6.1 Major Findings

Crude oil has been the fuel for the global and Indian economy for decades and, as such has addressed both personal as well as business needs of different sectors across the country. India, however, remains one of the largest net importers of crude oil in the world, making crude oil an important aspect in which price volatility can have a significant impact on our energy needs and hence the economic growth of the country as well. Recently, the shift has been towards renewable energy sources which aims to address environmental challenges due to the higher carbon footprint generated by fossil fuels and at the same time, also address the volatility faced in the economy due to price deviation of crude oil and our current position as one of the largest net importer in the world. This aspect has been reviewed in the current study which has been analyzed using a quantitative analysis approach in which a questionnaire has been used to collect data and analyzed through SPSS software. A significant influence has been noted both regarding crude oil prices and alternative prices on the economic growth of the country. The influence of crude oil reliability on economic growth has been clearly established and participants also highlighted the need to focus on different alternative energy sources. Additionally, the role of policy framework which can be established by the government and which promotes the utilization of alternative energy has also been noted. To add to this, the current study established a negative impact on both economic growth as well as environment due to crude oil prices, thus establishing the need to focus on alternative energy in the transition to a developed and less volatile economy.

6.2 Recommendations:

The following recommendations have been suggested to reduce the dependence of India on crude oil and increase the utilization of alternative energy sources for reduced dependence on energy growth and improvement in the level of economic growth for the country:

- The government should allocate dedicated funds for the development of solar, hydro, and wind energy sources which can aid in increasing renewable energy availability for the country

- The government should provide incentives like tax breaks, incentives and subsidies for investment and utilization of renewable energy in different sectors and personal consumption by individuals
- Businesses and governments should engage in research and development to develop more efficient and cost-effective sources of renewable energy generation and storage which can make it competitive with traditional energy solutions
- Businesses should focus on the development of effective energy storage and distribution solutions which can aid in addressing the unreliability of energy generation from renewable energy sources.
- The government should provide incentives and encourage electric vehicle adoption in an attempt to reduce dependence on fossil fuel consumption for transportation needs across the country
- Government and business should also invest in the development of public transportation solutions to address the need for private vehicles and reduce total fossil fuel consumption
- Government and businesses should launch informative advertising campaigns with the aim of educating people about the impact of crude oil on the economy and encouraging alternative energy adoption
- The government should encourage businesses to engage in collaboration with international firms in order to develop affordable and efficient renewable energy solutions for utilization across the country
- The government should explore and invest in different bioenergy solutions like biofuel and biogas in an attempt to address the diverse energy needs of different businesses for different business process
- The government should engage in the development of a systematic strategy which aims for the planned phase-out of fossil fuel and the adoption of renewable energy sources across different sectors in India for both commercial and public usage

6.3 Limitations

Certain limitations have been noted which might have an impact on both study reliability as well as validity. Firstly, the current study is based on quantitative data

hence public perception regarding alternative energy adoption, challenges faced, and their expectation regarding the role of government and business have not been taken into consideration. Additionally, the current study is based on viewpoints and reflections from different industries and also accounts for both domestic as well as commercial use. It should be noted that energy consumption and usage of energy are different for each sector, and hence distinct focus on aspects of specific sectors and personal usage of energy might show different results in alternative energy adoption. Finally, the current study is based on the crucial assumption that respondents are aware of crude oil prices and renewable energy prices, which may lead to result deviation in case the price of each aspect changes and people get to know about such aspects which may lead to a change in perception.

6.4 Further Research

Future scholars shall consider this study as a foundational study and attempt to conduct diverse studies with a narrowed down scope, focusing on the needs of particular industries and particular usage under domestic consumption. Additionally, a qualitative study shall also be conducted in order to analyze subjective views, reflections, and perceptions of government officials as well as businessmen involved in different sectors and make plans to systematically implement renewable energy in the country. Moreover, future scholars shall also conduct an extensive analysis of secondary data to establish trends depicting the influence of energy consumption variance in different sectors based on changes in the price of crude oil. Additionally, future scholars shall focus on establishing different energy production and distribution facilities for pilot study or simulation in order to understand the influence on different sectors. Finally, future scholars shall broaden the framework to also take into consideration different aspects like employment, changes in the GDP of the country, and changes in domestic usage due to the utilization of renewable energy usage in the country.

Important additional points

Total consumption of Crude Oil In India	1.75 Billion Barrels for 2023-2024				
Transportation is 40 to 50%	Two-wheeler 20 to 25% (EV is 3%)	Four-wheeler LCV 20 to 25% (EV is 2%)	Four-wheelers HCV 30 to 35%	Airplanes 10 to 15%	Shipping 5 to 10%
45% of 1.75 billion barrels = 787.5 million barrels	Cost per barrel = 70$ to 90$	80$ * 787.5 million $ = $ 63 Billion	45% of $ 63 Billion = % 28.35 billion	$28.35 billion * 83.50 INR = ₹2,367,083,250,000.00 Indian rupees	(2,36,708 Crores) total imported amount 1,169,000.00 crores
Industry 20 to 25%					
Agriculture 10 to 15%					
Residential & commercial areas 10 to 15%					
Power generation 5 to 10%					
Petrochemical products 5 to 10%					

The distribution of crude oil consumption in India across different sectors can be broken down as follows:

1. Transportation Sector

The transportation sector is the largest consumer of crude oil in India. This includes:

- **Road Transport:** Diesel and petrol are the primary fuels, used extensively for vehicles.
- **Aviation:** Jet fuel (ATF) consumption for domestic and international flights.
- **Railways:** Although a significant portion is electrified, diesel locomotives still use a considerable amount of diesel.

2. Industrial Sector

This sector includes:

- **Manufacturing:** Use of oil in machinery and as a feedstock for chemicals and plastics.
- **Construction:** Heavy machinery and equipment use diesel.
- **Mining and Quarrying:** Diesel is used in equipment and transport vehicles.

3. Agriculture

- **Irrigation Pumps and Machinery:** Diesel is widely used for irrigation pumps and farm machinery.

4. Residential and Commercial Sectors

- **LPG (Liquefied Petroleum Gas):** Used for cooking and heating.
- **Kerosene:** Used for cooking and lighting in rural and semi-urban areas.

5. Power Generation

- **Electricity Generation:** Oil is used in thermal power plants, although its share is decreasing with the increase in renewable energy sources.

6. Petrochemicals

- **Feedstock for Petrochemical Industries:** Crude oil derivatives are used as raw materials in the production of chemicals, fertilizers, and synthetic materials.

Approximate Distribution

While precise percentages can vary year by year, a general distribution based on typical data would be:

- **Transportation:** 40-50%
- **Industrial:** 20-25%
- **Agriculture:** 10-15%
- **Residential and Commercial:** 10-15%
- **Power Generation:** 5-10%
- **Petrochemicals:** 5-10%

Additional Notes

1. **Policy Impacts:** Government policies promoting electric vehicles and renewable energy can shift these percentages over time.
2. **Economic Factors:** Economic growth or contraction can affect industrial and transportation fuel consumption.
3. **Technological Advances:** Improvements in fuel efficiency and alternative energy sources can reduce crude oil dependence.

For the most up-to-date and specific data, consulting resources like the Ministry of Petroleum and Natural Gas (MoPNG) in India or reports from the Petroleum Planning and Analysis Cell (PPAC) would be beneficial.

The transportation sector's consumption of crude oil in India can be further detailed by looking at the specific segments: two-wheelers, four-wheelers (including cars, buses, and trucks), airplanes, and shipping. Here's an approximate breakdown:

1. Two-Wheelers

- **Two-wheelers (Motorcycles, Scooters):** These primarily use petrol.
- **Consumption Share:** Approximately 20-25% of the transportation sector's fuel consumption.

2. Four-Wheelers

- **Cars, SUVs, and Light Commercial Vehicles (LCVs):** Predominantly use petrol and diesel.
- **Heavy Commercial Vehicles (Buses, Trucks):** Primarily use diesel.
- **Consumption Share:** Approximately 50-55% of the transportation sector's fuel consumption.
    - **Cars and LCVs:** Around 20-25%
    - **Heavy Commercial Vehicles:** Around 30-35%

3. Aeroplanes

- **Aviation (Domestic and International Flights):** Use Aviation Turbine Fuel (ATF).
- **Consumption Share:** Approximately 10-15% of the transportation sector's fuel consumption.

4. Shipping

- **Marine Transport (Domestic Shipping, Fishing Vessels, and International Shipping):** Use marine diesel oil and other marine fuels.
- **Consumption Share:** Approximately 5-10% of the transportation sector's fuel consumption.

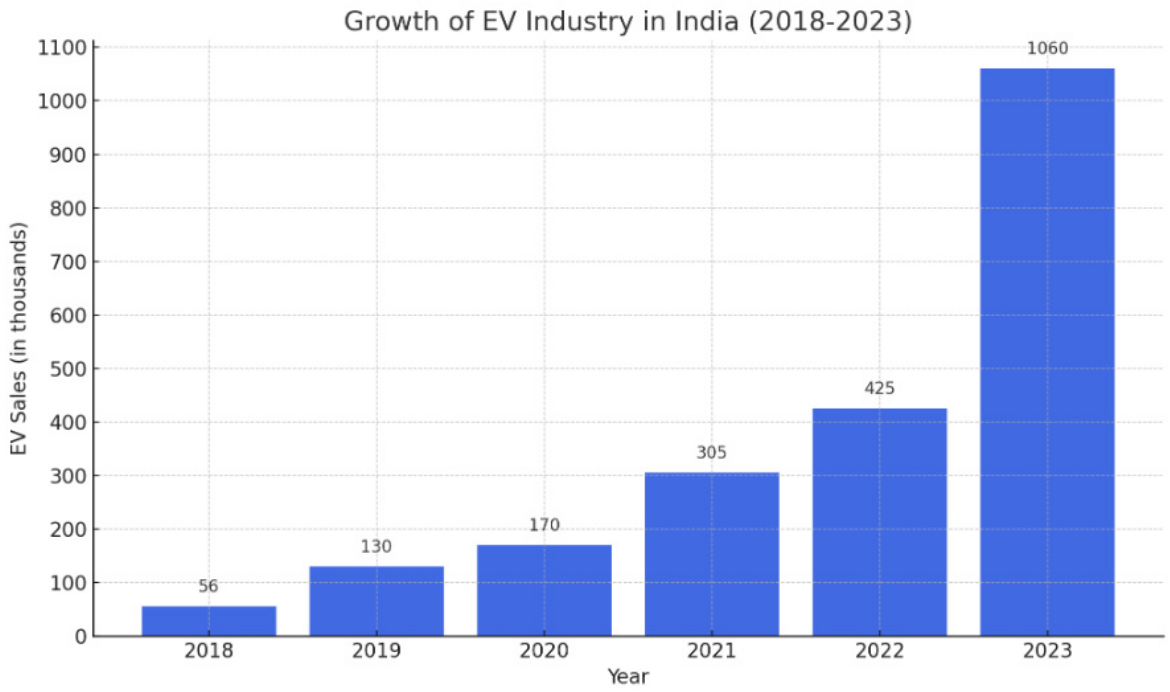
Summary Table

Sector	Fuel Type	Approximate Share (%)
Two-Wheelers	Petrol	20-25
Four-Wheelers	Petrol and Diesel	50-55
Cars and LCVs	Petrol and Diesel	20-25
HCVs	Diesel	30-35
Aeroplanes	Aviation Turbine Fuel	10-15
Shipping	Marine Fuels	5-10

Additional Notes

- **Two-Wheelers:** The high number of two-wheelers in India leads to significant petrol consumption.
- **Four-Wheelers:** Heavy commercial vehicles (trucks and buses) consume a major portion of diesel due to long-distance freight and passenger transport.
- **Aviation:** Rapid growth in air travel has been increasing ATF consumption.
- **Shipping:** While smaller in percentage, marine fuel consumption is vital for both domestic and international shipping activities.

These percentages provide a general idea and can vary slightly based on factors such as fuel prices, government policies, and advancements in vehicle technology. For precise and current data, consulting reports from the Ministry of Petroleum and Natural Gas (MoPNG) and the Petroleum Planning and Analysis Cell (PPAC) would be ideal.



The electric vehicle (EV) industry in India has been experiencing significant growth year on year, driven by various factors including government initiatives, increased consumer awareness, and advancements in technology. Here's a summary of the growth trajectory and key drivers:

Year-on-Year Growth

1. **Early 2010s to 2018**:
    - The EV market in India was relatively nascent, with growth primarily driven by e-rickshaws and two-wheelers.
    - Annual growth rates were moderate, influenced by limited infrastructure and high costs of EVs.
2. **2018 to 2020**:
    - The launch of the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme and its subsequent iterations provided subsidies and incentives, spurring growth.
    - The EV market saw a compound annual growth rate (CAGR) of around 20-25%.

3. **2020 to 2022**:
    - Despite the COVID-19 pandemic, the EV sector showed resilience. Companies like Tata Motors, Mahindra Electric, and new entrants like Ola Electric ramped up production.
    - Annual growth rates exceeded 30%, with a significant rise in electric two-wheeler and three-wheeler sales.
    - The government's push for cleaner mobility, including a target for 30% of all vehicles on the road to be electric by 2030, fueled investment and consumer interest.
4. **2023**:
    - The EV market in India continued its robust growth, with reports suggesting a nearly 150% increase in EV sales in the first half of 2023 compared to the same period in 2022.
    - The total number of EVs sold in 2023 was projected to surpass 1 million units.

Key Drivers of Growth

1. **Government Policies and Incentives**:
    - The FAME scheme, GST reductions, and state-level incentives.
    - Infrastructure development support, including the establishment of charging stations.
2. **Increasing Consumer Awareness and Demand**:
    - Rising awareness about environmental issues and the long-term cost benefits of EVs.
    - Enhanced consumer preferences for electric two-wheelers due to lower operating costs.
3. **Technological Advancements**:
    - Improvements in battery technology leading to better range and reduced costs.
    - Increased investment in R&D by both established automotive companies and startups.
4. **Economic Factors**:
    - Rising fuel prices making EVs a more economical option.

- Financial incentives and subsidies reducing the upfront cost disparity between EVs and traditional internal combustion engine (ICE) vehicles.

5. **Corporate and Fleet Adoption**:
   - Large corporations and e-commerce companies adopting EVs for last-mile delivery to reduce carbon footprints.

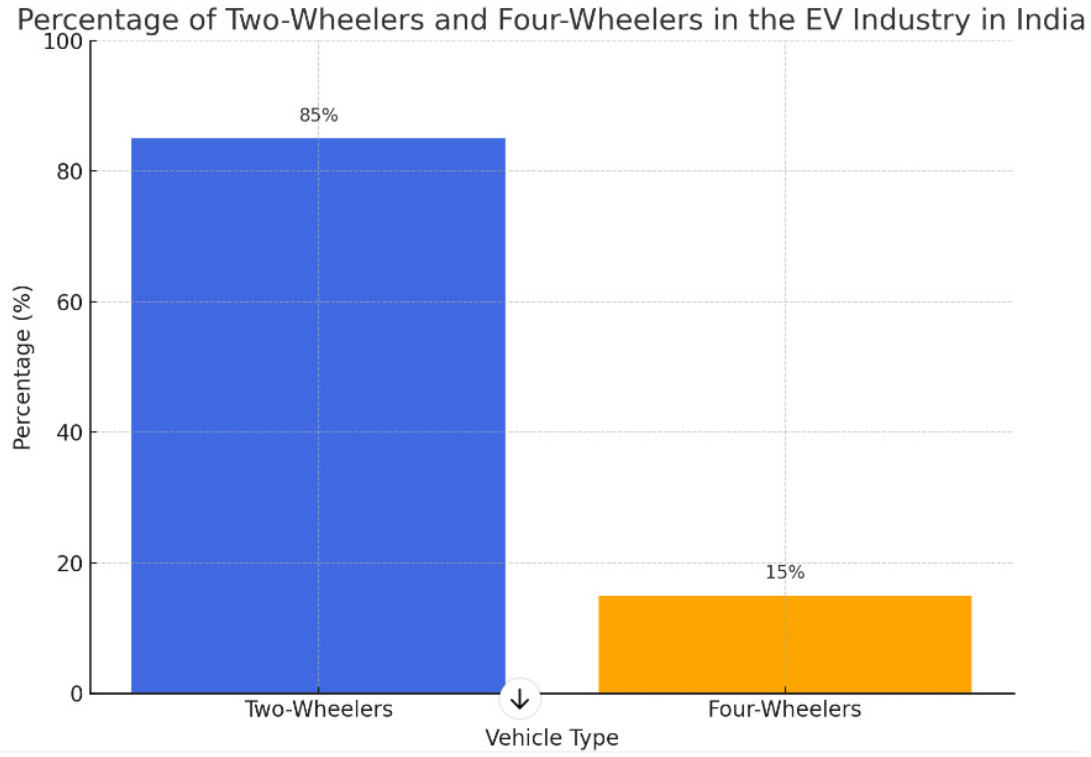
Future Projections

- The Indian EV market is expected to maintain high growth rates, with estimates suggesting that the market could grow at a CAGR of 40-50% over the next decade.
- By 2030, the EV market in India is anticipated to comprise a significant portion of total vehicle sales, with a focus on electric two-wheelers and commercial vehicles.

Challenges

- Despite the positive growth outlook, challenges such as inadequate charging infrastructure, high initial costs, and supply chain issues remain.

Continued policy support and investment in infrastructure are crucial to sustaining growth.



Here is the bar chart representing the percentage of two-wheelers and four-wheelers within the EV industry in India. As shown, two-wheelers make up the majority of the EV market with 85%, while four-wheelers account for 15%.

As of the most recent data available, the vast majority of two-wheelers in India are powered by petrol. Electric two-wheelers are still a small but growing segment of the market. Here are the approximate percentages:

1. **Petrol-powered two-wheelers**: Around 95-97% of the total two-wheelers in India run on petrol.
2. **Electric two-wheelers**: Approximately 3-5% of the total two-wheelers in India are electric.

As of the most recent data available, the majority of four-wheelers in India are powered by petrol, but there is a noticeable presence of diesel vehicles and a growing segment of electric vehicles (EVs). Here are the approximate percentages:

1. **Petrol-powered four-wheelers**: Around 60-65% of the total four-wheelers in India run on petrol.
2. **Diesel-powered four-wheelers**: Approximately 30-35% of the total four-wheelers run on diesel.
3. **Electric four-wheelers**: Approximately 1-2% of the total four-wheelers in India are electric.