks, and optimize supply management.

**Wastewater & Reuse Systems:** Water supply schemes also focus on greywater reuse and wastewater treatment to promote sustainability, reducing wastage and supporting secondary uses like irrigation and industrial processes.

## Challenges in Water Supply Schemes

**Water Scarcity & Depleting Resources:** Over-extraction of groundwater, population growth, and climate change effects are reducing the availability of fresh water, making sustainable management crucial.

**Infrastructure Maintenance:** Aging pipelines, leakages, and inefficient distribution networks lead to significant water loss, requiring continuous maintenance and modernization efforts.

**Quality Management:** Water contamination from industrial discharge, agricultural runoff, and inadequate sanitation poses serious health risks, making strict quality control measures essential.

**Financial Constraints:** High capital investment and operational costs impact the sustainability of water supply schemes, requiring better funding mechanisms and cost-effective solutions.

**Population Growth & Urbanization:** Rising populations and **rapid urban expansion** put pressure on existing water infrastructure, requiring **scalable and resilient** solutions to meet increasing demand.

### Technological Innovations in Water Supply Schemes

**Smart Water Management Systems:** AI-driven predictive analytics and IoT-based monitoring optimize water distribution, detect leaks, and improve overall efficiency in water supply systems.

**Desalination & Advanced Treatment Methods:** Technologies like reverse osmosis and nanotechnology enhance water purification, making seawater and other non-conventional water sources viable for supply.

**Rainwater Harvesting & Groundwater Recharge:** Encouraging rainwater harvesting and artificial groundwater recharge helps improve local water availability and reduce dependency on external sources.

**Public-Private Partnerships (PPPs):** Collaboration between government agencies and private sector players helps improve water infrastructure, service delivery, and financial sustainability of water supply schemes.

## Sustainability and Future Challenges

Several challenges impact the long-term sustainability of water supply schemes. Climate change has led to declining water sources due to droughts, pollution, and climate variability. With rapid population growth, water demand is increasing, requiring long-term planning with a design period of 15-50 years to meet future needs.

To tackle water scarcity, the adoption of water recycling and reuse technologies is essential, including advanced wastewater treatment and desalination projects. The implementation of smart water management systems using AI and IoT-driven leak detection can further enhance water distribution efficiency.

### Insights on Tamil Nadu Water Distribution

### Introduction:

Tamil Nadu covers a geographical area of 1,30,058 square kilometres. It is bordered by the Bay of Bengal to the east, the Indian Ocean to the south, the Western Ghats to the west, and the states of Karnataka and Andhra Pradesh to the north. Administratively, the state is divided into 32 districts, 209 taluks, and

1,139 firkas. It comprises 10 municipal corporations, 150 municipalities, 559 town panchayats, 12,620 panchayat villages, and 93,699 habitations.

Physio graphically, Tamil Nadu is categorized into four distinct regions:

- Coastal Plains
- Eastern Ghats
- Central Plateau
- Western Ghats

The Coastal Plains extend approximately 998 km, stretching from Pulicat Lake in the north to Cape Comorin in the south.The state primarily consists of a shield area, with around 73% of its land covered by hard crystalline formations, while the remaining 27% comprises unconsolidated sedimentary formations. In terms of groundwater resources, scarcity is a significant challenge in hard rock regions, whereas salinity poses a major issue in sedimentary areas.

**Rainfall:**

Tamil Nadu is a state with limited water resources and the rainfall in the state is seasonal. The annual average rainfall in the state is 960 mm. Approximately 33 % of this is from the southwest monsoon and 48 % from the northeast monsoon.

The annual rainfall distribution is as follows:

| Season | Month | Average Rainfall mm | Percentage |
|---|---|---|---|
| **Winter rains** | Jan – Feb | 47 | 4.82% |
| **Summer rains** | May | 138 | 14.12% |
| **Southwest monsoon** | Jun – Sept | 322 | 32.96% |
| **Northeast monsoon** | Oct - Dec | 470-970 | 48.10% |

Source: Tamil Nadu water supply and drainage board

**Water Supply in Urban Towns:**

| Civic status | Good | Average | Poor | Total |
|---|---|---|---|---|
| **Corporations (excluding Chennai)** | 8 | 3 | - | 11 |

| | | | | |
|---|---|---|---|---|
| **Municipalities** | 63 | 60 | 1 | 124 |
| **Town Panchayats (Erstwhile RTP &UTP)** | 480 | 41 | 2 | 528 |
| **Total** | **551** | **104** | **3** | **663** |

Source: Tamil Nadu water supply and drainage board

### Overview:

Tamil Nadu faces considerable challenges in water distribution due to its limited water resources and rising demand. The state depends heavily on monsoon rains for replenishing its water reserves, making it vulnerable to water scarcity and droughts. The Tamil Nadu Water Supply and Drainage Board (TWAD Board) is responsible for planning and implementing water supply and sewerage projects across the state, except for the Chennai Metropolitan Area.

**Major Water Supply Schemes:**

- Combined Water Supply Scheme (CWSS) Projects:
    1. Supplying water to Sankarankoil, Puliyankudi Municipalities, and Thiruvenkadam Town Panchayat in Tirunelveli District, along with Rajapalayam, Sivakasi, and Thiruthangal Municipalities in Virudhunagar District, using Tamiraparani River as the source.
    2. Water supply scheme for Aruppukottai, Sattur, and Virudhunagar Municipalities in Virudhunagar District, with Tamiraparani River as the source.
- Augmentation and Rural Water Supply Projects:
    1. Enhancing water supply for 708 habitations in Annur, Avinashi, and Sulur Unions in Coimbatore and Tiruppur Districts, with bulk provision for 165 habitations in Tiruppur Union of Tiruppur District.
    2. CWSS for 250 rural habitations in Andipatti, Kadamalaigundu, Mayiladumparai, and Theni Union of Theni District.
- Water Supply Projects Using Alternate Sources:
    1. CWSS for Tittakudi, Pennadam, Mangalampettai, Vadalur, Kurinjipadi, and Gangaikondan Town Panchayats, along with 625 rural habitations in Mangalore, Nallur, and Vridhachalam Unions in Cuddalore District, utilizing NLC mine water as the source.
- Cauvery River-Based Water Supply Projects:

1. CWSS for Elampillai, Attaiyampatti, Panamarathupatti, Mallur, and Edanganasalai Town Panchayats, along with 778 rural habitations in Veerapandi, Panamarathupatti, and Salem Unions in Salem District, using Cauvery River as the source.
2. CWSS for 8 Town Panchayats and 2,452 rural habitations, with bulk water provision for 3 municipalities in Sivagangai District, utilizing Cauvery River as the source.

**Jal Jeevan Mission (JJM) Water Supply Projects:**

District-Wise CWSS Projects:

- Thanjavur District:
    1. Water supply to 67 rural habitations in Kumbakonam, Thirupanandal, and Thiruvidaimarudur Unions, along with 2 hamlets of Town Panchayats.
    2. CWSS to 214 habitations in Budalur, Thiruvaiyar (part), and Thanjavur (part) Unions, with bulk supply to SASTRA University - Thanjavur.
    3. CWSS to 252 habitations in Papanasam and Ammapettai Unions.
- Karur District:
    1. Water supply to 756 habitations in K.Paramathi and Aravakurichi Unions.
- Tirupathur District:
    1. CWSS for 759 habitations in Tirupathur, Jolarpet, Kandhili, and Natrampalli Unions.
- Erode District:
    1. Water supply to 442 habitations in 23 Village Panchayats of Modakurichi Union.
    2. CWSS for 434 habitations in 22 Village Panchayats of Chennimalai Union.
- Tiruchirappalli District:
    1. CWSS for 109 rural habitations in Lalgudi and Pullambadi Unions.
    2. Water supply to 174 rural habitations in Manikandam and Andhanallur Unions.
- Namakkal District:
    1. CWSS to 547 rural habitations in Mallasamudram, Elachipalayam, and Paramathi (11 Panchayats) Unions, utilizing bulk provision under CWSS to Rasipuram Municipality, 8 Town Panchayats, and 523 habitations.

2. Combined Water Supply Scheme for Rasipuram Municipality, 8 Town Panchayats, and 424 Rural Habitations in Rasipuram, Vennandur, Namagiripettai, and Puduchatram Unions, with bulk provision for 547 habitations in Mallasamudram, Elachipalayam, and Paramathi Unions.

- Thiruvarur District:

    1. CWSS for 1,016 habitations in Thiruvarur, Nannilam, Koradachery, Kottur, Mannargudi, and Tiruthuraipoondi Unions.

- Madurai District:

    1. CWSS to 88 habitations in Kottampatti and Melur Unions, augmenting the Melur CWSS with Cauvery River as the source.
    2. Water supply improvement scheme to 236 rural habitations in T.Kallupatty and Sedapatty Unions in Andipatty – Sedapatty CWSS of Madurai and Theni Districts.
    3. CWSS for 867 rural habitations in Alanganallur, Chellampatti, Kallikudi, Thirumangalam, Thirupparankundram, Usilampatti, and Vadipatti Unions, including 2.00 MLD for SIPCOT complex, Nilakottai in Dindigul District, with Vaigai Dam as the source.

- Thoothukudi District:

    1. CWSS for 363 rural habitations in 6 Panchayat Unions, using Tamiraparani River as the source.

- Tirunelveli District:

    1. CWSS to 831 rural habitations in Radhapuram, Valliyur, Nanguneri, Kalakadu, Palayamkottai, and Cheranmahadevi Unions.

- Virudhunagar & Thoothukudi Districts:

    1. Water supply for 1,286 rural habitations in Virudhunagar District and 45 rural habitations in Thoothukudi District, with Tamiraparani River as the source.

- Ramanathapuram & Dindigul Districts:

    1. CWSS for 2 municipalities, 5 town panchayats, and 2,306 rural habitations in 11 unions of Ramanathapuram District, along with Oddanchatram Municipality, Keeranur, Neikkarapatti Town Panchayat, and 1,422 rural habitations in 7 unions of Dindigul District, with Cauvery River as the source.

- Nagapattinam District:
    1. New Multi-Village Scheme - CWSS for Nagapattinam Municipality, 4 Town Panchayats, and 980 Rural Habitations in 6 Unions, with Coleroon River as the source under the Jal Jeevan Mission.

**AMRUT (Atal Mission for Rejuvenation and Urban Transformation) Schemes**

- Underground Sewerage System (UGSS) Projects:
    1. UGSS for Kurichi and Kuniyamuthur areas of Coimbatore Corporation (Wards 87-100).
    2. UGSS for Rameshwaram Municipality in Ramanathapuram District.
    3. UGSS for Ambur Municipality in Tirupattur District.

Water Supply Improvement Projects:

1. Water Supply Improvement Scheme for Nagercoil Corporation in Kanyakumari District.
2. Water Supply Improvement Scheme for six expanded areas of Coimbatore City Corporation, including newly merged regions, with River Bhavani (Pillur III) as the source.

Combined Water Supply Schemes (CWSS):

1. CWSS for Kalakadu Municipality and seven Town Panchayats in Tirunelveli District, using River Tamiraparani as the source.

## Government Initiatives for Water Supply

### Government Initiatives for Water Accessibility, Conservation, and Management in India

The Government of India has launched several comprehensive schemes to enhance water accessibility, conservation, and management across the country. These initiatives focus on improving rural and urban water supply, irrigation efficiency, groundwater conservation, dam rehabilitation, and climate-resilient water management strategies to ensure long-term sustainability.

**Jal Jeevan Mission (JJM) – Rural Drinking Water Supply**

Launched in 2019 by the Ministry of Jal Shakti, the Jal Jeevan Mission (JJM) aims to provide safe and adequate drinking water through individual household tap connections to all rural households by 2024. The mission focuses on community-based water management, source sustainability through groundwater recharge, greywater reuse, water conservation, and rainwater harvesting. Additionally, it promotes Information, Education, and Communication (IEC) activities to encourage behavioral change among stakeholders.

**National Rural Drinking Water Programme (NRDWP)**

The National Rural Drinking Water Programme (NRDWP) is dedicated to providing safe drinking water in rural areas. It supports community-led planning, groundwater conservation, and rainwater harvesting to ensure long-term water security. By emphasizing local participation, NRDWP ensures that rural communities play an active role in managing their water resources efficiently.

**Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0 – Urban Water Infrastructure**

Launched on October 1, 2021, AMRUT 2.0 aims to achieve universal water supply coverage in all statutory towns, ensuring urban 'water security.' The mission focuses on infrastructure development in water supply, sewerage, septage management, and stormwater drainage. It also promotes the adoption of circular economy principles and encourages Public-Private Partnerships (PPPs) to enhance service delivery.

**Smart Cities Mission – IoT-Based Water Management**

The Smart Cities Mission integrates IoT-based monitoring systems to enhance urban water management. Sensor-based leak detection technology is used to minimize water wastage and optimize distribution networks. By leveraging technology, this initiative aims to create smart water infrastructure in urban areas, improving efficiency and reducing water losses.

**Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) – Irrigation and Agricultural Water Management**

Launched in 2015-16, PMKSY aims to improve irrigation efficiency and optimize water resources for agriculture. It focuses on increasing access to water for farms, expanding the cultivable area under assured irrigation, and promoting micro-irrigation technologies like drip and sprinkler systems under the 'Per Drop More Crop' initiative. This program ensures sustainable water use in agriculture, enhancing productivity while conserving resources.

**Atal Bhujal Yojana (ATAL JAL) – Sustainable Groundwater Management**

The Atal Bhujal Yojana is a Central Sector Scheme dedicated to promoting sustainable groundwater management through community participation. It emphasizes demand-side interventions, including the development of water security plans at the Gram Panchayat level. By involving local communities in groundwater conservation efforts, the scheme helps ensure long-term water availability.

### National Hydrology Project (NHP) – Water Resource Data Management

Approved on April 6, 2016, and supported by the World Bank, the National Hydrology Project (NHP) aims to improve the extent, quality, and accessibility of water resource information. The project strengthens the institutional capacity of water management agencies, enabling them to make data-driven policy decisions for sustainable water governance.

### National Water Mission (NWM) – Climate-Resilient Water Conservation

As one of the eight missions under the National Action Plan on Climate Change (NAPCC), the National Water Mission (NWM) focuses on conserving water, minimizing wastage, and ensuring equitable distribution across states. Its objectives include developing a comprehensive water database, assessing the impact of climate change on water resources, and promoting citizen and state-level actions for water conservation and augmentation.

### Dam Rehabilitation and Improvement Programme (DRIP) – Dam Safety and Infrastructure

Initiated in April 2012 with financial assistance from the World Bank, the Dam Rehabilitation and Improvement Programme (DRIP) aims to rehabilitate and upgrade dams across India. It focuses on strengthening institutional capacity for dam safety evaluation and management while improving the regulatory framework for long-term dam sustainability. This initiative enhances the safety and operational efficiency of India's water storage infrastructure.

### State-Level Water Initiatives

In addition to national schemes, several state governments have launched their own initiatives to improve water accessibility and conservation:

- **Har Ghar Jal (Punjab):** Under the **'Har Ghar Pani, Har Ghar Safai'** scheme, Punjab has provided 26.44 lakh rural households with piped water connections, aiming for 100% coverage.
- **Shiv Kalin Pani Sathwan Yojana (Maharashtra):** Focuses on enhancing rural water supply and ensuring water security in Maharashtra.
- **Pilloor Water Supply Scheme (Tamil Nadu):** Strengthens drinking water infrastructure for both urban and rural populations in Tamil Nadu.
- **Indira Gandhi Canal Project (Rajasthan):** Supplies water to arid desert regions, ensuring access to water in one of the most water-scarce areas of the country.

## Water Supply Scheme (WSS) Project in India

The Government of India, through various ministries and departments, has initiated several Water Supply Schemes (WSS) to ensure the provision of safe and adequate drinking water across the country. These schemes encompass both rural and urban areas, aiming to improve water accessibility and sustainability.

### Jal Jeevan Mission (JJM)

Launched in August 2019, the Jal Jeevan Mission aims to provide Functional Household Tap Connections (FHTCs) to every rural household by 2024, ensuring regular access to safe drinking water. The mission also emphasizes source sustainability through measures like recharge and reuse via greywater management, water conservation, and rainwater harvesting.

### National Water Mission (NWM)

The National Water Mission focuses on conserving water, minimizing wastage, and ensuring equitable distribution. It operates under the Ministry of Jal Shakti and includes various schemes aimed at improving water use efficiency across sectors.

### Neer Nirmal Pariyojana

This World Bank-assisted project was initiated to enhance piped water supply and sanitation services in rural areas of Uttar Pradesh, Bihar, Assam, and Jharkhand. It promotes decentralized service delivery systems, involving local communities in the planning and management of water supply and sanitation services.

### Uttarakhand Rural Water Supply & Sanitation Project

Aimed at improving the effectiveness of rural water supply and sanitation services, this project emphasizes decentralization and increased involvement of Panchayati Raj Institutions and local communities in the planning, implementation, operation, and maintenance of schemes.

### Ramjal Setu Link Project (Eastern Rajasthan Canal Project)

Renamed as the Ramjal Setu Link Project, this initiative aims to provide water to 13 districts in eastern Rajasthan by interlinking rivers and utilizing surplus monsoon water. The project focuses on supplying drinking and industrial water, as well as irrigation facilities.

### Surya Regional Water Supply Scheme

In the Mumbai Metropolitan Region, the Surya Regional Water Supply Scheme is designed to supply 185 Million Liters per Day (MLD) of bulk water to the Vasai-Virar City Municipal Corporation and 17 surrounding villages, benefiting approximately 1.4 million people.

**Water Supply Projects in Guwahati**

To provide affordable, reliable, safe, pressurized, and continuous (24x7) water supply to the Guwahati Metropolitan Area, the Government of Assam has initiated four major water supply projects. These projects are funded by the Government of India, Japan International Cooperation Agency (JICA), and the Asian Development Bank (ADB).

## Wastewater Distribution in India

Wastewater distribution in India is a complex process influenced by rapid urbanization, population growth, industrialization, and significant regional variations in infrastructure. The distribution system includes the collection, transportation, treatment, and eventual discharge or reuse of wastewater. However, the sector faces challenges stemming from unequal development across different states and cities, leading to inefficiencies and varying levels of service.

As urban areas expand, wastewater management becomes more critical due to increased generation of sewage. Yet, large sections of rural and semi-urban regions still lack proper sewage networks and treatment plants, with untreated wastewater being released into water bodies, further exacerbating pollution. This situation not only affects public health but also places a tremendous strain on already overstressed water resources. While metropolitan cities tend to have better wastewater infrastructure, smaller towns and rural areas often face poor or non-existent treatment facilities, resulting in widespread contamination of water sources. India's drinking water distribution infrastructure is undergoing significant transformation, driven by government initiatives aimed at providing universal access to safe and reliable drinking water. In urban areas, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) focuses on enhancing water supply and distribution systems. This initiative aims to improve infrastructure, reduce water losses, and ensure equitable distribution across urban centres.

Additionally, state-specific projects like Mission Bhagiratha in Telangana exemplify localized efforts to provide safe drinking water. Launched in 2016, Mission Bhagiratha aims to supply piped water to 2.32 crore people across 20 lakh households in both urban and rural areas of Telangana. The project sources water from the Godavari and Krishna rivers, with the bulk supply expected to be completed by May 2018. Despite these advancements, challenges persist, including aging infrastructure, water quality issues, and disparities in distribution between urban and rural areas. The government continues to prioritize investments in water infrastructure to address these challenges and ensure sustainable access to safe drinking water for all citizens.

### Challenges in Wastewater Distribution in India

Despite numerous efforts to improve wastewater management, several challenges persist in India's wastewater distribution system. One of the most pressing issues is infrastructure deficiency, as many cities and towns still lack proper sewer networks and treatment plants, leading to the direct discharge of untreated wastewater into natural water bodies. The high cost of treatment is another significant challenge, as setting up and maintaining Sewage Treatment Plants (STPs) and Effluent Treatment Plants (ETPs) requires substantial financial investment, making it difficult for municipalities and industries to expand wastewater treatment facilities.

Additionally, weak enforcement of environmental regulations has resulted in many industries illegally discharging untreated effluents into rivers and lakes, exacerbating pollution levels. Pollution of major water bodies, including the Ganga, Yamuna, and Godavari, remains a critical concern, as unchecked wastewater discharge leads to severe water quality degradation. Furthermore, groundwater contamination is a growing issue due to the infiltration of untreated wastewater into aquifers, posing serious risks to public health and drinking water safety.

### Future Strategies for Wastewater Distribution

To address these challenges, India must adopt a multi-pronged approach to wastewater distribution and treatment. One key strategy is the implementation of decentralized treatment solutions, such as small-scale STPs and constructed wetlands, especially in rural and peri-urban areas where centralized sewage networks are not feasible. Wastewater recycling and reuse should be promoted by encouraging industries and municipalities to repurpose treated wastewater for agricultural irrigation, industrial cooling, and landscaping, reducing the demand for freshwater. Additionally, Public-Private Partnerships (PPPs) can play a crucial role in financing and managing wastewater treatment infrastructure, bringing in technical expertise and efficient management practices. Stricter compliance measures must be enforced by strengthening regulatory frameworks and imposing heavier penalties on industries and municipalities that discharge untreated wastewater. Finally, leveraging smart wastewater management technologies, such as IoT-based monitoring systems, can help track wastewater flow, treatment efficiency, and pollution levels in real time, enabling proactive interventions and better regulatory oversight. By integrating these strategies, India can work towards a more sustainable and efficient wastewater distribution system, ensuring cleaner water resources for future generations.

## Collection and Transportation of Wastewater

Wastewater in India is primarily collected through a network of sewage pipelines, open drains, and stormwater channels. In well-planned urban centers like Delhi, Mumbai, and Bengaluru, a structured underground sewer network carries wastewater to sewage treatment plants (STPs). However, in smaller cities and rural areas, the absence of proper sewage systems results in the direct discharge of wastewater into local rivers, lakes, and groundwater sources. Many towns still rely on septic tanks and pit latrines, leading to localized contamination and health hazards.

Municipal bodies and urban local governments are responsible for wastewater transportation through sewage pumping stations and drainage systems. In cities with planned wastewater infrastructure, sewage is transported through gravity-based pipelines, while in low-lying areas, pumping stations are used to lift and transfer sewage to treatment plants. However, due to poor maintenance and overloading, many sewage networks experience frequent blockages, leakages, and overflows, contributing to environmental pollution.

### Treatment and Processing of Wastewater

India generates around 72,368 million liters per day (MLD) of sewage, but only 31,841 MLD is treated, leaving a gap of over 40,000 MLD of untreated wastewater that flows into water bodies. Wastewater treatment is unevenly distributed, with major cities like Mumbai, Chennai, and Delhi having well-established Sewage Treatment Plants (STPs), while many smaller towns lack treatment facilities.

The distribution of wastewater treatment capacity across states is highly disproportionate:

- Maharashtra, Gujarat, Tamil Nadu, and Karnataka have relatively higher wastewater treatment capacities, with large STPs in urban centers.
- Uttar Pradesh, Bihar, Jharkhand, and Odisha face severe shortages in treatment infrastructure, leading to the direct discharge of untreated sewage into rivers like the Ganga, Yamuna, and Godavari.
- Northeastern states have minimal sewage treatment infrastructure, leading to high pollution levels in local water bodies.

The treatment of wastewater follows various methods, including:

1. **Primary Treatment** – Removal of solid waste and debris through sedimentation.
2. **Secondary Treatment** – Biological treatment using activated sludge or trickling filters to remove organic matter.
3. **Tertiary Treatment** – Advanced purification using chemical and membrane-based filtration for reuse or safe discharge.

**Reuse and Discharge of Treated and Untreated Wastewater**

The final stage of wastewater distribution involves either reuse or disposal. The reuse of treated wastewater is gaining momentum in cities like Chennai, Bengaluru, and Pune, where treated water is used for industrial cooling, agriculture, and landscaping. However, in most cases, wastewater is either discharged into rivers, lakes, and coastal waters or reabsorbed into the ground through irrigation and land disposal.

Discharge of untreated wastewater is a major environmental concern. In states like Uttar Pradesh, Bihar, and West Bengal, large volumes of untreated sewage enter the Ganga River, worsening pollution levels. Similarly, the Yamuna in Delhi, Mithi River in Mumbai, and Hussain Sagar in Hyderabad have become severely polluted due to wastewater inflow.

In industrial zones, large-scale industries such as textiles, pharmaceuticals, and chemicals generate toxic effluents, which are either treated in Effluent Treatment Plants (ETPs) or, in many cases, illegally discharged into nearby rivers. Common Effluent Treatment Plants (CETPs) are being developed in industrial clusters to handle effluents from multiple industries, but enforcement remains weak.

**Regional Disparities in Wastewater Infrastructure**

The **geographical distribution of wastewater treatment facilities** highlights stark differences:

- **Southern and Western India** (Maharashtra, Tamil Nadu, Karnataka, Gujarat) have better treatment infrastructure, with multiple STPs and wastewater reuse projects.
- **Northern and Eastern India** (Uttar Pradesh, Bihar, West Bengal, Assam) struggle with inadequate treatment facilities, leading to high pollution levels in the **Ganga, Brahmaputra, and Yamuna rivers**.
- **Rural Areas** largely lack proper wastewater collection and treatment systems, relying on **open drains, septic tanks, and direct land disposal**, which contaminates groundwater and affects drinking water quality.

## Competitive Landscape

The Engineering, Procurement, and Construction (EPC) industry in India exhibits a highly fragmented structure, comprising over 180 participants and a wide range of stakeholders. This sector includes a substantial number of small and medium-sized players as well as a few large conglomerates that dominate the construction of complex projects such as roads, power plants, ports, airports, industrial plants, and railways. The competitive dynamics within the EPC industry are primarily shaped by substantial upfront capital investments and stringent technical norms established by contract awarding authorities, which restrict smaller players from entering large-scale projects. Consequently, smaller firms predominantly focus on less complex projects like urban and rural road construction, where entry barriers and investment requirements are relatively lower. This section offers a detailed analysis of the competitive landscape within the Indian EPC sector, emphasizing the key factors influencing competition, the strategic positioning of major players, and the significant entry barriers that new entrants encounter. Understanding these dynamics is crucial for stakeholders to navigate the complexities of the EPC market and identify potential opportunities for growth and collaboration.

### Key Factors Shaping Competition in EPC Segment

**Market Fragmentation and Player Segmentation:** The Indian EPC market is highly fragmented, with a significant number of small and medium-sized players and a few large conglomerates. Large players typically handle high-capital and technically demanding projects, leveraging their extensive experience and financial strength. In contrast, smaller firms focus on less complex projects, such as urban and rural road construction, due to lower entry barriers and investment requirements.

**Technological Advancements:** Advancements in construction technologies and project management tools are pivotal in shaping competition. Companies investing in cutting-edge technology and innovative construction techniques gain a competitive edge by improving efficiency, reducing costs, and ensuring timely project completion.

**Government Policies and Regulations:** Government initiatives, such as the National Infrastructure Pipeline (NIP) and various public-private partnership (PPP) models, significantly impact the competitive landscape. These policies create opportunities for EPC players to participate in large-scale infrastructure projects, while regulatory norms ensure adherence to quality and safety standards, thus influencing competitive dynamics.

**Financial Strength and Capital Requirements:** High upfront capital investments and longer break-even periods are crucial factors. Large players with robust financial backing can undertake extensive projects, whereas smaller firms often face challenges in securing necessary funding. The ability to manage finances effectively and maintain liquidity is a critical competitive factor.

**Contract Awarding Criteria:** EPC contracts are awarded based on a fine balance of technical capability and cost efficiency. Firms that can demonstrate superior technical expertise while offering competitive pricing are more likely to win contracts. This necessitates continuous improvement in technical skills and cost management strategies.

**Sector Focus and Diversification:** EPC companies often build their reputations based on sector focus. Some firms specialize in specific sectors like power transmission or urban infrastructure, while others diversify their operations across multiple sectors to mitigate risks and enhance market presence. Diversification strategies help companies to leverage opportunities across various segments, thereby shaping the competitive environment.

## Key Entry Barriers

**High Capital Investment:** Entering the EPC market, particularly for large and complex projects, requires substantial capital investment. This includes costs related to acquiring advanced machinery, hiring skilled labour, and securing raw materials. High capital requirements deter many small players from entering the market, ensuring that large, well-established firms dominate.

**Stringent Technical and Operational Norms:** Contract awarding authorities impose rigorous technical and operational standards that companies must meet to qualify for project bids. These include criteria related to past project experience, technical expertise, and financial stability. Meeting these stringent requirements can be challenging for new entrants, thereby acting as a significant entry barrier.

**Experience and Reputation:** A proven track record and established reputation are crucial in the EPC sector. Clients prefer to engage firms with a history of successfully completed projects, reliable performance, and adherence to timelines. New entrants often struggle to compete with established players who have built strong reputations over time.

**Regulatory Compliance:** Compliance with numerous regulatory requirements, including environmental regulations, safety standards, and quality certifications, is mandatory for EPC companies. Navigating these regulatory frameworks demands substantial expertise and resources, posing a challenge for new entrants unfamiliar with the complex regulatory environment.

**Market Competition and Price Sensitivity:** The intense competition within the EPC sector, combined with the price-sensitive nature of contracts, creates a challenging environment for new players.

Established companies with efficient cost structures and economies of scale can offer competitive pricing, making it difficult for new entrants to compete on price without compromising on quality or profitability.

**Access to Skilled Labor and Technology:** The availability of skilled labour and access to advanced construction technologies are critical for success in the EPC industry. New entrants may find it difficult to attract and retain skilled professionals or invest in the latest technologies, further inhibiting their ability to compete effectively.

**Established Relationships:** Existing players often have long-standing relationships with suppliers, subcontractors, and clients. These connections can provide them with better pricing, preferential treatment, and access to projects, creating a barrier for new entrants trying to establish similar networks.

**Brand Reputation**: Trust and reliability are crucial in the EPC industry. Established companies benefit from their reputation, which can take years to build. New entrants may struggle to convince clients of their capabilities without a solid track record.

## Profiling of the Key Players:

| Company name | Business Overview |
|---|---|
| Ems Limited: | EMS Limited, based in Delhi, India, is a leading multi-disciplinary Engineering, Procurement, and Construction (EPC) company specializing in water and wastewater management solutions. Established in 1998, the company is dedicated to sustainable development, promoting a clean environment, and creating modern infrastructure. The company provides comprehensive turnkey services, which include designing, constructing, and maintaining water supply systems, sewage solutions, and wastewater treatment plants. Over the years, EMS has completed numerous projects for urban authorities as well as state and central government agencies, delivering essential infrastructure such as water treatment plants, sewage treatment facilities, and common effluent treatment plants. Through its subsidiary, SKUEM Water Projects Pvt. Ltd., EMS operates a Common Effluent Treatment Plant (CETP) with a capacity of 4.5 million liters per day (MLD) in SIDCUL. |
| Va Tech Wabag Ltd. (Wabag Group) | The WABAG Group is a global company with a presence in 4 continents and over 20 countries, specializing in water treatment and management. WABAG Group was founded in 1924. WABAG offers various services, including drinking water treatment, water reclamation, and seawater desalination, with a focus on efficiency |

| | |
|---|---|
| | and conservation. Their projects include the IOCL Paradip ETP, the Ujams industrial project, and the Koyambedu Water Reuse Plant, showcasing their expertise in water management solutions. Overall, the WABAG Group is committed to providing innovative and sustainable solutions for pure water, with a strong emphasis on conservation and efficiency. |
| Vishnu Prakash R Punglia Limited | Vishnu Prakash R Punglia Limited is an infrastructure development company based in India. Established in 1986, the company specializes in executing integrated water supply projects, road construction, bridges, and other civil infrastructure works. It serves government and semi-government organizations, focusing on creating sustainable and high-quality infrastructure. With a commitment to timely project delivery and environmental responsibility, Vishnu Prakash R Punglia Limited has earned a reputation for excellence in the infrastructure sector. |
| Enviro Infra Engineers Limited | Enviro Infra Engineers Limited is a leading infrastructure company in India specializing in water and wastewater management solutions. Established in 2009, the company provides end-to-end services, including design, construction, operation, and maintenance of sewage treatment plants, effluent treatment plants, and water treatment facilities. Known for its commitment to sustainability and innovation, Enviro Infra Engineers Limited caters to government and private sector clients, delivering projects that align with environmental standards and promote sustainable development. |
| Denta Water and Infra Solutions Limited | Denta Water and Infra Solutions Limited, established in 2016 and headquartered in Bengaluru, India, specializes in water management and infrastructure projects. The company offers comprehensive services, including the design, installation, commissioning, operation, and maintenance of water management infrastructure, with a particular focus on groundwater recharging using recycled water. Denta has expertise in groundwater recharging and has successfully completed 32 water management projects, with 17 ongoing as of late 2024. These projects encompass lift irrigation, drinking water supply, and the reuse of treated wastewater. Beyond water management, Denta also undertakes construction projects in the fields of railways and highways, showcasing a diversified portfolio in infrastructure development. |
| Ion Exchange (India) Limited | Ion Exchange (India) Limited, established in 1964, is a pioneer in water and environment management solutions, serving industries, institutions, homes, and |

| | |
|---|---|
| | communities. The company provides comprehensive solutions for water treatment, waste management, and environmental services. Its product portfolio includes ion exchange resins, membranes, specialty chemicals, and water quality monitoring instruments, marketed under the INDION brand. Headquartered in Mumbai, Ion Exchange operates 7 manufacturing and assembly facilities across India, with additional units in Bangladesh and the UAE. The company has a strong global presence. It serves a diverse clientele across sectors such as automotive, pharmaceuticals, food processing, and power generation while also focusing on sustainability through research and development of eco-friendly water and environmental technologies. |

## Financial Profiling of the Key Peer Companies:[4]

### Ems Limited

| Indicator (INR Millions) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| **Revenue** | 3,599.17 | 5,318.62 | 7,933.11 |
| **Raw material cost** | 2,447.43 | 4,041.09 | 5,319.31 |
| **Power & Fuel cost** | 0.00 | 0.00 | 0.00 |
| **Employee cost** | 103.87 | 193.88 | 260.92 |
| **Interest cost** | 57.46 | 38.41 | 62.84 |
| **EBITDA** | 1,159.56 | 1,551.24 | 2,196.05 |
| **EBITDA Margin** | 31.9% | 28.6% | 27.1% |
| **PAT** | 788.50 | 1,088.51 | 1,526.63 |
| **PAT Margin** | 21.7% | 20.0% | 18.9% |
| **Debt Equity Ratio** | 0.01 | 0.09 | 0.09 |
| **Interest Coverage Ratio** | 19.74 | 39.50 | 33.91 |
| **Return on Assets** | 15.6% | 17.0% | 15.7% |
| **Current Ratio** | 2.99 | 5.14 | 6.14 |

Source – Annual Reports

[4] Financials Considered on Consolidated basis

EMS Limited's financial data reflects strong growth and operational efficiency from FY 2022 to FY 2024. Revenue more than doubled from INR 3,599.17 million to INR 7,933.11 million, driven by robust business performance. Raw material and employee costs increased in line with expansion, while EBITDA grew to INR 2,196.05 million, though margins slightly declined from 31.9% to 27.1% due to rising expenses.

PAT rise from INR 788.50 million to INR 1,526.63 million, with PAT margins decreasing from 21.7% to 18.9%. The company maintained a low debt-equity ratio of 0.09, strong interest coverage (33.91 in FY 2024), and stable ROA (15.7%), reflecting financial resilience. The current ratio improved from 2.99 to 6.14, ensuring strong liquidity.

### Va Tech Wabag Ltd.

| Indicator (INR Million) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| **Revenue** | 29,793.00 | 29,604.80 | 28,564.00 |
| **Raw material cost** | 11,249.60 | 12,603.50 | 10,577.00 |
| **Power & Fuel cost** | 31.20 | 58.80 | 87.00 |
| **Employee cost** | 2,506.60 | 2,655.10 | 2,354.00 |
| **Interest cost** | 877.00 | 658.00 | 711.00 |
| **EBITDA** | 2,662.20 | 3,806.70 | 4,096.00 |
| **EBITDA Margin** | 8.8% | 12.6% | 14.1% |
| **PAT** | 1,320.60 | 109.30 | 2,504.00 |
| **PAT Margin** | 4.4% | 0.4% | 8.6% |
| **Debt Equity Ratio** | 0.06 | 0.03 | 0.10 |
| **Interest Coverage Ratio** | 2.92 | 5.65 | 5.64 |
| **Return on Assets** | 3.3% | 0.3% | 5.5% |
| **Current Ratio** | 1.37 | 1.33 | 1.68 |

Source – Annual Reports

VA Tech Wabag Ltd. exhibited mixed financial performance from FY 2022 to FY 2024. Revenue declined slightly from INR 29,793.00 million to INR 28,564.00 million, but profitability improved, with EBITDA rising from INR 2,662.20 million to INR 4,096.00 million and margins expanding from 8.8% to 14.1%, driven by cost efficiencies. PAT rebounded sharply to INR 2,504.00 million in FY 2024 after a dip in FY 2023, boosting the PAT margin to 8.6%. The debt-equity ratio increased slightly (0.10 in FY 2024) but remains manageable, supported by a stable interest coverage ratio (~5.64). Return on assets improved to 5.5%, reflecting better asset utilization, while a higher current ratio (1.68) strengthens liquidity.

### Vishnu Prakash R Punglia Limited

| Indicator for (INR Million) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| Revenue | 8,546.38 | 11,684.04 | 14,738.65 |
| Raw material cost | 0.00 | 53.08 | 86.99 |
| Power & Fuel cost | 0.00 | 363.27 | 513.47 |
| Employee cost | 214.28 | 265.29 | 383.79 |
| Interest cost | 227.74 | 302.28 | 429.78 |
| EBITDA | 876.06 | 1,596.43 | 2,186.71 |
| EBITDA Margin | 10.2% | 13.6% | 14.7% |
| PAT | 459.26 | 906.43 | 1,221.85 |
| PAT Margin | 5.3% | 7.7% | 8.2% |
| Debt Equity Ratio | 0.37 | 0.19 | 0.03 |
| Interest Coverage Ratio | 3.67 | 5.05 | 4.83 |
| Return on Assets | 10.6% | 11.0% | 7.9% |
| Current Ratio | 1.54 | 1.51 | 1.89 |

Source – Annual Reports

Vishnu Prakash R Punglia Limited has shown strong growth from FY 2022 to FY 2024, with revenue rising from INR 8,546.38 million to INR 14,738.65 million. EBITDA surged to INR 2,186.71 million, with margins improving from 10.2% to 14.7%, while PAT grew to INR 1,221.85 million, boosting the PAT margin to 8.2%. The debt-equity ratio fell sharply from 0.37 to 0.03, enhancing financial stability. Though the interest coverage ratio (4.83) and ROA (7.9%) declined slightly, the current ratio improved to 1.89, strengthening liquidity.

### Enviro Infra Engineers Limited

| Indicator for (INR Million) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| Revenue | 2,235.25 | 3,381.02 | 7,289.15 |
| Raw material cost | 2.82 | 2.09 | 3.59 |
| Power & Fuel cost | 40.59 | 81.10 | 165.66 |

| | | | |
|---|---|---|---|
| **Employee cost** | 144.83 | 218.15 | 338.87 |
| **Interest cost** | 43.31 | 83.55 | 225.17 |
| **EBITDA** | 521.19 | 880.72 | 1,755.88 |
| **EBITDA Margin** | 23.1% | 25.8% | 23.8% |
| **PAT** | 345.49 | 574.52 | 1,064.56 |
| **PAT Margin** | 15.3% | 16.8% | 14.4% |
| **Debt Equity Ratio** | 0.03 | 0.19 | 0.31 |
| **Interest Coverage Ratio** | 11.64 | 10.27 | 7.53 |
| **Return on Assets** | 23.3% | 16.3% | 14.0% |
| **Current Ratio** | 1.66 | 1.46 | 1.54 |

Source – Annual Reports

Enviro Infra Engineers Limited has achieved remarkable revenue growth, expanding from INR 2,235.25 million in FY 2022 to INR 7,289.15 million in FY 2024. EBITDA more than tripled to INR 1,755.88 million, with margins staying strong at 23–25%. PAT rose to INR 1,064.56 million, though the PAT margin declined to 14.4% due to higher interest costs and operational expenses.

The debt-equity ratio increased from 0.03 to 0.31, reflecting greater leverage for expansion. While the interest coverage ratio declined to 7.53, the current ratio remained stable at 1.54, ensuring liquidity. Return on assets fell to 14.0%, signaling the need for efficient asset utilization. Despite these challenges, the company maintains strong growth momentum while scaling operations.

### Denta Water and Infra Solutions Limited

| Indicator for (INR Million) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| **Revenue** | 1,195.72 | 1,743.24 | 2,385.98 |
| **Raw material cost** | 668.84 | 1,045.02 | 1,519.78 |
| **Power & Fuel cost** | 26.62 | 37.72 | 30.15 |
| **Employee cost** | 0.97 | 11.26 | 36.21 |
| **Interest cost** | - | 0.93 | 5.07 |
| **EBITDA** | 518.74 | 683.83 | 823.76 |
| **EBITDA Margin** | 43.4% | 38.9% | 34.1% |
| **PAT** | 383.37 | 498.55 | 604.68 |
| **PAT Margin** | 32.0% | 28.4% | 25.0% |

| | | | |
|---|---|---|---|
| **Debt Equity Ratio** | - | 0.008 | 0.003 |
| **Interest Coverage Ratio** | - | 731.31 | 161.52 |
| **Return on Assets** | 63.2% | 40.3% | 27.5% |
| **Current Ratio** | 8.52 | 4.29 | 3.20 |

Source – Annual Reports

Denta Water and Infra Solutions Limited has shown strong growth from FY 2022 to FY 2024, with revenue increasing from INR 1,195.72 million to INR 2,385.98 million. EBITDA rose to INR 823.76 million, though EBITDA margin decreased from 43.4% to 34.1%. PAT grew to INR 604.68 million, with the margin falling from 32.0% to 25%. The company reduced its debt-equity ratio from 0.008 to 0.003, improving financial stability. Despite declines in interest coverage (from 731.31 to 161.52) and return on assets (from 63.2% to 27.5%), Denta Water maintains a solid financial position with a healthy current ratio, decreasing from 8.52 to 3.20.

## Ion Exchange (India) Limited

| Indicator for (INR Million) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| Revenue | 15,768.68 | 19,896.09 | 23,478.49 |
| Raw material cost | 9,279.20 | 11,815.27 | 13,746.34 |
| Power & Fuel cost | 214.55 | 249.36 | 262.60 |
| Employee cost | 1,990.35 | 2,362.64 | 2,965.49 |
| Interest cost | 99.47 | 92.00 | 120.62 |
| EBITDA | 2,553.20 | 2,969.90 | 3,173.61 |
| EBITDA Margin | 15.8% | 14.6% | 13.3% |
| PAT | 1,616.88 | 1,949.66 | 1,953.52 |
| PAT Margin | 10.0% | 9.6% | 8.2% |
| Debt Equity Ratio | 0.018 | 0.019 | 0.10 |
| Interest Coverage Ratio | 22.85 | 29.12 | 23.29 |
| Return on Assets | 9.9% | 10.0% | 7.9% |
| Current Ratio | 1.45 | 1.54 | 1.54 |

Source – Annual Reports

Ion Exchange (India) Limited has achieved remarkable revenue growth, expanding from INR 15,768.68 million in FY 2022 to INR 23,478.49 million in FY 2024. Raw material and employee costs have also increased, aligning with the expanding scale of operations. Despite this, EBITDA remains strong, growing to INR 3,173.61 million in FY 2024, though margins slightly compressed from 15.8% in FY 2022 to 13.3% in FY 2024. PAT follows a similar trend, rising to INR 1,953.52 million in FY 2024, with a slight decline in PAT margins from 10.0% in FY 2022 to 8.2% in FY 2024. The debt-equity ratio rose from 0.018 in FY 2022 to 0.10 in FY 2024, indicating increased leverage to support growth. Despite this, the company maintains sufficient liquidity with a stable current ratio of 1.45 in FY 2022 and 1.54 in FY 2023 and FY 2024, and a manageable interest coverage ratio, though the latter has slightly declined from 29.12 in FY 2023 to 23.29 in FY 2024. Return on assets shows a gradual decrease, from 9.9% in FY 2022 to 7.9% in FY 2024, highlighting the need for efficient asset utilization amid rapid expansion.

## Consolidated Financial Benchmarking of Key Players (2024):

| Indicator for (INR Million) | Sattva Engineering Construction Ltd | EMS Ltd | VA Tech Wabag Ltd. | Vishnu Prakash R Punglia Limited | Enviro Infra Engineering Limited | Denta Water and Infra Solutions Limited | Ion Exchange (India) Limited |
|---|---|---|---|---|---|---|---|
| Revenue | 769.31 | 7,933.11 | 28,564.00 | 14,738.65 | 7,289.15 | 2,385.98 | 23,478.49 |
| Raw material cost | 0.40 | 5,319.31 | 10,577.00 | 86.99 | 3.59 | 1,519.78 | 13,746.34 |
| Power & Fuel cost | 4.03 | 0.00 | 87.00 | 513.47 | 165.66 | 30.15 | 262.60 |
| Employee cost | 60.25 | 260.92 | 2,354.00 | 383.79 | 338.87 | 36.21 | 2,965.49 |
| Interest cost | 65.90 | 62.84 | 711.00 | 429.78 | 225.17 | 5.07 | 120.62 |
| EBITDA | 131.49 | 2,196.05 | 4,096.00 | 2,186.71 | 1,755.88 | 823.76 | 3,173.61 |
| EBITDA Margin | 17.0% | 27.1% | 14.1% | 14.7% | 23.8% | 34.1% | 13.3% |
| PAT | 45.64 | 1,526.63 | 2,504.00 | 1,221.85 | 1,064.56 | 604.68 | 1,953.52 |
| PAT Margin | 5.9% | 18.9% | 8.6% | 8.2% | 14.4% | 25.0% | 8.2% |
| Debt Equity Ratio | 0.053 | 0.088 | 0.103 | 0.035 | 0.310 | 0.003 | 0.107 |
| Interest Coverage Ratio | 1.953 | 33.908 | 5.643 | 4.828 | 7.528 | 161.521 | 23.293 |
| Return on Assets | 0.0509 | 0.1574 | 0.0547 | 0.0792 | 0.1399 | 0.2750 | 0.0798 |
| Current Ratio | 1.3235 | 6.1425 | 1.6824 | 1.8927 | 1.5372 | 3.2034 | 1.5493 |

Source – Annual Reports

The financial benchmarking highlights the varied performance of Sattva Engineering Construction Ltd compared to its peers. Sattva's revenue (INR 769.31 million) is the lowest among the peer companies in revenue terms, with VA Tech Wabag Ltd leading at INR 28,564 million. Despite this, Sattva achieved a notable EBITDA margin of 17.0%, higher than Ion Exchange (India) Limited (13.3%), VA Tech Wabag Ltd (14.1%) and Vishnu Prakash R Punglia Limited (14.7%) but below EMS Limited (27.1%) and Enviro Infra Engineers Limited (23.8%). Sattva's PAT margin of 5.9% lags behind peers, especially Denta Water and Infra Solutions Limited (25%) and EMS (18.9%). It stands out with the lowest debt-equity ratio (0.053), indicating minimal leverage, and an improving interest coverage ratio (1.953). However, its return on assets (5.09%) and current ratio (1.32) trail behind the group average, reflecting room for efficiency and liquidity enhancement. Overall, Sattva shows financial prudence but operates on a smaller scale with moderate profitability compared to larger peers.

## Threat & Challenges

Engineering, procurement, and construction (EPC) procurement is essential for large-scale construction projects, involving the sourcing and management of materials, equipment, human resources, and services. The complexity and global nature of EPC projects introduce numerous risks, including long lead times, global supply chain challenges, and significant financial risks. Effective risk management strategies are crucial for project success.

**Long Lead Times**:

- **Procurement Delays**: Poor planning and scheduling in EPC projects can result in significant delays, cost overruns, and resource allocation issues. Unforeseen changes or scope creep can further complicate project timelines. Additionally, the procurement of large, specialized equipment and materials, which often takes months or even years to produce and deliver, can cause substantial delays if not managed properly. These delays in procurement can have a considerable impact on the overall project schedule.

- **Impact on Project Schedules**: Poor planning and scheduling can lead to delays, cost overruns, and resource allocation issues. Unforeseen changes or scope creep can further complicate project timelines. The extended lead times can disrupt project schedules, leading to cascading delays in subsequent project phases such as construction and commissioning.

- **Budget Overruns**: EPC projects are susceptible to cost overruns due to inaccurate estimates, fluctuating material prices, and unforeseen expenses. Prolonged procurement timelines can result in increased costs due to inflation, storage costs for early arrivals, and expedited shipping charges for delayed items.

**Global Supply Chain Complexities**:

- **Regulatory Compliance**: Managing the supply chain is critical to ensure timely delivery of materials, which affects the overall project schedule. Sourcing materials and equipment globally require navigating a myriad of regulatory frameworks, including import/export regulations, customs duties, and local environmental laws.
- **Logistical Challenges**: Coordinating the transport of materials across multiple countries involves dealing with various logistical hurdles, including transportation delays, port congestions, and varying standards of infrastructure.
- **Cultural and Legal Considerations**: Understanding and managing different cultural expectations and legal requirements can complicate supplier relationships and contractual agreements.

**Financial Risks**:

- **Capital Expenditures**: EPC projects typically involve large capital outlays, making them highly susceptible to financial risks. Any increase in costs can have a significant impact on the overall project budget.
- **Cost Overruns**: Unanticipated costs, such as those arising from design changes, scope creep, or unexpected site conditions, can lead to budget overruns.
- **Payment Delays**: Delays in payments from clients, particularly in public sector projects, can strain the financial resources of EPC firms, impacting their ability to meet ongoing project expenses.

**Supplier and Subcontractor Risks**:

- **Supplier Reliability**: The reliability and performance of suppliers are critical. Issues such as poor quality, delayed deliveries, or supplier insolvency can disrupt the project.
- **Subcontractor Performance**: Managing subcontractors effectively is essential. Poor performance, lack of adherence to schedules, or substandard workmanship can lead to rework and delays.

- **Supplier Relationships**: Maintaining good relationships with suppliers and subcontractors is crucial for ensuring cooperation and timely delivery.

**Project Management and Coordination Risks**:

- **Coordination Challenges**: Multiple teams, including engineers, procurement specialists, and construction crews, often work across various locations, leading to potential miscommunication and misalignment of project goals. EPC projects require meticulous coordination among various stakeholders, including project managers, engineers, suppliers, and contractors. Miscommunication or lack of coordination can lead to errors and delays.
- **Resource Management**: Efficient management of resources, including labour, equipment, and materials, is essential. Any disruption can impact project timelines and costs.
- **Quality Control**: Ensuring consistent quality across all phases of an EPC project can be challenging, especially when multiple vendors and subcontractors are involved. Ensuring consistent quality and adherence to standards is critical to avoid rework and penalties. Implementing robust quality control measures is necessary.

**External Risks**:

- **Political and Economic Instability**: Political changes or economic instability in the countries involved can affect project approvals, funding, and the availability of materials.
- **Natural Disasters**: Natural calamities such as floods, earthquakes, and cyclones can disrupt project execution and cause damage to infrastructure and materials.

**Geopolitical Tensions**: International trade issues and geopolitical tensions can impact the availability and cost of materials, as well as the smooth flow of goods across borders.

## Challenges & Risks in Wastewater Distribution in India

India's wastewater distribution systems face significant challenges that affect their efficiency and sustainability. These issues stem from outdated infrastructure, funding limitations, regulatory gaps, and environmental concerns. Addressing these challenges is crucial to improving wastewater management and protecting public health and ecosystems.

**Infrastructure Deficiencies**

Many wastewater distribution networks suffer from aging and inadequate infrastructure, leading to frequent leaks, blockages, and contamination. Poorly designed and maintained sewer systems struggle to handle increasing wastewater volumes, causing overflows and untreated discharge into water bodies.

**Funding Constraints**

Securing sufficient funding for upgrading wastewater infrastructure is a major challenge. Budget limitations delay expansion and modernization efforts, worsening pollution issues. Limited private sector participation and public-private partnerships further slow investment in necessary improvements.

**Technical and Operational Challenges**

Efficient wastewater distribution requires advanced expertise and consistent maintenance. However, many regions lack trained personnel, resulting in inefficiencies and system failures. Rapid urbanization also increases the complexity of wastewater networks, making management more difficult.

**Public Awareness and Participation**

Lack of public awareness leads to improper disposal practices, putting additional strain on wastewater systems. Public cooperation is essential, but limited knowledge and engagement hinder effective maintenance. Illegal wastewater discharge by industries and households further exacerbates the problem.

**Environmental Concerns**

Inefficient wastewater distribution leads to untreated or partially treated sewage entering natural water bodies, causing severe pollution. Groundwater contamination from leaks poses serious health risks, while degraded ecosystems and biodiversity loss highlight the need for better wastewater management.

**Regulatory and Compliance Issues**

Weak enforcement of wastewater management regulations and the absence of well-defined legal frameworks create inconsistencies in oversight. Proper monitoring and adherence to guidelines are crucial to prevent public health crises and protect water resources.

**Technological Adaptation**

Adopting modern wastewater distribution technologies is hindered by high costs and infrastructure limitations. Smart monitoring systems and advanced management techniques could improve efficiency, but their implementation requires significant investment and technical expertise.

**Climate Change Impacts**

Changing weather patterns and extreme climate events, such as floods, put additional strain on wastewater systems. Rising temperatures can also affect wastewater storage and transport, adding to operational challenges.

**Urbanization and Population Growth**

Rapid urban expansion overwhelms existing wastewater infrastructure, leading to frequent blockages and overflows. Poorly planned city growth results in inefficient wastewater networks, increasing the demand for continuous infrastructure upgrades.

**Health Risks**

Improper wastewater distribution exposes communities to harmful pathogens and pollutants, increasing the risk of waterborne diseases. Contaminated water sources pose severe public health threats, making effective wastewater treatment and distribution critical.

**The Way Forward**

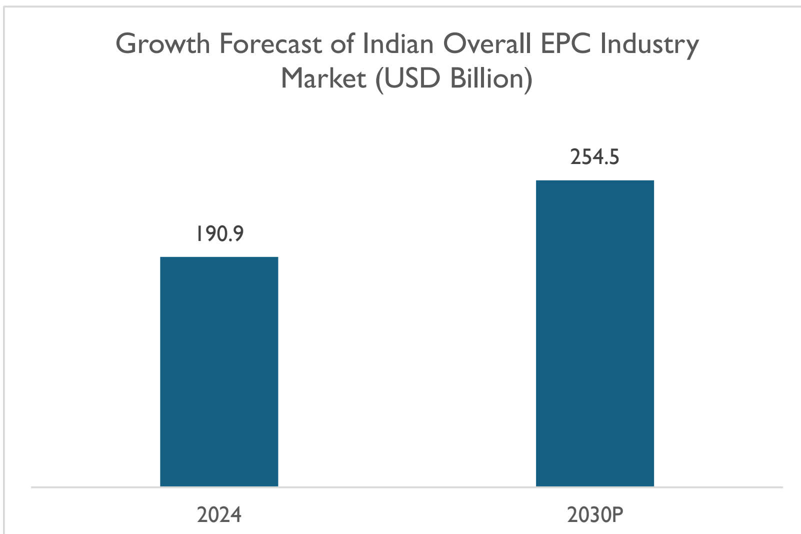
Addressing these challenges requires a comprehensive approach, including investment in modern wastewater infrastructure, technical training programs, public education initiatives, stronger regulatory frameworks, and the adoption of advanced monitoring technologies. By implementing these measures, India can ensure sustainable wastewater management and safeguard environmental and public health.

## Growth Outlook

India is witnessing significant growth in its water treatment and distribution infrastructure, propelled by substantial government initiatives and investments. A key program driving this development is the Jal Jeevan Mission (JJM), launched in 2019, which aims to provide safe and adequate drinking water through individual household tap connections to all rural households by 2024. The mission has seen notable financial commitments, with the Union Budget for 2024-25 allocating INR 701.63 billion to JJM, maintaining the funding at approximately the same level as the revised estimates for 2023-24.

As of January 2025, the Government of India has released INR 218.25 billion to 25 eligible states for the implementation of JJM in the financial year 2024-25. This funding is part of the ongoing efforts to ensure the provision of functional tap water connections across rural India. In addition to JJM, other initiatives like the Swachh Bharat Abhiyan (Clean India Mission), focusing on improving sanitation, have indirectly increased the need for wastewater treatment facilities to manage growing sewage generation. Similarly, the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) emphasizes urban infrastructure development, including water supply and sewerage facilities, contributing significantly to water treatment infrastructure in urban areas.

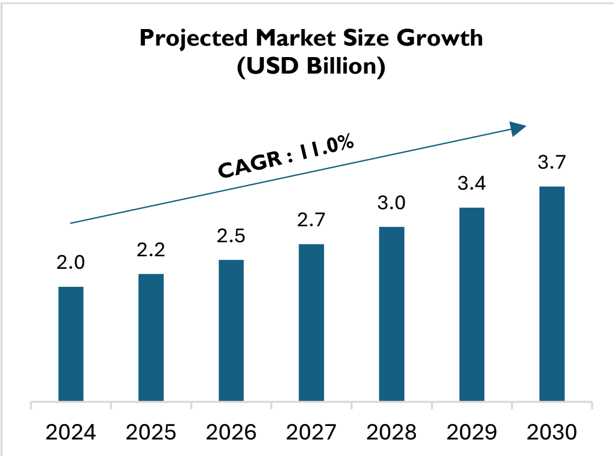
The rapid pace of urbanization and industrialization in India has led to a surge in wastewater generation, creating an urgent need for expanding treatment facilities. The government's commitment to sustainable water management and infrastructure development has opened substantial opportunities for growth in the water treatment sector. With increased funding and a focus on sustainability, India's water treatment infrastructure is well-positioned to address the challenges of a rapidly urbanizing and industrializing nation, ensuring equitable access to clean water and effective wastewater management.

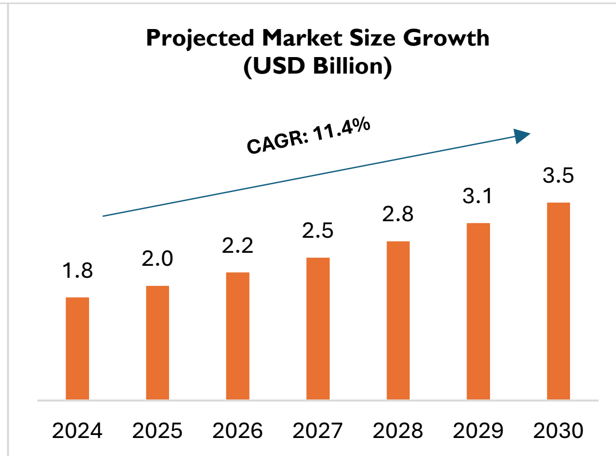



Source- 6W research and Dun & Bradstreet Research

India's overall EPC industry is projected to increase at CAGR of 6.4% reach USD 254.5 billion in 2030 from 175.3 billion in 2024. The Indian water sector offers immense opportunities for EPC (Engineering, Procurement, and Construction) players, driven by rapid industrialization, urbanization, and increasing government spending. Emerging industries like hydrogen and semiconductors demand high-quality treated water, while urban areas require robust water distribution and treatment networks. Stringent regulatory compliance, water scarcity, and government initiatives like the Jal Jeevan Mission have further heightened the need for efficient water treatment and distribution solutions. With advancements in technology, a focus on sustainability, and the adoption of digital tools like IoT and BIM, EPC players can offer innovative and eco-friendly solutions to meet these growing demands. Despite a fragmented market, significant opportunities exist for EPC companies to establish leadership in this expanding sector.

The EPC wastewater treatment market in India is expected to grow significantly due to increasingly stringent regulations on effluent treatment. India's water and wastewater treatment market is projected to grow significantly, reaching an estimated value of USD 3.7 billion. It is expected to expand at a CAGR of 11.0% between 2024 to 2030. Simultaneously, the country's EPC market for water treatment projects is anticipated to rise to USD 3.5 billion from USD1.8 billion, registering a CAGR of 11.4% during the same period.




**India Water and Wastewater Market** **India EPC Industry Market (Water Treatment Projects)**

Source- 6W research and Dun & Bradstreet Research

The market is anticipated to benefit from government initiatives aimed at improving water and wastewater treatment infrastructure. The EPC wastewater treatment market in India is expected to grow significantly due to increasingly stringent regulations on effluent treatment and the rising use of shale gas in manufacturing and energy industries. The market is anticipated to benefit from government initiatives aimed at improving water and wastewater treatment infrastructure.

## Company Profile

### Sattva Engineering Construction Limited

Established in 1985, Sattva Engineering Construction Limited is EPC contracting company focusing in Water sector, Waste water sector, Industrial building sector and executing projects like Distribution, Pumping Main, Networks, Overhead Tanks, Underground Tanks, Treatment plants, Pumping station. Moreover, the company is also involved in the development, design, and promotion of multi-storeyed residential apartments, deluxe apartments, residential flats, and independent bungalows, enhancing urban infrastructure across the region. Sattva Engineering Construction caters to both government and private sector clients. Furthermore, the company has completed 100+ projects.

| Indicator (INR Millions) | FY 2022 | FY 2023 | FY 2024 |
|---|---|---|---|
| Revenue | 880.69 | 836.39 | 769.31 |
| Raw material cost | 3.89 | 0.27 | 0.40 |
| Power & Fuel cost | 129.00 | 5.24 | 4.03 |
| Employee cost | 623.63 | 0.51 | 60.25 |
| Interest cost | 50.86 | 60.32 | 65.90 |
| EBITDA | 69.67 | 78.75 | 131.49 |
| EBITDA Margin | 7.9% | 9.4% | 17.0% |
| PAT | 9.35 | 10.38 | 45.64 |
| PAT Margin | 1.1% | 1.2% | 5.9% |
| Debt Equity Ratio | 0.28 | 0.15 | 0.05 |
| Interest Coverage Ratio | 1.28 | 1.23 | 1.95 |
| Return on Assets | 1.2% | 1.2% | 5.1% |
| Current Ratio | 1.37 | 22.56 | 1.32 |

Source – Annual Reports

Sattva Engineering Construction Ltd showed improved profitability and financial stability from FY 2022 to FY 2024 despite a decline in revenue, which fell from INR 880.69 million in FY 2022 to INR 769.31 million in FY 2024, indicating potential challenges in sales or market demand. However, the company effectively managed its costs, leading to a significant increase in EBITDA from INR 69.67 million to INR 131.49 million, with EBITDA margins improving from 7.9% to 17.0%, showcasing operational efficiency and cost optimization.

Profitability saw substantial growth as PAT surged nearly fivefold from INR 9.35 million in FY 2022 to INR 45.64 million in FY 2024, improving PAT margins from 1.1% to 5.9%, reflecting enhanced bottom-line performance. The raw material cost remained negligible, while power and fuel expenses drastically declined from INR 129 million in FY 2022 to INR 4.03 million in FY 2024, likely contributing to improved margins.

Financial stability indicators further strengthened as the debt-equity ratio fell significantly from 0.28 in FY 2022 to 0.05 in FY 2024, suggesting lower dependence on debt financing. The interest coverage ratio improved from 1.28 to 1.95, demonstrating better ability to meet interest obligations. Additionally, Return on Assets (ROA) rose sharply from 1.2% to 5.1%, indicating more efficient utilization of assets.

The current ratio saw a sharp fluctuation, peaking at 22.56 in FY 2023 before stabilizing at 1.32 in FY 2024, which may point to an unusual liquidity position in FY 2023 that later normalized. Employee costs dropped drastically in FY 2023 before rising again in FY 2024, suggesting potential workforce restructuring or operational adjustments.

**Calculation Used:**

| | |
|---|---|
| PBT+Finance Cost+D&A | EBITDA |
| EBITDA/Total Income | EBITDA Margin |
| PAT | PAT |
| PAT/Total Income | PAT Margin |
| Long term Debt/Total equity | Debt Equity Ratio |
| EBIT/Interest Cost | Interest Coverage Ratio |
| PAT/Total Asset | Return on Assets |
| Current Assets/Current Liabilities. | Current Ratio |