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Research Paper

Consumption of Petroleum Products in India: Challenges, Impacts and Reforms

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Ravee Shekhar

Post-Graduate in Economics

Bharti Vidyapeeth Deemed University, Pune (India) Email - RaveeShekhar@yahoo.com

Abstract: The article examines the relationship between petroleum consumption in India and economic growth in the country. Energy is a crucial component of economic development. In spite of the availability of other energy sources including coal, natural gas, electricity, solar, wind, and nuclear energy, India's economy still depends heavily on Oil. Due to its rapid economic growth and modernization, the country's energy demand continues to rise. However, this is not the only factor; there are numerous other factors that influence India's consumption of petroleum products. Additionally, this article advocates a variety of reforms, which are divided into three categories: social, technological and authoritative reforms.

Key Words: E31 Inflation, F63 Economic Development, L71 Fuel, Q4 Energy, Q35 Hydrocarbon Resources-Petroleum, Per-Capita Income.

1. INTRODUCTION:

Energy is a most significant component of economic development. Among the different energy sources, such as coal, oil, natural gas, electricity, solar, wind and nuclear energy, oil continues to play a vital role in a country's economy. In this regard, India is no exception; however, oil is the country's second-largest energy source after coal, accounting for 31 percent of primary energy consumption.

After the United States and China, India is the world's third largest importer of crude oil, importing approximately 55% of its natural gas requirements and 85% of the crude oil it processes. The country's energy demand continues to climb because of its dynamic economic growth and modernization. India's consumption of petroleum products increased by 5.3% compared to the previous year which is more than 200 MMT causing a significant expenditure on oil imports. Given the rising demand for fossil fuels and India's rapidly expanding motor vehicle fleet, the government of India has set a target of reducing imports by 10% by 2022. India is one of the countries that is highly dependent on oil imports. The domestic consumption of oil products is rising year over year and since there has been a decrease in oil prices over the years due to financial crises and oil shocks in the market.

2. LITERATURE REVIEW:

Fuel prices and Macroeconomics

Fuel is an integral component of every economy. During the 1970s, there was a growing period of dependence on imported crude oil and unprecedented disruption in the global crude oil market.

• The fluctuation towards high oil prices has been one of the key factors responsible for recession, excessive inflation, poor productivity and lower economic growth (Barsky & Kilian, 2004). Although the burden of this price wasn't passed on to domestic consumers in India, the deficit exerted pressure on the government's financial process and affecting the economy at the macro level.



- The hike in oil prices typically generates cost-push inflation that leads to a decline in output and a shift in terms of trade (Bhattacharya & Bhattacharyya, 2001).
- The various researchers opined that, there are general conclusions regarding the global inflationary and recessionary impact of crude oil prices (Darby, 1982), even though there has been considerable opinion regarding the extent of the impact of crude oil prices on macroeconomics.
- Further theoretical research states that shocks in oil prices increase wages and prices for consumable products and decrease output (Bruno, 1982; Bruno & Sachs, 1982).
- High fuel prices feed into inflation raising both the Wholesale Price Index (WPI) and the Consumer Price Index (CPI) since production costs increase leading to higher commodity prices. WPI is a measure that tracks the changes in the price of goods in the stages before the retail level, i.e. at the producer level, whereas CPI examines the weighted average of prices of a basket of goods and services that are of primary consumer need. However, WPI inflation is not the reference point for monetary policy as India follows CPI measures, but the risk of its feeding into retail inflation is hard to ignore.

3. OBJECTIVES:

- 1. Find the relationship between Consumption of Petroleum Products and the Growth of the Indian Economy.
- 2. How is the Indian Economy affected by the Price Hike of Crude Oil ?
- 3. How to reduce the Consumption of Petroleum Products in India ?
- 4. What types of challenges are associated with the high Consumption Rate of Petroleum Products in India ?

4. METHOD:

Here I am using the Secondary Research method.

"Secondary research is research that has already been compiled, gathered, organized and published by others". Such data can be obtained faster and is more affordable. Secondary data is available through websites, reading articles, magazines, trade journals etc.

5. DISCUSSION:

Determination of Oil Prices in India

India imports almost no petrol or diesel whereas it imports crude oil. The price of petrol and diesel depends on several drivers; crude oil rate is one of them. Until 2017, fuel prices were fixed by the central government but after that, the government of India moved to a dynamic fuel pricing methodology that allowed oil marketing companies (OMCs) to fix the retail rates of petrol and diesel. Oil refineries import crude oil, process it, and hand it to the OMCs for marketing. OMCs then decide the price of petrol and diesel and update it every day at six in the morning.

Oil refineries set the price based on the Trade Parity Price (TPP) which is a weighted average of Import Parity Price (IPP) and the Export Parity Price (EPP). IPP is the price that importers would have paid if they actually imported petrol and diesel. On the other hand, EPP is the price that exports of petrol and diesel would receive. TPP has an 80% weightage of IPP and 20% of EPP. After that comes OMCs, which add their margin for marketing the final product to the dealers. Dealers further add their commission for distributing it to end consumers.

Simplified Calculation Chart for Petrol & Diesel Prices in New Delhi - (as on 22 nd May 2022)



| | Petrol Price Calculation* | Diesel Price Calculation * | |
|---|------------------------------|-------------------------------|--|
| Basic OMC Cost Calculation | | | |
| Crude Oil (from Brent Crude + Russian Import + Other Crude Import) | Rs 50 per Litre | Rs 50 per Litre | |
| OMC Processing Cost (Freight + Refinery Processing + Refinery Margins + OMC Margin + Logistics + Operational Costs etc) | Rs 7.35 per Litre | Rs 8.15 per Litre | |
| Fuel Price after Processing (Ready to send to Petol Pump) | Rs 57.35 per Litre | Rs 58.15 per Litre | |
| | | | |
| Central Government Taxes & Dealer Commission | | | |
| Additional: Excise Duty + Road Cess as Charged by Central Government (after Excise Duty Cut in November) | Rs 19.9 / Litre on Petrol | Rs 15.8 / Lit on Diesel | |
| Commission to Petrol Pump Dealers | Rs 3.8 per Litre | Rs 2.6 per Litre | |
| | | | |
| Fuel Cost Before VAT | | | |
| Cost as on 22nd May 2022 | Rs 81.05 per Litre | Rs 76.55 per Litre | |
| | | | |
| VAT Calculation | | | |
| Additional:VAT (19.4% on Petrol and 16.75% on Diesel. Additional Cess on Diesel) (22nd May 2022) - Delhi | Rs 15.67 / Litre on Petrol | Rs 13.07 / Litre on Diesel | |
| | | | |
| Final Retail Price as on 22nd May 2022 in Delhi | Rs 96.72 per Litre | Rs 89.62 per Litre | |
| Final Retail Price as on 22nd May 2022 in Mumbai (due | | | |
| to VAT as charged over Rs 30 per Litre in Maharashtra and over Rs 20 per Litre on Diesel) | Rs 111.35 per Litre | Rs 97.28 per Litre | |

Table-1

Fuel Efficiency Norms in India

India's dependence on imported fossil fuels is rising continuously due to the country's limited domestic petroleum resources. The country's energy demand continues to climb as a result of its dynamic economic growth and modernization. Given the rising demand for fossil fuels and India's rapidly expanding motor vehicle fleet, the government of India has set a target of reducing imports by 10% by 2022. BEE is working on the development of fuel efficiency norms for vehicles that could moderate the rising demand for fuel.

Fuel Economy Norms for Heavy Duty Vehicles:

In August 2017 the Government of India finalised fuel efficiency norms for commercial vehicles (CVs) with a gross vehicle weight (GVW) of 12 tonnes or greater. Manufacturers must demonstrate compliance with the rule by evaluating vehicles using the constant speed fuel consumption (CSFC) test procedure. In the CSFC protocol, trucks are driven at a constant speed on a test track between 40 and 60 kilometres per hour (kph), and buses are run at 50 kph.

Corporate Average Fuel Economy Norms for Passenger Cars: The Government of India, Ministry of Power, issued average fuel consumption standards for cars on April 23, 2015. This standard is applicable to motor vehicles using petrol, diesel, liquefied petroleum gas or compressed natural gas, which carry passengers and their luggage and comprise not more than nine seats including the driver's seat, and whose Gross Vehicle Weight does not exceed 3,500 kilogram's when tested.



The fuel consumption standards would be effective from 2017-18 onwards, and a second set of standards would come into force from 2022-23. The standards relate the Corporate Average Fuel Consumption (in liters/100 km) to the Corporate Average Curb Weight of all the cars sold by a manufacturer in a fiscal year.

According to the first standard, the average weight of all cars is expected to be 1037 kg in 2016-17, and the Average Fuel Consumption Standard would have to be less than 5.49 km/100 litres for this average weight. The second standard assumes an average car weight of 1145 kg in 2022, and requires the average fuel consumption to be less than 4.77 l/100 km at this average weight.

Fuel consumption is measured under standard conditions at nationally accredited labs over the national driving cycle. It is expected that these standards would lead to a reduction of 22.97 million tonnes of fuel consumption by 2025.

Other initiatives in Fuel Efficiency in Transport Sector:

There is huge scope of fuel saving by on-road vehicles also. Tyres as an important component of vehicles have been identified for potential savings in fuel. Customers replace approximately 2/3rd of all tyres on the market by themselves. Keeping this in mind, a vehicle tyre standardisation and labeling programme has also been launched.

Prior to the release of a model, the fuel efficiency of the vehicle is tested. The current testing procedures are expensive, time and energy consuming. So, it is required to develop a tool that can assess the fuel efficiency of a vehicle without performing any physical tests. BEE has initiated the development of a computer-based simulation tool (like VECTO in the EU) as per Indian specific conditions. The tool will be helpful to reduce the cost and time of testing vehicles.

6. ANALYSIS:

To analyse this study, we sub-categorised the different factors into three sub-groups: challenges, impacts, and reforms. We are now going through them one by one.

Challenges:

The Indian transportation system is facing numerous obstacles that are raising fuel consumption. Let's talk about:

- **Driving Behaviour:** Rapid acceleration, speeding, driving at inconsistent speeds and even extended idling can increase your fuel consumption. The smooth drive will reduce your fuel consumption by up to 25%.
- Schedule Regular Maintenance: Servicing your vehicle regularly is good for both your engine and your fuel efficiency. It also reduces pollution.
- Older Vehicles are in Use: More than 15 years old vehicles are available on the road. Their efficiency is low.
- **Maintain proper Tyre pressure:** The majority of the population is unaware of their vehicle's tyre pressure. Due to incorrect Tyre Pressure, the engine required more power to carry the same load. That ultimately increases fuel consumption.
- Limit the load according to capacity: The majority of vehicles in India transport goods that exceed their capacity. High loads require high power and generating high power requires more fuel.
- **Transportation through Roads:** The majority of goods are transported through roads but the condition of Indian Roads is very critical and uses mostly long routes.

Impacts:

• Economic Growth :



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CHAPTER V

CHAPTER VI CHAPTER VII CHAPTER VIII CHAPTER IX CHAPTER X CHAPTER XI CHAPTER XII APPENDIX

However, in terms of per capita consumption, India lags behind the world's largest consuming economies and other non-Organization for Economic Cooperation and Development (OECD) countries.

Our research spans 33 Indian states and union territories from 2013-14 to 2019-20. We obtained the petroleum consumption and by-products consumption data for the States and Union Territories from the Indian Petroleum & Natural Gas Statistics 2019-20, a comprehensive compilation of state-level statistics published by the Ministry of Petroleum and Natural Gas Economic and Statistics Division, Government of India, and the Per Capita Income data from the National Statistical Office, Ministry of Finance.

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|---|----------------|----------------|----------------|----------------|---------------|------------|----------------|
| V.16: State-wise & Product-wise Per Capita Consumption of Petroleum Products (Figures in Kg) | | | | | | | |
| State/UT | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 (P) |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 5 | tate wise & Pr | duct-wise P | er Canita Cons | umption of P | atroleum Prod | ucte | |
| Andhra Bradesh | 126 2 | 127.0 | 125.2 | 122.2 | 140.9 | 150 4 | 155.0 |
| Andaman & Nicobar | 427.5 | 127.0 | 473.0 | 133.5 490 E | 520.0 | 150.4 | 133.9 571 5 |
| Arupachal Bradesh | 122.0 | 431.0 139 E | 1/4 5 | 463.5 | 175 3 | 179.7 | 190.5 |
| Assam | £0.3 | £1.1 | 68.0 | 71 7 | 213.3 | 113.1 | 190.5 |
| Bibar | 38.3 | 39.6 | 44.5 | 45.8 | 47.9 | 50.5 | 52.0 |
| Chandigarh | 335.9 | 384.1 | 417.4 | 367.9 | 404.5 | 417.5 | 413 3 |
| Chhattisoarh | 94.9 | 100.1 | 112.5 | 113.9 | 140.4 | 160.9 | 143.5 |
| Dadra & Nagar Haveli | 870.3 | 1097.9 | 1199.5 | 1278.4 | 1169.7 | 1160.5 | 1098.2 |
| Daman & Diu | 598.0 | 647.2 | 745 5 | 904.2 | 969.4 | 909.7 | 812.2 |
| Delhi | 256.1 | 269.6 | 298.3 | 291.4 | 298.4 | 291.9 | 275.9 |
| Goa | 446.5 | 470.8 | 500.7 | 534.8 | 534.5 | 547.1 | 541.9 |
| Guiarat | 282.0 | 291.9 | 314.3 | 314.5 | 316.9 | 351.4 | 373.2 |
| Harvana | 393.2 | 417 5 | 424.9 | 422.9 | 432.9 | 415.0 | 403.2 |
| Himachal Pradesh | 189.5 | 181.8 | 226.0 | 249.0 | 230.2 | 227.4 | 247.0 |
| lammu and Kashmir | 98.3 | 95.7 | 106.9 | 100.3 | 115.1 | 119.7 | 119.5 |
| Ibarkhand | 76.0 | 79.7 | 84.0 | 88.6 | 96.6 | 103.4 | 103.6 |
| Karnataka | 146.1 | 156.7 | 180.8 | 187.5 | 205.3 | 216.0 | 213.8 |
| Kerala | 158.5 | 161.4 | 166.3 | 171.5 | 184.1 | 189.9 | 195.7 |
| Lakshadweep | 206.0 | 228.9 | 232.7 | 213.8 | 225.7 | 235.0 | 256.6 |
| Madhya Pradesh | 83.6 | 88.6 | 96.5 | 95.9 | 101.9 | 110 3 | 108.3 |
| Maharashtra | 149.2 | 150.6 | 162.2 | 172.1 | 183.5 | 187.0 | 185.1 |
| Manipur | 60.3 | 63.7 | 66.0 | 59.9 | 76.2 | 88.5 | 93.6 |
| Meghalaya | 158.1 | 142.5 | 141.3 | 144.4 | 163.4 | 166.0 | 185.7 |
| Mizoram | 94.7 | 98.5 | 103.7 | 107.5 | 114.1 | 127.2 | 129.2 |
| Nagaland | 60.8 | 60.7 | 64.3 | 66.8 | 72.2 | 77.9 | 86.6 |
| Odisha | 87.6 | 93.6 | 106.4 | 123.4 | 135.6 | 141.4 | 143.7 |
| Puducherry | 362.1 | 369.0 | 418.5 | 436.0 | 445.5 | 435.6 | 415.2 |
| Punjab | 198.0 | 206.2 | 215.2 | 229.1 | 245.0 | 255.0 | 256.8 |
| Rajasthan | 154.9 | 158.5 | 163.5 | 160.1 | 164.2 | 166.2 | 159.1 |
| Sikkim | 156.8 | 152.9 | 164.9 | 171.7 | 192.7 | 207.1 | 214.1 |
| Tamil Nadu | 174.4 | 169.3 | 176.0 | 184.1 | 193.2 | 199.9 | 195.7 |
| Telangana | - | 136.5 | 161.7 | 173.8 | 186.0 | 198.4 | 197.0 |
| Tripura | 49.3 | 51.8 | 57.8 | 58.5 | 64.0 | 64.0 | 63.1 |
| Uttar Pradesh | 62.6 | 66.9 | 75.2 | 79.8 | 84.6 | 91.1 | 92.2 |
| Uttarakhand | 119.6 | 128.8 | 150.2 | 146.9 | 150.8 | 170.6 | 163.7 |
| West Bengal | 74.4 | 70.6 | 78.7 | 82.2 | 90.3 | 96.2 | 101.9 |
| All India | 122.8 | 126.6 | 136.9 | 141.5 | 149.7 | 157.3 | 157.5 |
| | Product-v | vise Per Capi | ta Consumptio | on of Petroleu | m Products | | |
| Naphtha | 8.6 | 8.5 | 8.9 | 9.0 | 9.0 | 9.4 | 9.8 |
| MS | 14.2 | 15.8 | 18.1 | 19.6 | 21.6 | 23.4 | 24.8 |
| SKO | 5.9 | 5.9 | 5.6 | 4.5 | 3.2 | 2.9 | 2.0 |
| HSDO | 56.4 | 57.3 | 61.6 | 62.8 | 66.9 | 68.9 | 68.2 |
| LDO | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 |
| F.O (Regular) | 4.2 | 4.1 | 4.9 | 5.2 | 4.9 | 4.6 | 4.2 |
| LSHS/HHS | 0.4 | 0.3 | 0.1 | 0.1 | 0.1 | 0.3 | 0.3 |
| All India | 122.8 | 126.6 | 136.9 | 141.5 | 149.7 | 157.3 | 157.5 |

Note: 1: Population figures have been taken from Census of India, 2011 2:Includes private sales by oil companies and excludes direct private imports. Source: Petroleum Planning and Analysis Cell.

Table- 2



| PER CAPITA NET STATE DOMESTIC PRODUCT | | | | | | | |
|---------------------------------------|-------------------|---------|---------|---------|---------|---------|---------|
| (Current Prices) (Concld.) (₹) | | | | | | | |
| Per Capita Income (₹) | | | | | | 1 | |
| State/Union Territory | Base Year 2004-05 | | | | | | |
| | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 |
| Andaman and Nicobar Islands | 111087 | 126344 | 137064 | 153904 | 178709 | 204254 | 218649 |
| Andhra Pradesh | 82870 | 93903 | 108002 | 120676 | 138299 | 152286 | 168480 |
| Arunachal Pradesh | 94135 | 114789 | 116985 | 124129 | 138836 | 154652 | 169742 |
| Assam | 49734 | 52895 | 60817 | 66330 | 75151 | 81034 | 86801 |
| Bihar | 26948 | 28671 | 30404 | 34045 | 36850 | 40715 | 45071 |
| Chandigarh | 203356 | 212594 | 230009 | 252236 | 280512 | 305140 | 330015 |
| Chhattisgarh | 69880 | 72936 | 72991 | 83285 | 89690 | 98254 | 105089 |
| Delhi | 227900 | 247209 | 270261 | 295558 | 318323 | 344350 | 376221 |
| Goa | 215776 | 289185 | 334576 | 378953 | 411740 | 423716 | 435959 |
| Gujarat | 113139 | 127017 | 139254 | 156295 | 176961 | 197457 | 213936 |
| Haryana | 137770 | 147382 | 164963 | 184982 | 210592 | 226409 | 247628 |
| Himachal Pradesh | 114095 | 123299 | 135512 | 150290 | 165497 | 176459 | 190407 |
| Jammu and Kashmir | 61108 | 61211 | 73215 | 76634 | 84471 | 95448 | 102789 |
| Jharkhand | 50006 | 57301 | 52754 | 60018 | 67484 | 75421 | 77739 |
| Karnataka | 118829 | 130024 | 148108 | 169898 | 186405 | 205697 | 223175 |
| Kerala | 123388 | 135537 | 148133 | 166246 | 183252 | 205657 | 221904 |
| Madhya Pradesh | 51849 | 55678 | 62080 | 74324 | 81973 | 90487 | 103288 |
| Maharashtra | 125261 | 132836 | 146815 | 163726 | 172663 | 187118 | 202130 |
| Manipur | 47798 | 52717 | 55447 | 59345 | 71507 | 75229 | 84746 |
| Meghalaya | 65118 | 64638 | 68836 | 73753 | 77504 | 82653 | 87170 |
| Mizoram | 77584 | 103049 | 114055 | 127107 | 155222 | 164429 | 187327 |
| Nagaland | 71510 | 78367 | 82466 | 91347 | 102003 | 109198 | 120518 |
| Odisha | 61305 | 64233 | 65993 | 79181 | 89353 | 100771 | 110434 |
| Puducherry | 148147 | 146921 | 172727 | 187357 | 198364 | 204463 | 220949 |
| Punjab | 103831 | 108970 | 118858 | 128780 | 139835 | 149974 | 155491 |
| Rajasthan | 69480 | 76429 | 83426 | 91924 | 98188 | 107890 | 115492 |
| Sikkim | 194624 | 214148 | 245987 | 280729 | 349163 | 375773 | 403376 |
| Tamil Nadu | 116960 | 129494 | 142028 | 156595 | 175276 | 194373 | 213396 |
| Telangana | 112162 | 124104 | 140840 | 159395 | 179358 | 210563 | 233325 |
| Tripura | 61815 | 69857 | 84267 | 91596 | 100444 | 113016 | 125675 |
| Uttar Pradesh | 40124 | 42267 | 47118 | 52671 | 56861 | 62652 | 65704 |
| Uttarakhand | 126356 | 136099 | 147936 | 161752 | 180613 | 191450 | 202895 |
| West Bengal | 65932 | 68876 | 75992 | 82291 | 91401 | 103944 | 113163 |

Source: National Statistical Office, Ministry of Statistics and Programme Implementation, Government of India.

Table -3

We show energy consumption and real gross domestic product (RGDP) in per capita terms in the above tables (Tables 2 and 3). With the exception of Delhi, per capita RGDP in high-income states is closely tracked by per capita petroleum consumption, and thus this relationship appears to be positive. With the exception of a few states, we find a similar pattern for middle- and low-income panels. For example, in middle-income states such as Arunachal Pradesh, Nagaland, Kerala, and West Bengal, as well as, more recently, Jammu and Kashmir, the plots show a decline in petroleum consumption despite steady growth in per capita income. Among the low-income states, Bihar, an agriculture-based state with the third largest population, has seen a significant decrease in petroleum consumption per capita in the 2000, even though per capita income has been increasing steadily. Similar relationships are shown on a year-to-year basis for other low-income states, including Assam, Madhya Pradesh, Manipur, and Uttar Pradesh, though the long-term trend is upward.



• Higher prices- Adverse impact on fiscal deficit:

Every year, India imports 1.5 billion barrels of crude oil. This amounts to approximately 86% of its annual crude oil requirement. As a result, the rise in crude oil prices may increase India's expenditure, negatively impacting the country's fiscal deficit—the difference between the government's total revenue and total expenditure. The fiscal deficit is the amount of money borrowed by the government to cover its expenses. An increase in the fiscal deficit could have a negative impact on the economy and markets.

• Impact on the Rupee:

Crude oil price increases have a direct impact on the Indian rupee. The rupee closed at 68.34 against the US dollar on May 24, 2018. According to a Live Mint report, the rupee is nearing an 18-month low and is only 0.6% away from its all-time low of 68.825. Furthermore, if crude oil prices remain high, the rupee is expected to depreciate further by the end of the year. The depreciation of the rupee has repercussions on the Indian economy and even the stock market.

• Impact on Current Account Deficit (CAD):

Over the last few years, India's reliance on crude oil imports has only grown. The dependency rate increased from 77.3% in fiscal year 2014 to 83.7% in fiscal year 2018. Crude oil price increases have a significant impact on India's current account deficit (CAD). CAD is a measure of India's trade in which the value of imported goods and services exceeds the value of exported goods and services. CAD represents how much money India owes the rest of the world in foreign currency. According to an SBI report, India's CAD could exceed 2.5% of GDP in FY2019 (assuming oil prices remain at \$80 per barrel).

• Impact on Sensex, Midcaps:

The rise in crude oil prices has put a lot of pressure on the Indian stock markets. The Sensex fell 2.3% between May 1 and May 24, 2018. In comparison, the BSE small and mid cap indices have suffered a nearly 8% drop. With crude oil prices approaching \$80 per barrel, small and mid-cap stocks have suffered a sell-off. Analysts warn that if the price of crude oil continues to rise, this could continue.

• Impact on Stocks:

Many Indian companies rely on stable crude oil prices. This includes companies in the tyre, lubricant, footwear, refining, and airline industries. Higher input costs have a negative impact on the profitability of these businesses. This could have an immediate negative impact on stock prices. On the other hand, a rise in oil prices could benefit the country's oil exploration companies.

• Impact on Inflation:

Oil is a vital commodity that is required to meet domestic fuel needs as well as a necessary raw material used in a variety of industries. A rise in the price of crude oil would raise the cost of manufacturing goods. This price increase would eventually be passed on to consumers, causing inflation. According to experts, a \$10 increase in crude oil prices could raise inflation by 10 basis points (0.1%). Inflation will rise as crude oil prices rise, and the RBI will have to raise interest rates to control inflation. It will result in lower spending and thus lower growth for the country.

<u>Reforms</u>:

1. Social Reforms :

India is a developing country with an HDI ranking of 132 out of 191 in 2022. According to the National Survey of India, the literacy rate in India will be 77.7 percent in 2022. As a result, the Indian population is suffering from severe social degradation. Some reforms should be implemented

- Use low-powered engines with a high weight-to-fuel ratio. Plains and plateaus cover about 70% of India's total land area, while mountains cover only 30%. As a result, 70% of the region required low powered engines, i.e. 100cc-125cc only. Engines larger than 125cc are useless in this region. A 100-to 125-cc engine is more than enough to carry the load of two people.
- When travelling alone, use a two-wheeler instead of a car, which consumes more fuel.



Always use a bicycle when travelling short distances.

2. Technological Reforms :

• <u>Two Stoke or Four Stoke Engine</u> : A two-stroke engine is a type of internal combustion engine that completes a power cycle with two strokes (up and down movements) of the piston during one power cycle, which is completed in one crankshaft revolution. In a two-stroke engine, the end of the combustion stroke and the start of the compression stroke occur simultaneously, as do the intake and exhaust (or scavenging) functions. Dugald Clerk, a Scottish engineer, is credited with developing the first commercial two-stroke engine with cylinder compression, which he patented in 1881.

A four-stroke engine is an internal combustion (IC) engine in which the piston performs four distinct strokes while turning the crankshaft. A stroke is the complete movement of the piston along the cylinder in either direction. Intake, Compression, Combustion, Combustion, and Exhaust are the four distinct strokes. In 1876, Nikolaus Otto invented the four-stroke internal-combustion engine.





| Description | 4- Stroke Engine | 2- Stroke Engine Requires only 2 strokes or 1 revolution | | |
|------------------------|--|---|--|--|
| Completion of Cycle | Requires 4 different strokes or 2 revolutions | | | |
| Power stroke | For every 2 revolutions | For every 1 revolutions | | |
| Admission of charge | Directly enters into the cylinder | First enters into the crankcase & then transferred to cylinder | | |
| Valves | Consists of inlet and exhaust valves operated by cam mechainsm | Consists of ports which are opened & closed by piston movement | | |
| Cooling & Lubricatioin | Required lesser cooling and lubrication | Requires greater cooling & lubrication | | |
| Fuel Consumption | Less | More | | |
| Mechanical Efficiency | Less | High | | |
| Weight | Heavy and bulky | Lighter and compact | | |

Table -4

Table – 5

Four-stroke engines are more efficient due to the lower demand for fuel. Fuel is consumed once every four strokes rather than twice. Four-stroke engines are better for the environment due to their reduced emissions. A two-stroke engine release burned oil into the air in addition to the exhaust it produces. Two-stroke engines often have a high power-to-weight ratio. Therefore, manufacturers must place a greater emphasis on research and development of four-stroke engines to achieve a similar high power-to-weight ratio.

• Popularize the use of Electric Vehicles instead of Fuel operated Cars.

3. Reforms by Government Policy :

Government has been implementing Ethanol Blended Petrol (EBP) Programme throughout the country except Union Territories of Andaman Nicobar and Lakshadweep islands, wherein OMCs sell petrol blended with 10% ethanol. However, considering the encouraging performance, due to various interventions made by the Government since 2014, the target of 20% ethanol blending was advanced from 2030 to 2025-26. If India achieves the target of blending 20% ethanol with petrol by 2025, it will save around Rs. 1 Lakh Crore of Foreign exchange. This type of initiative is also required for the Diesel Engine.

7. FINDINGS:

- ✓ This research paper establishes the strong relationship between consumption of Petroleum products and the Growth of Indian Economy (Indian States). The relationship between them is proportional. When the consumption of Petroleum products increases, the Gross Domestic Product also increases.
- ✓ Redesign the Four Stoke Engine that has a high power-to-weight ratio and is useful for two-wheelers.
- Reduce imports of crude oil. This will save lakhs of crores of rupees per year and control the adverse effect on economy by the price hike.



8. CONCLUSION:

This study indicates that the Indian economy is experiencing similar effects to those experienced by the rest of the world. The Indian economy still relies significantly on oil, despite the country's limited petroleum resources. The Indian economy would save billions of rupees a year if we could resolve the issues and start the new reforms. Additionally, India's Balance of Trade will show the positive relationship with Oil Exporting Countries.

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