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CHALLENGES AND PROSPECTS OF CRUDE OIL PRODUCTION IN INDIA

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ABSTRACT
Crude oil is an indispensable part of our everyday life as it is used widely in transportation, industrial and manufacturing sectors, agriculture, household and packaging industry. Along with these wide applications, crude oil has powered economies, fuelled industries and transformed modern life extensively. India is currently the largest growing economy of the world with a growth rate around 6 percent. To meet the needs of this rapid growth along with a surge in population growth and increasing demand for crude oil, India is importing nearly 88 percent of its crude oil needs. But today's Oil and Gas (O&G) sector faces a tough balancing act of meeting global energy demand while improving safety, reducing costs and cutting greenhouse gas emissions in order to align with the United Nations Sustainable Development Goals. This paper explores how the oil and gas industry is constrained by many structural and technological pitfalls and understands the stagnation in the current domestic crude oil production. The paper further examines the multi-dimensional challenges to India's crude oil production and assesses realistic prospects for increasing domestic output in a sustainable manner.

KEYWORDS: *Enhanced Oil Recovery, Oil And Gas, Digital Transformation, Sustainable Management*

1. INTRODUCTION

The Finance Minister Nirmala Seetharaman announced in 2019 that India's aim of becoming a 5 trillion-dollar economy in 2024-25 was challenging but realizable. India's GDP has reached 4.1 trillion dollars in 2025 making it the fifth largest economy in the world. Crude oil holds strategic and economic significance as India is heavily import-dependent, with nearly 88 percent of its crude oil requirements met through imports (IEA, 2023). India is the third-largest oil consumer globally, with a daily consumption of approximately 5.05 million barrels per day (bpd) accounting for about 4.58% of the world's total consumption of 97,103,871 barrels per day as per US Energy Information Administration Report of 2025 making the Indian economy highly vulnerable to fluctuations in global crude oil prices. Oil contributes around 30 percent of India's primary energy mix, making it vital for meeting industrial and household energy needs. Crude oil is one of the most indispensable natural resources sought by all the nations of the world.

A highly significant factor that has confronted the global economy is the fluctuations in the oil price and its direct and indirect impact on countries. Oil is used as an input which is used in a wide variety of goods and services. Hence any changes in the price of oil will have an impact on the overall impact on price in the economy. According to OPEC's 2025 forecast, India's oil demand is anticipated to rise to 5.74 million bpd in 2025 (a 3.39 percent increase) and further to 5.99 million bpd in 2026, driven by growing transport, manufacturing and infrastructure requirements. This high reliance on crude oil imports significantly affects India's trade balance and foreign exchange reserves with rising oil prices widening the current account deficit and putting pressure on the Indian Rupee every additional year. Thus, one of the major challenges faced by the Indian economy presently is to reduce the excessive import dependency of crude oil. The ICRA report says that every $10 per barrel increase in crude oil price results in CAD widening to 0.4 percent of the GDP. Therefore, the focus is now immensely towards sustainable development of the oil and energy sector within the country.

As India is among the world's fastest growing major energy markets, rapid economic expansion and urbanization have increased crude oil demand substantially. However, domestic crude oil production has failed to match the growing requirements and hence the country remains heavily reliant on imports.

In order to maintain energy security and macroeconomic stability, it becomes imperative to improve domestic crude production and thus is one of the key strategic objectives India follows.

Crude oil, often referred to as 'black gold' is one of the most critical natural resources in the global economy. It is not only the primary source of energy but also a raw material for numerous industrial products, including fuels (petrol, diesel, kerosene), petrochemicals, plastics, fertilizers and synthetic materials. Because of its extensive use in transportation, power generation, supplying inputs for petrochemical industries, manufacturing and agriculture, crude oil prices directly influence the cost of living and production across the world (Kilian, 2009). The process of delivering involves complex operations in some of the harshest environments on Earth, from deep-water rigs to remote desert fields. And the stakes are high as a breakdown can mean millions lost in downtime, not to

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mention safety risks and environmental damage.

At the same time, the oil and gas industry are under pressure like never before due to price volatility, skilled labor shortage and action on climate change especially on methane, a greenhouse gas over 25 times more potent than CO_2 (International Energy Agency [IEA], 2024). While these challenges are serious, there is also a huge opportunity. The manufacturing world has been transforming through Industry 4.0 which is an integration of physical operations with digital technologies such as sensors, data analytics, artificial intelligence and automation (McKinsey & Company, 2023).

2. NATURE OF CRUDE OIL

Crude oil, a fossil fuel, is the most widely used energy source in the world, accounting for 31 percent of total primary energy demand in 2012 (statista.com). Crude oil itself has limited applications and so it must first be refined before it can be used. Crude oil is a generic term for a host of hydrocarbons of varying characteristics as there are hundreds of grades of crude oil sold around the world. Once produced, oil is classified and priced based on its quality. This classification is determined by density (which ranges from 'heavy' to 'light') and sulphur content (which ranges from 'sweet' to 'sour'). Lighter, sweeter crudes are sold at a higher price relative to heavier, more sulfuric crudes because less processing is generally required to convert them into refined products. Since crude quality varies so greatly, benchmark crudes are used both as a quality reference for buyers and to set the value of other, non-benchmarked crudes. Examples of regional benchmarks are Brent, West Texas Intermediate, Urals, and Bonny Light.

3. HISTORICAL BACKGROUND OF CRUDE OIL IN INDIA

Before the Independence of India, oil was mostly exploited by a number of British companies and their alliances. While digging the earth to lay railway tracks, the British accidentally discovered oil wells in Assam and in Burma. Later, The Assam Oil Company was established in 1899 to oversee the oil production. In 1901, Digboi Refinery was commissioned in place of the earlier refinery at Margharita in Assam. In 1909, the Indo Burmah Petroleum (IBP) was incorporated in Rangoon, Burma. Their output began to increase during the First and Second World Wars to support British troops and industries in the United Kingdom.

The government took upon the role of managing the oil fields after India gained Independence in 1947. During that time, private entrepreneurship was not encouraged and the system of License Raj existed. Public sector then had an enormous bureaucratic control and the focus shifted onto centralized planning. However, the foreign companies continued to play a key role in the oil industry. Oil India Limited was established as a joint venture involving the Indian government and the British-owned Burmah Oil Company (presently, the Bharat Petroleum) whilst the Indo-Stanvac Petroleum project in West Bengal was a joint venture between the Government of India and the Standard Vacuum Oil Company (presently, the Exxon Mobil, USA). This partnership changed in 1956 when the government placed oil as 'Schedule A Industry' under the Industrial Policy Resolution of 1956 and provided more powers to the governmental machinery to develop the oil industry.

The Oil and Natural Gas Commission Act of 1959 passed in the Parliament gave the state-owned Oil and Natural Gas Commission (ONGC) the powers to plan, organize and implement programs for the development of oil resources, the sale of petroleum products and also to perform as per the plans laid down by the central government. Experts from the Soviet Union were invited to India and they drew up detailed plans for further oil exploration which were to form part of the Second Five Year plan. India thus adopted the Soviet model of economic development and the increased focus on exploration resulted in the discovery of several new oil fields most notably, the off-shore Bombay High Field in 1974, which is India's most productive oil well till date.

The Indian petroleum industry started its journey at a very slow pace from a place called Digboi, in the state of Assam. The production of petroleum and new extraction locations were manly limited to the North-Eastern parts of the South Asian country till the 1970s. Initially, the government completely subsidized the entire petroleum market. However, in July 1991, with economic liberalization and privatization, the Indian government started giving industrial control to private hands and entered into joint ventures. This gave the sector a tremendous boost and allowed it to grow. For the ONGC this meant being reorganized into a public limited company. It came to be called as the Oil and Natural Gas Corporation and around 2 percent of government held stocks were sold off. Despite this, the government still plays a pivotal role and ONGC is still responsible for 77 percent of oil and 81 percent of gas production while the Indian Oil Corporation (IOC) owns most of the refineries putting it within the top 20 oil companies in the world along with the government while maintaining subsidized prices.

Crude oil is produced in three major areas in India which includes Mumbai High, Cambay basin in Gujarat, Assam basin and Krishna-Godavari basin in the eastern coast of India while private operators like Cairn oil and Co. operate in Rajasthan mainly.

4. METHODOLOGY ADOPTED

The topic includes understanding the domestic production of crude oil and the challenges the sector faces and hence the study uses both Descriptive and Exploratory Research Design to understand the current practices, policies and innovations in India's crude oil industry. Secondary sources of data have been taken from government publications, industry annual reports and international energy databases to examine trends in production, technological innovation, social responsibility and environmental stewardship in India's crude oil industry, for the purpose of this paper.

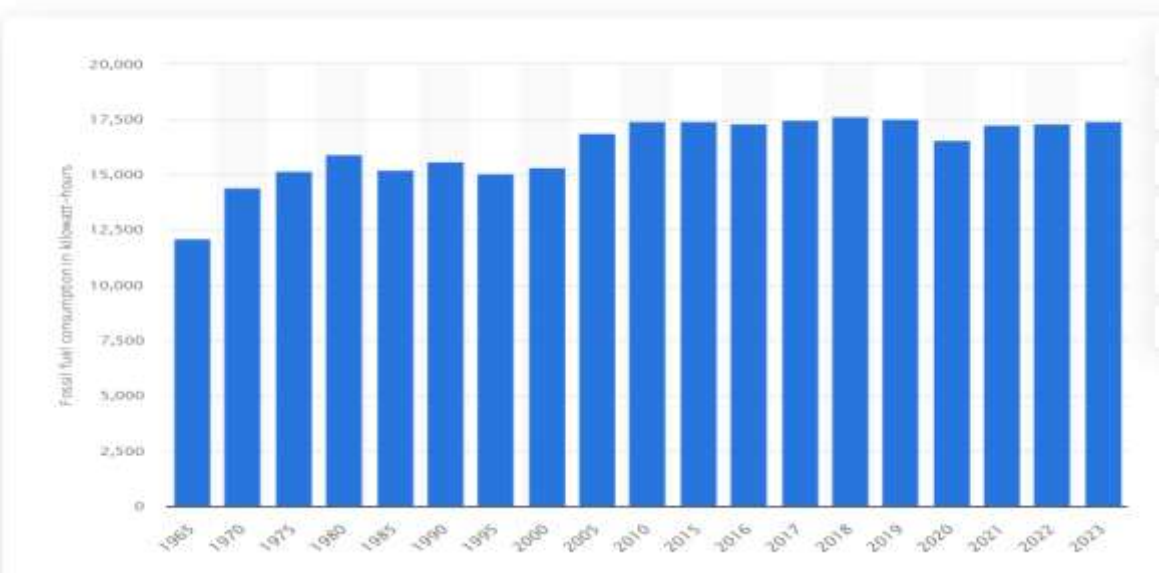
5. CONSUMPTION PATTERNS OF CRUDE OIL

India is the world's largest growing economy and is the world's most populous country with over 1.4 billion people. An ever-increasing demand for goods and services is also substantially increasing energy and transportation costs thereby leading

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directly to an increase in the demand for crude oil. Even though India is making efforts to shift to alternate sources of energy, the conventional sources of energy continue to see a rapid surge in demand.

Figure 1: World consumption of Crude Oil



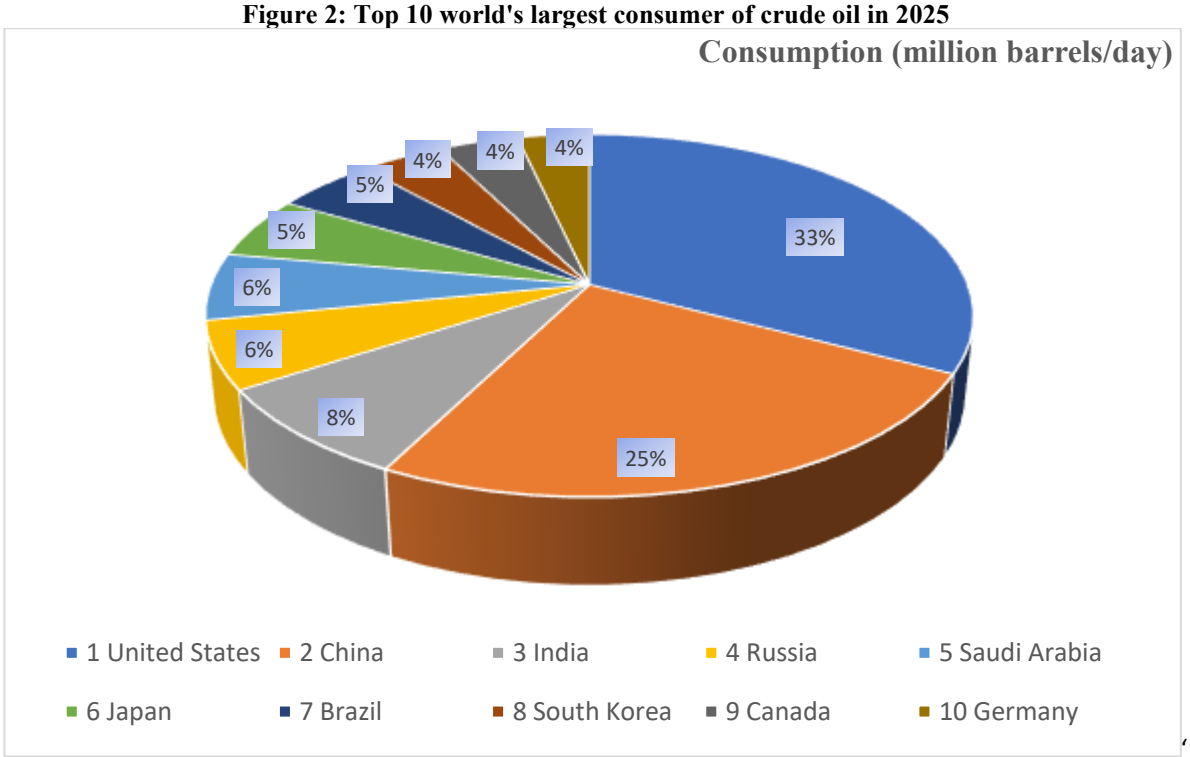
Source: Statista infographic

The above table clearly shows an upward trend in the consumption of crude oil globally measured in kilowatt hours. From 1965 to 1980 there is a rapid growth in oil consumption from 12000 kWh in 1965 to 15000 kWh by 1980 reflecting industrial expansion, rising energy demand and oil dependency during this period.

It is observed that in the 1980s, there were some ups and downs mainly due to oil crises, economic recessions and efficiency improvements but it showed recovery thereafter. Consumption rose again, reaching 17,000-17,500 kWh by 2010-2015.This aligns with global economic growth, industrialization in emerging economies (China, India) and rising electricity demand.

There is a noticeable dip around 2020, when global energy consumption fell due to lockdowns, travel restrictions and reduced industrial activity. However, the trend from 2021 shows stabilization rather than strong growth, suggesting renewables and efficiency are limiting further increases.

Figure 2: Top 10 world's largest consumer of crude oil in 2025



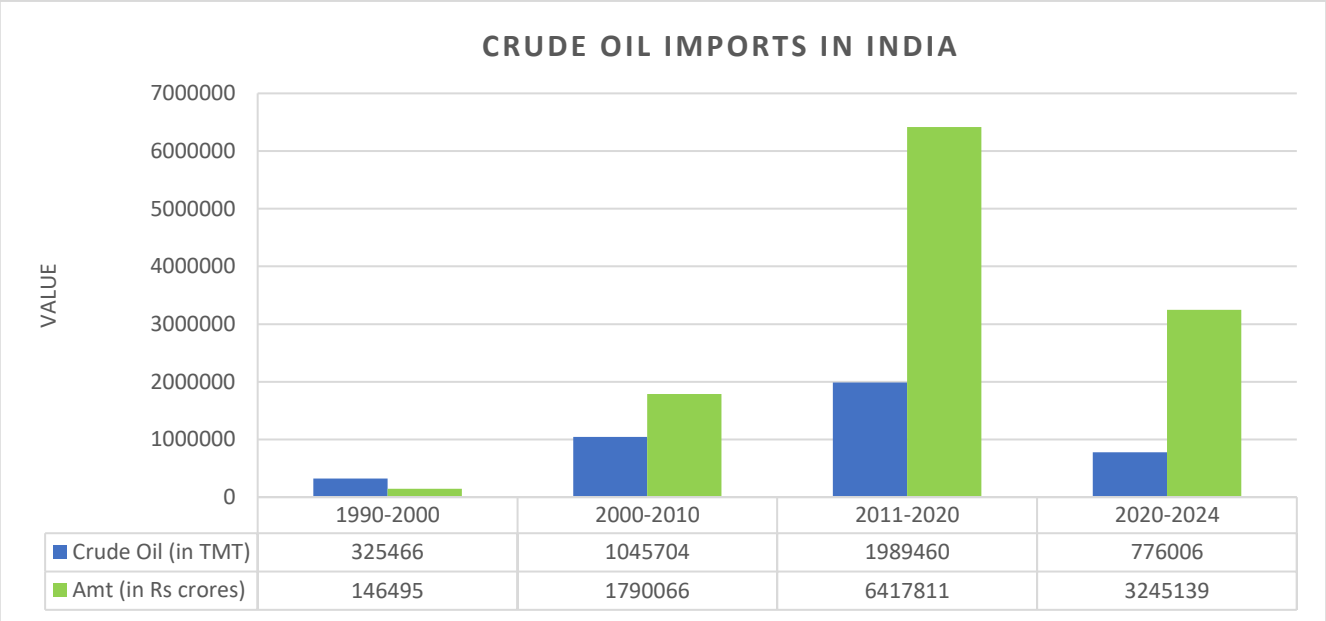
Source: International Energy Statistics

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The U.S. is the largest consumer, accounting for one-third of total consumption in this chart. It uses oil heavily for transportation, industry and energy production. China is the second-largest consumer, with a quarter of global consumption and is driven by rapid industrialization, boom in transport and manufacturing sectors.

The third largest is India, reflecting growing energy demand due to population growth, industrialization and transport needs. Both Russia and Saudi Arabia, inspite of being top exporters of crude oil in the world, consume only about six percent each of global oil domestically. U.S.A and China together consume 58 percent of the total oil while India, Russia and Saudi Arabia add another twenty percent. The rest of the countries (Japan, Brazil, South Korea, Canada, and Germany) share the remaining twenty percent.

Figure 3: Crude oil imports in India



Abbr: TMT- Thousand Metric Ton
Source: Petroleum Planning and Analysis Cell, 2024

The above chart shows the trend of crude oil imports in India across four time periods (1990-2000, 2000-2010, 2011-2020, and 2020-2024), measured in terms of both quantity and value**.** The chart clearly shows that India's crude oil import volume has increased significantly from 3,25,466 TMT in the 1990s to a peak of 19,89,460 TMT in 2011-2020, before declining to 776,006 TMT in 2020-2024**.** However, the import bill in rupee terms has grown much faster due to rising global oil prices and currency depreciation. The value rose sharply from ₹1.46 lakh crores in the 1990s to ₹64.17 lakh crores in 2011-2020. Although import volumes declined in 2020-2024, the bill still remained very high at ₹32.45 lakh crores**.**

The graph highlights that India's dependence on crude oil imports has increased over the decades, and even when the import volume reduced in recent years (partly due to COVID-19, energy transition and efficiency measures), the financial burden remained high because of price volatility in international oil markets.

Table 1: India's Crude Oil Consumption

Year	Import Dependence (in %)	Reason
1970	40%	Discovery of Mumbai High leading to increased production
1985	30 %	Highest domestic production
1995	50 %	Old Fields Production declines
2010	75 %	Demand grows faster than production.
2025	88 %	Extreme dependence on Imports

Source: Author's Compilation

Table 1 shows the structural shift in the consumption pattern of crude oil in India after Independence. Mumbai High which was discovered in 1970 added significantly to the indigenous crude oil production thereby reflecting the positive impact that the discovery of oil field had as import dependency was at about 40 percent only. Import dependence declined further to around 30 percent in 1985, marking the period of highest domestic production. But starting in the mid-1990s the trend changed and import reliance rose to 50 percent in 1995, mostly as a result of aging oil fields, decreasing productivity and the lack of success with new large-scale discoveries. By 2010, the situation had gotten worse as the demand for petroleum products increased far more quickly than domestic production capacity due to rapid economic growth, and urbanization which led to a sharp increase in import dependence to 75 percent. India's crude oil import dependence is estimated to reach 88 percent by 2025,

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demonstrating extreme reliance on external sources and highlighting concerns related to energy security, global oil price volatility and balance of payments pressures.

6. CURRENT PRODUCTION AND REFINING CAPACITY

Annual Crude oil production in India in 2025 was 18.56 MMT with 17 operational plants located across 12 states in India. ONGC and Oil India Ltd are the two major Public-sector undertakings which are the backbone of upstream production, with a combined share of 73 percent with ONGC alone accounting for 70 percent of the total production (PPAC, 2025). Major oil producing basins include Mumbai Offshore (including Mumbai High), Assam and other onshore and deeper offshore areas in India. Among the Indian states, Rajasthan is the largest producer of petroleum in India followed by Gujarat and Assam. Indian Oil Corporation, BPCL and HPCL are the top public sector oil companies which import crude oil for refining while Reliance Industries Limited and Nayara Energy are the leading private oil refining industries which import crude oil extensively.

However, it is disheartening to note that India's crude oil production has experienced a slow stagnation and a marginal decline in several recent years. India's Hydrocarbon Outlook report by Directorate general of Hydrocarbons (2025) showed that recent exploration had resulted in marginal additions to existing reserves. Monthly and annual reports from PPAC and MOSPI reflect small year-on-year variations and some months show negative growth in indigenous crude oil production. Advanced recovery techniques and redevelopment contracts are essential as many of India's largest fields which were discovered decades ago are completely mature and in natural decline (NSE India Archives). The silver lining is that India's refining capacity has expanded substantially in the last decade but on the flip side a widening gap between refining crude oil capacity and indigenous crude availability is concerning.

7. CRUDE OIL VALUE CHAIN

Crude oil sector is divided into upstream, midstream and downstream segments. Upstream includes exploration and production, midstream comprises of transporting oil from production sites to refineries via pipelines, trains, tankers and trucks and downstream comprises refining and marketing refined petroleum products to use the end users.

Data related to the downstream sector shows that refineries, industrial users and others consume about 90 million barrels of crude oil every day. Since all the different segments of the value chain are capital intensive, some companies specialize in just one component of the value chain, while others called integrated companies participate in all of them. Whether it is a simple onshore project or a multi-billion dollar ultra-deep water project which has a lead time running to decades, oil production is a capital and technology intensive process. Hence many exploration and production ventures are long-term investments as it can take a decade or more from initial prospects to bring a well to production making the industry plan and operate with long lead times and exposure to price risk.

8. SIGNIFICANT CHALLENGES FACED BY CRUDE OIL INDUSTRY

India is the third largest importer of crude oil in the world. Any industry has its own opportunities to offer and unique challenges to face. Some of the most significant challenges faced by the Crude Oil Industry are discussed below:

a. Mature and aging reservoirs

The production in the existing oil reservoirs have either remained stagnant or has seen a steady decline as some of the older oil fields like Mumbai High have reached peak production decades ago. Technically complex redevelopment and EOR investments are necessary to revitalise them.

b. Unsuccessful explorations

The success-to-well ratio of the exploration activities has been largely limited and stagnant in the last decade. Added to this, new discoveries of oil fields have not been that productive although seismic and drilling activities continue, making it commercially unviable projects.

c. Lack of technological and skills upgradation

Indian upstream public companies have made huge investments, but lack of technology upgradation and a shortage of specialized skilled labour force hinder quick growth in the industry,

d. Financing and risk allocation

Exploration and Production projects are extremely capital-intensive and expose investors to geological and financial risks. Private investment is inhibited due to perceived policy uncertainty, long lead-times and changing fiscal regimes.

e. Regulatory constraints

Many private and foreign players are weary of investing in India due to procedural delays, inter-governmental clearances, environmental clearances, land and right-of-way issues, disputes over revenue-sharing or taxation.

f. Environmental and social constraints

Crude Oil production faces a lot of environmental compliance demands like managing spills, emissions, habitat impacts along with social challenges like local land use, resettlement and community concerns. Local resistance and legal requirements can unduly delay projects and raise costs. Further, India's climate commitments and global energy transition question long-term demand for hydrocarbons and raise doubts over capital allocation decisions for new developments.

g. Limited Strategic Storage Reserves

India's Strategic Petroleum Reserves (SPR) hold 5.33 million tonnes of crude oil as buffer stock which is equivalent to about 9-10 days of India's total requirement while countries like USA have almost 90 day of oil cover that can be used in emergency situations. These underground rock caverns in Phase -I facilities at Visakhapatnam, Mangalore and Padur provide a strategic buffer against global supply disruptions, geopolitical risks and price volatility.

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9. CRUDE OIL AND SUSTAINABLE DEVELOPMENT

Crude oil plays a paradoxical role in relation to the United Nations' Sustainable Development Goals (SDGs). On one hand, oil remains indispensable for economic growth, industrialization and poverty reduction, supporting SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure) by fuelling mobility, trade and development.

For a country like India, which relies on nearly 88 percent crude oil imports to meet its energy needs, oil ensures energy access and security in the short term, contributing to SDG 7 (Affordable and Clean Energy).

10. POLICY RECOMMENDATIONS

After carefully drawing on the above analysis, the following policy measures can enhance domestic crude production sustainably and substantially.

a. Need to improve Enhanced Oil Recovery (EOR) programmes which are advanced tools and techniques used to extract additional oil after primary and secondary recovery methods are exhausted. Encouraging public-private partnerships for rapid technology transfer is a very effective method to improve the overall oil output. The Mumbai High redevelopment agreement with BP allows an international operator to bring in advanced reservoir technology and project management to boost output.

b. Should expand production enhancement contracts with transparent mechanisms and incentive alignment to attract global operators while protecting state interests) and this can definitely unlock latent production as well.

c. Invest in high-resolution seismic surveys (2D/3D), open-data portals and basin-mapping initiatives to reduce geological risks for private explorers and to strengthen exploration data infrastructure. Extracting hydrocarbons from complex, deep-water and ultra-deep reservoirs or tight formations requires advanced drilling, reservoir modelling, subsea systems and EOR techniques. Hence partnerships with sound international operators and technology providers are absolutely necessary.

d. Promote digital adoption and skills development by offering tax incentives for digital oilfield investments and funding skilling programmes in reservoir engineering, subsea operations and data sciences through industry-academia partnerships. Adoption of AI, big data reservoir modelling, remote sensing, predictive maintenance and IoT for operations monitoring can reduce operating costs, improve uptime and raise recovery factors. Digital twins for complex offshore infrastructure and real-time reservoir management tools are extremely essential.

e. Enforce environmental safeguards and community engagement robust for quick contingency mechanisms for spills/accidents and inclusive community development plans to reduce social friction.

f. Accelerate Phase -II of SPR expansion and encourage strategic commercial storage partnerships to improve supply buffer and price resilience to ensure regular utilisation plans and transparency thereby avoiding underutilisation.

g. Align upstream plans with low-carbon goals by encouraging low-emissions upstream projects, exploring CO_2-EOR pilots and building measurement and reporting systems for upstream greenhouse gases to attract climate-conscious financiers

h. Streamlining approvals, providing transparent and stable fiscal regimes and consistent implementation of block award terms are necessary to boost investor confidence. The shift toward performance-based contracts and production enhancement contracts can incentivise private and foreign operators to invest in mature and technically challenging fields.

i. Encourage contracts from national and international companies for new exploration in frontier areas and for the revival of unconventional resources.

11. CONCLUSION

Oil demand in India is expected to increase in the near future due to biomass (mostly corn or sugar), which is one possible alternative fuel source for the transportation sector, even though renewable energy sources are growing quickly. Biofuels' long-term commercial viability in the transportation industry is still up for debate. Furthermore, although biofuels are marketed as a sustainable and eco-friendly substitute for petroleum products, their overall effects on the environment and society have been questioned.

A combination of underperforming exploration, investment and technological limitations and structural decline in legacy fields has badly affected India's crude oil production. However, if India pursues a coordinated strategy that combines EOR and redevelopment of mature assets, performance-oriented contracting with international partners, aggressive exploration driven by data and technology and stronger incentives for private capital, then prospects for significant increases are conceivable. Without sacrificing climate commitments, complementary actions like increasing strategic storage, guaranteeing environmental compliance and matching investments with decarbonization pathways will improve energy security. Positive early signals are provided by the Mumbai High redevelopment and ongoing DGH initiatives. However, the main policy challenge for the next ten years will be scaling such models across other basins and reduce our import dependence.

REFERENCES

1. *Directorate General of Hydrocarbons. (2024).* India's hydrocarbon outlook 2023–24. *Ministry of Petroleum and Natural Gas, Government of India.*
2. *Financial Intelligence and Policy Institute. (2024).* Annual report 2023–24. *https://fipi.org.in*
3. *Ghosh, A. (2002).* Petroleum in India: A historical survey. *Geological Society of India.*
4. *International Energy Agency. (2023).* Indian oil market outlook to 2030. *IEA.*
5. *Ministry of Petroleum and Natural Gas. (2017).* Indian petroleum and natural gas statistics 2016–17. *Government of India.*
6. *Mishra, R. (2018). A history of petroleum exploration in Northeast India.* Northeast Research Journal*, 6(2), 45–62.*
7. *Oil and Natural Gas Corporation. (2015).* 60 years of ONGC: A legacy of energy security. *ONGC Publications.*
8. *Oil and Natural Gas Corporation. (2023–2025).* Annual and integrated reports. *NSE India Archives.*

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9. *Petroleum Planning and Analysis Cell. (2023).* Snapshot of India's oil and gas sector. *Ministry of Petroleum and Natural Gas, Government of India.*
10. *Petroleum Planning and Analysis Cell. (2025).* Monthly report on indigenous crude oil production (May 2025). *Ministry of Petroleum and Natural Gas, Government of India.*
11. *Planning Commission of India. (2006).* Hydrocarbons vision 2025. *Government of India.*
12. *Ray, P. K. (2004).* Evolution of India's oil sector: Institutions, policy and industry growth. *Oxford University Press.*
13. *Reuters. (2024). India gas demand growth and implications for hydrocarbons.* Reuters Energy Reports.
14. *Sengupta, S. (2013).* India's offshore oil revolution: The Mumbai High story. *Energy Studies Institute.*
15. *S&P Global. (2024). Strategic petroleum reserve expansion and energy security in India.* India CEO Series.
16. *Times of India. (2024). ONGC well incidents and operational hazards.* The Times of India.
17. *Trendlyne. (2024).* ONGC company filings and annual report summaries. *https://trendlyne.com*