

## *India's Ethanol Bet and Possible Future*

22 Jun 2021 | Ronnie Ninan, Risk Intelligence Consultant

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## 1. EXECUTIVE SUMMARY

India expected to witness a rise in its primary energy demand to 1,123 million tonnes of oil equivalent.

Prime Minister Modi recently announced the preponement of the Centre's plan of achieving 20% ethanol blended petrol (E20) from 2030 to 2025. The ethanol blending with petrol (EBP) will help save foreign exchange of more than ₹300 billion.

Currently, the US is the largest ethanol producer, followed by Brazil. Within Asia, China has a lead over India in ethanol production.

To achieve the goal of doubling ethanol distillation capacity, the government has planned to divert 3.5 million metric tonnes of sugar, which is currently in surplus—with the aim to increase it to 6 million metric tonnes by 2025.

According to the report by NITI Aayog, there is an estimated loss of 3-4% for two-wheelers fuel efficiency and 6-7% for four-wheelers when using E20.

Increasing ethanol blending with fossil fuels can help reduce India's carbon footprint. It would also help resolve the commitment made at COP-21 in 2015.

Vehicular engines—to reach E20 compatibility—would require recalibration considering the lower energy density of the blended fuel. Vehicles with such compatible engines are already in use in the US, Brazil, and Canada.

## 2. WHAT HAPPENED?

According to the India Energy Outlook 2021 report, published by the International Energy Agency, India is the world's 3rd largest energy consumer. The country is expected to witness a rise in the primary energy demand to 1,123 million tonnes of oil equivalent. This is in direct correlation to an expected rise in GDP to \$8.6 trillion by 2040. India's oil refining capacity, as of 1 May 2020, stood at 259.3 million metric tonnes (MMT), making it the 2nd largest refiner in Asia. The refining capacity is expected to double to 450-500 million tonnes by 2030. Being the 3rd largest oil consumer in the world in 2019, India is also the 4th largest LNG importer (33.68 billion cubic meters in FY20), which is expected to double in the next 5 years, and natural gas demand to increase three-fold in the next 10 years (by 2030).

In an effort to increase India's energy security, the country plans to double its ethanol distillation capacity by 2025. Prime Minister Modi recently announced the preponement of the Centre's plan of achieving 20% ethanol blended petrol (E20) from 2030 to 2025. The ethanol blending with petrol (EBP) will help save foreign exchange of more than ₹300 billion. India currently spends \$101.4 billion (2019) on crude oil imports, which can be reduced if the

dependence on imports is reduced through ethanol blending through domestic production. Increasing ethanol blending with fossil fuels can help reduce India's carbon footprint. It would also help resolve the commitment made at COP-21, the UN Climate Change Conference held in France in 2015.

As part of the announcement by the Prime Minister on India's national biofuels policy, a policy report titled "*Roadmap for ethanol blending in India 2020-25*" was released by NITI Aayog. Indian oil companies such as the Indian Oil Corporation, Hindustan Petroleum Corporation Limited will be expected to provide 20% ethanol-blended fuel from the first quarter of 2023 onward, with a complete transition in two years. To achieve that target, over 10 billion litres of ethanol will be required to blend with the petrol. While half of this will come from the sugar the rest will come from grain-based distilleries. **States like Maharashtra and Uttar Pradesh, where ethanol is produced in surplus are expected to be early adopters of higher ethanol fuel blending rate.** At present, India's ethanol blending rate in fuel is at 8%, which according to the roadmap is expected to increase to 10% by 2022. The Department of Food and Public Distribution (DFPD) is the nodal department for promotion of fuel grade ethanol producing distilleries in the country.

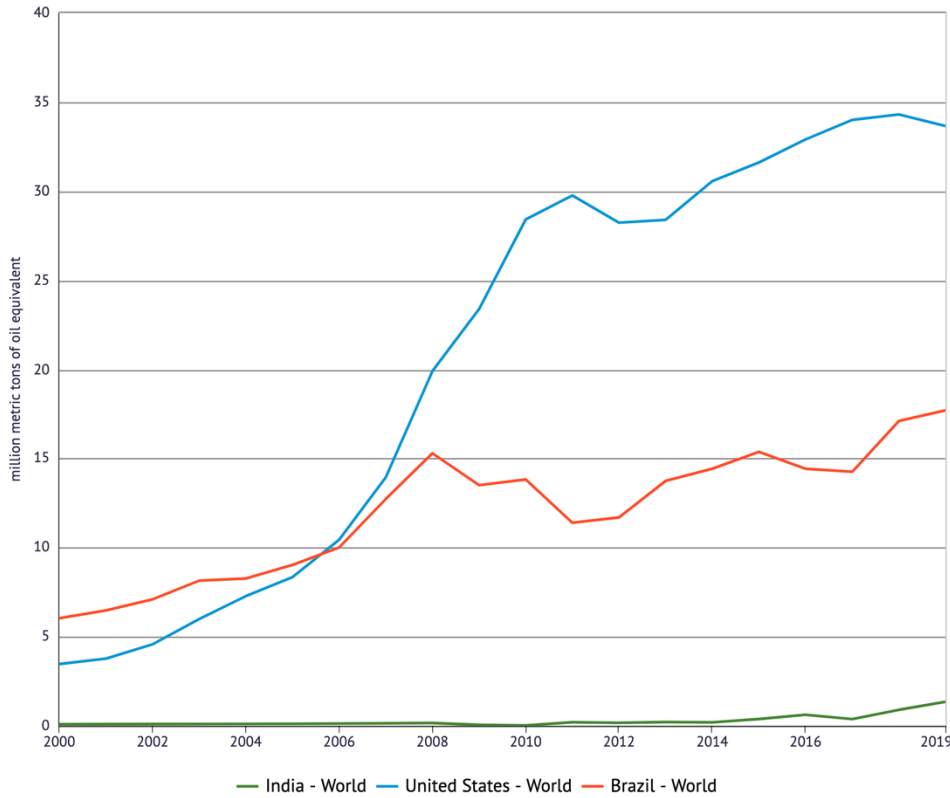
### 3. AS A FUEL: ETHANOL vs. METHANOL vs. LPG vs. LNG

The table below provides an overview of 4 kinds of fuels namely: Ethanol, Methanol, Liquefied Petroleum Gas (LPG), and Liquefied Natural Gas (LNG).

Ethanol	Methanol	LPG	LNG
Renewable fuel made from plant material known as 'biomass'.	Cleaner combustion properties; lower emissions of NO <sub>x</sub> , HC, and CO.	LPG comprises of propane and butane.	LNG comprises of methane; cleanest fossil fuel.
Have high blending properties.	Low combustion temperature; poor self-ignition properties.	Stored under high pressure.	Not stored under high pressure; does not emit soot, dust, or fumes.
Reduces CO and NO <sub>x</sub> emission.	Poor oil lubrication properties	LPG is transported and stored in cylinders and tanks.	LNG is stored and transported in special-designed cryogenic tanks and pipelines; Top 3 producers: Qatar, Australia, and Malaysia.
Top 5 producers: USA, Brazil, European Union, China, and India.	Top 5 producers: China, Saudi Arabia, Trinidad and Tobago, Iran, and Russia.	LPG is more readily available compared to LNG, therefore, more viable for developing countries.	Safer than LPG as it is not refrigerated and stored under pressure.

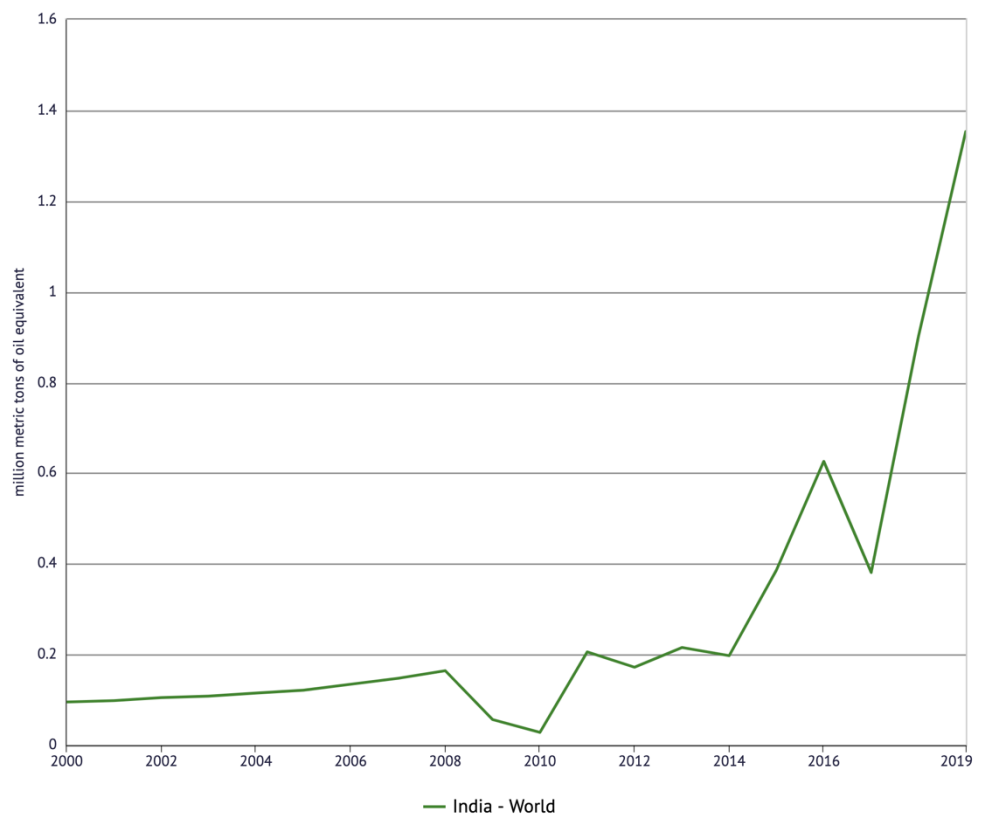
#### 4. GLOBAL PLAYERS IN ETHANOL

Just like every sector has market players, in production, ethanol also has many, and India is among them. With the plan to increase production, India could very well become a market leader, while also developing its agricultural sector. Currently, the US is the largest ethanol producer, followed by Brazil. Within Asia, China has a lead over India in ethanol production.

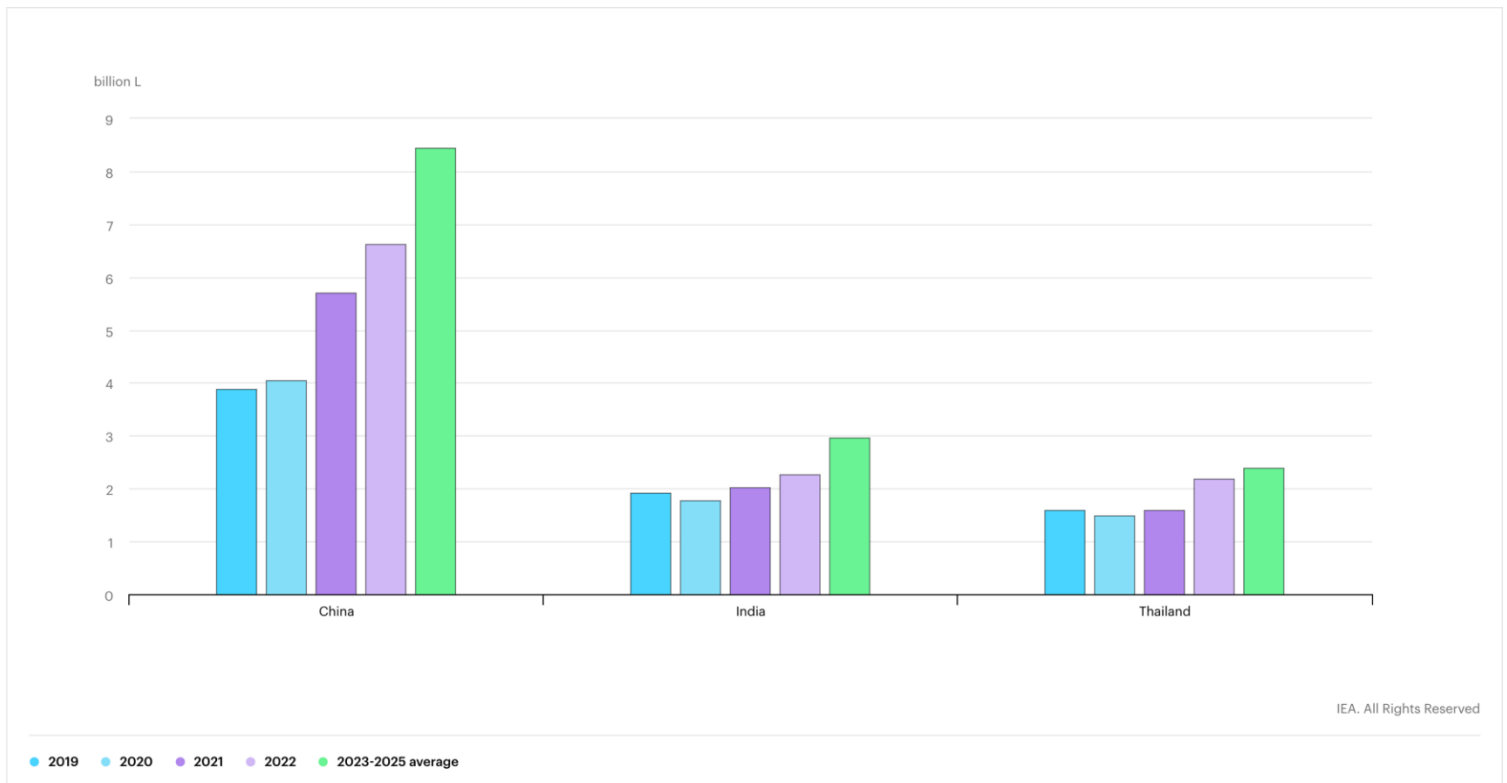


**Ethanol production in Million Metric Tons (MMT): US, Brazil, and India (2000-2019)**

**Ethanol production in MMT: India (2000-2019)**



## ETHANOL PRODUCTION OVERVIEW IN ASIAN MARKETS (2019-2025F)



### 5. WHAT IS E20? HOW IS IT DIFFERENT FROM E10?

E20 is India's proposed target for ethanol-blended petrol

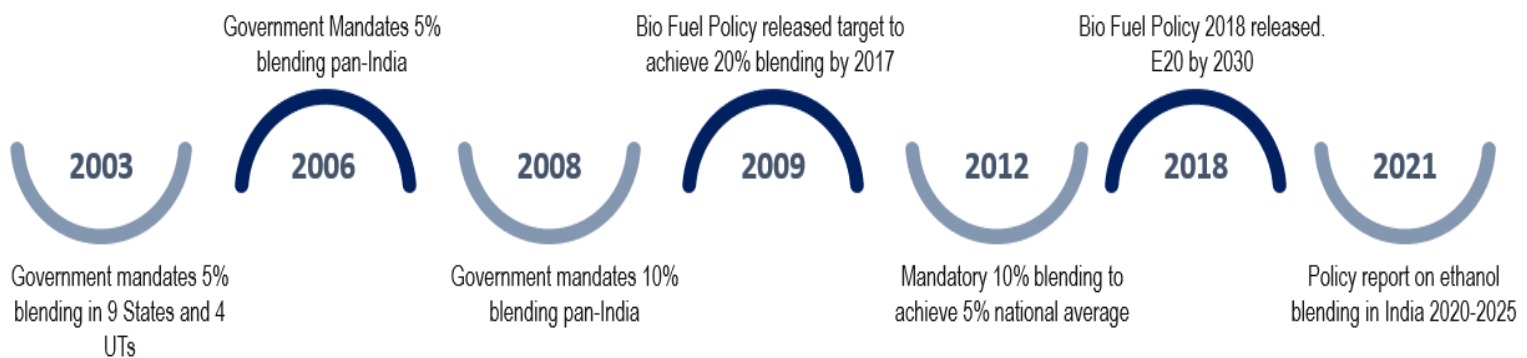
E20 is 20% ethanol and 80% fuel (whereas E10 is a biofuel made up of 10% ethanol and 90% regular unleaded fuel). With E20, there is a higher reduction of CO emissions compared to E10 (50% lower in two-wheelers and 30% in four-wheelers.) Hydrocarbon emissions are reduced by 20% with ethanol-blends compared to normal petrol. There is no significant change in NOx emissions from E10 and E20.

#### ISSUES WITH THE USE OF E20

According to the report by NITI Aayog, there is an estimated loss of 3-4% for two-wheelers fuel efficiency and 6-7% for four-wheelers when using E20. Most vehicles in India are designed for E0 (no ethanol blend) and can be calibrated for E10. **Therefore, for E20 to be possible, there is a need for new engine specifications and modifications to the fuel lines.** The corrosive nature of the blended fuel would also require changes in the plastic and rubber components of the vehicle. The engines would require recalibration to produce the expected power-level, efficiency-level, and emission-level balance considering the lower energy density of the blended fuel. Vehicles with such compatible engines are already in use in the US, Brazil, and Canada.

## 6. NATIONAL POLICY ON BIOFUELS AND ETHANOL BLENDING PROGRAMME

The National Policy on Biofuels, 2018, proposed a suggestive target of 20% blending of ethanol in petrol and 5% blending of biodiesel in diesel by 2030. This derives from India's over-reliance on imported non-renewable fuel sources, such as crude oil, needed to suffice domestic demand. According to the Ministry of New and Renewable Energy, the global fluctuation of crude oil prices could adversely impact India's import reliance. As part of the plan to securitize energy while keeping the carbon footprint in check, the national policy is an innovative roadmap to create an energy-efficient, sustainable, and energy secure future for India.



## 7. BREAKING DOWN INDIA'S BLENDING PROGRAM 2020-2025

The Expert Committee report *"Roadmap for Ethanol Blending in India 2020-25"* by NITI Aayog outlines India's future path for attaining energy security and transitioning to a low carbon economy. For that purpose, locally produced ethanol will be blended in with petrol, enabling local enterprises and farmers to participate in India's energy economy. The committee estimated India's ethanol demand to reach 10.16 billion litres to be met by 2025. India's current ethanol production capacity is 4.26 billion litres that are derived from distilleries based on molasses and 2.58 billion litres from grain-based distilleries. It is proposed to expand to 7.60 billion litres and 7.40 billion litres respectively to suffice the future demand. To ensure this expansion, it will require 6 million metric tonnes of sugar and 165 metric tonnes of grain per year up until 2025. Therefore, there will be an increase in sugar and grain production to satisfy this need for ethanol-blending.

## 8. BUSINESS IMPLICATIONS

### a. A POSSIBLE BOOST TO INDIA'S AGRICULTURE SECTOR

Ethanol can be produced from feedstocks such as cereals (wheat, rice, barley, corn, and sorghum), sugarcane, sugar beet, among other plant-based sources. To ensure this increase, there will be a need to boost ethanol production—therefore, sugar production from sugarcane. However, most sugarcane production in the country is concentrated in a few states, including Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, and Bihar. Rice is another feed for ethanol production, like sugarcane. To boost ethanol production through rice, the Centre has allocated about 78,000 tonnes of rice from Food Corporation of India (FCI) stocks. As per the Ministry of Consumer Affairs, Food and Public Distribution estimate, around 16.5 million tonnes of grains will be used to produce the required ethanol from grains in 2025.

### b. SWINGS IN THE OIL INDUSTRY

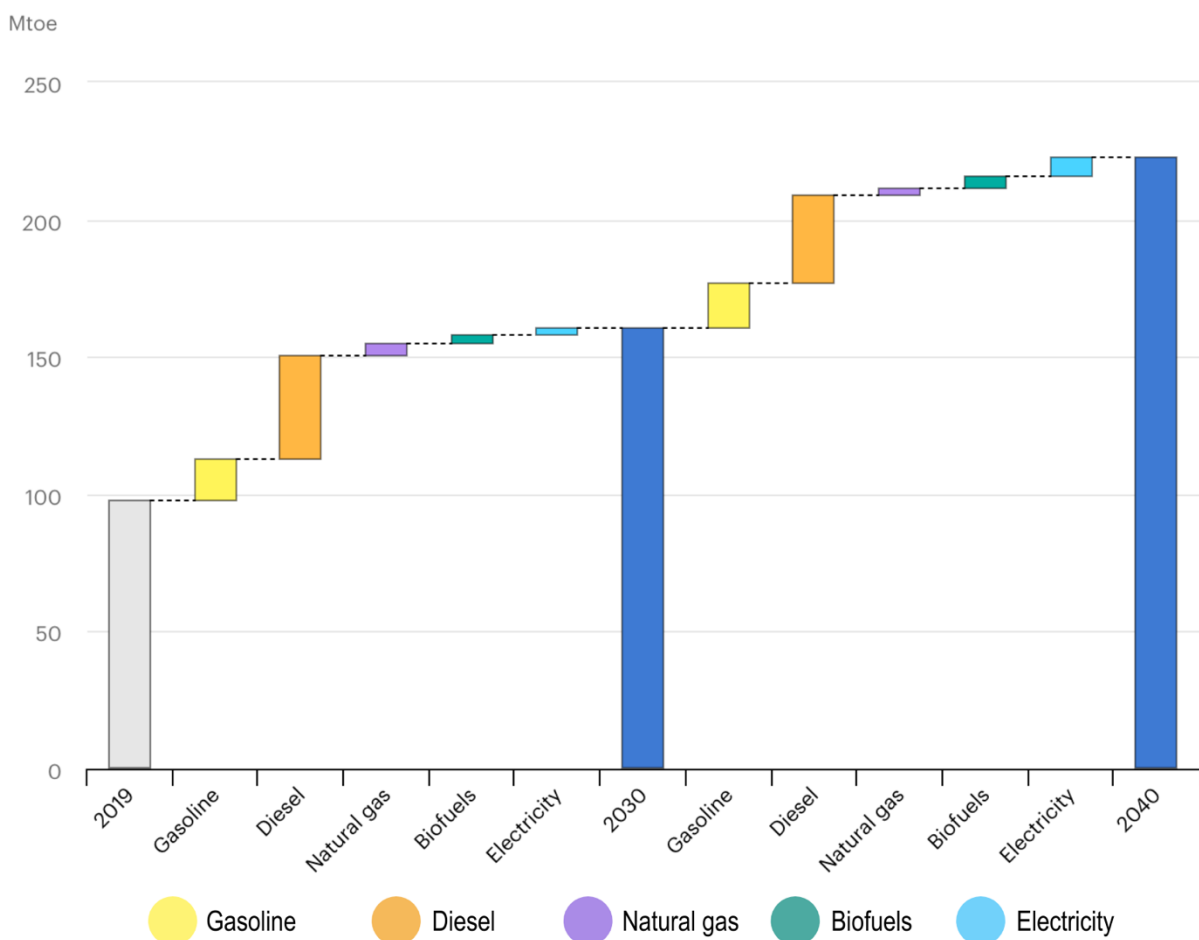
At present, India is highly dependent on high-cost oil imports, which is taking a toll on the public exchequer. To remedy this situation, through ethanol blending, Indian oil firms—predicated upon the Centre's target of 10%

ethanol blending in petrol by 2022 and 10% ethanol blending in diesel by 2030—have raised their proportion of ethanol blended in petrol from 5% to 8.5% in 2020. To ensure the 10% is reached, oil companies, including the Indian Oil Corporation and Hindustan Petroleum Corporation Limited, have started procuring ethanol through an administered pricing mechanism. The Indian Oil Corporation has planned to build 2 second-gen bio-refineries in Andhra Pradesh and Telangana to ensure ethanol production up to scale. This will form part of India's planned 12 bio-refineries across 11 states, including Punjab, Gujarat, Haryana, Bihar, Assam, Odisha, Maharashtra, and Madhya Pradesh.

**c. MODIFICATIONS NEEDED IN THE AUTOMOBILE INDUSTRY**

India's automobile industry will witness a shift in the country's pursuit of ethanol-blended fuel. This shift will be to accommodate the new fuel (E20), which will not suit the existing engine specifications. Due to the corrosive nature of the ethanol-blended fuel, it will be detrimental to vehicle's functioning. In addition, present-day engines are calibrated for E0-E10, not E20. The low energy density of E20 will require the engines to be recalibrated to ensure balance in power, efficiency, and emission levels. The emissions roadmap of India will also witness a turn, and the graph below forecasts India's shifting fuel demand until 2040.

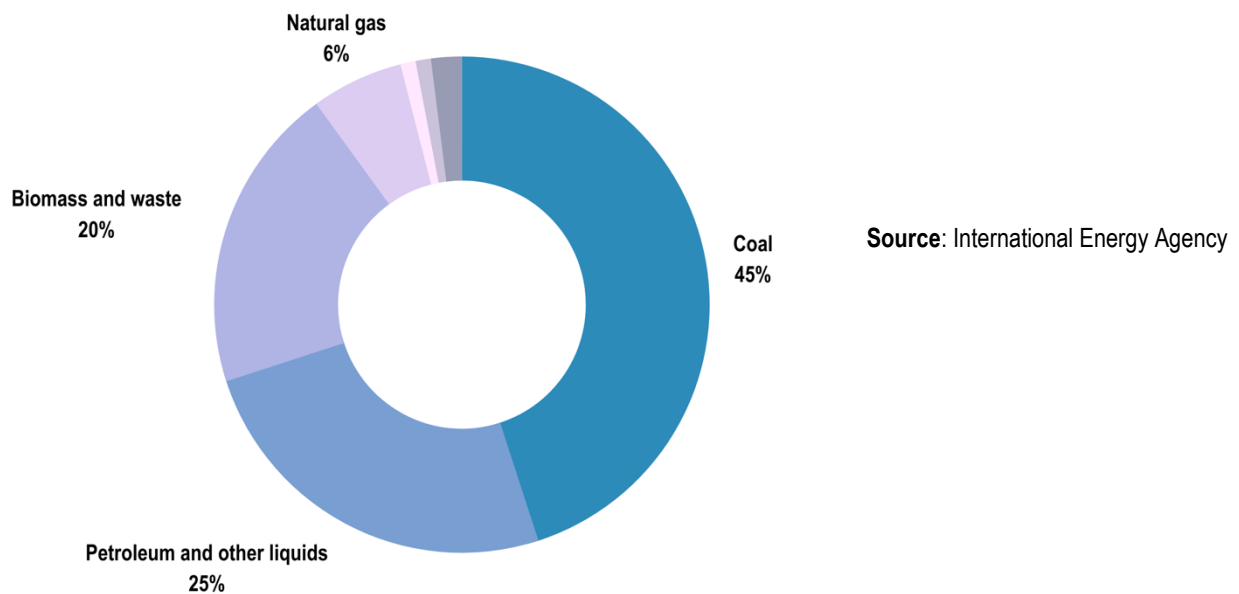
**CHANGES IN INDIAN ROAD TRANSPORT ENERGY DEMAND BY FUEL AND TECHNOLOGY SCENARIO (2019-2040F)**



## 9. CONCLUSION

India, as a country, is growing, and so follows its energy demand. International Energy Agency estimates India to make up one-fourth of the growing global demand for energy between 2019 and 2040. It is expected that India's natural gas, crude oil, and other renewable energy demands would rise soon. However, within this future, India hopes to be a global leader in ethanol production and ethanol-blended fuel production, with the aim to achieve energy security, energy efficiency, and reduce its carbon footprint. India is still dependent on energy imports from other countries, including Iraq, Saudi Arabia, United Arab Emirates, the US, etc. India's dependency on coal as a primary energy source, even in 2019, continues to lead over the others.

**INDIA'S ENERGY CONSUMPTION BY FUEL TYPE (2019)**



For India to meet its ethanol demands by 2025 and achieve the aim to reach E20, India would require a pan-India rollout which would include standardized technological and vehicular modifications while increasing ethanol production from both grain-based and molasses-based distilleries. China dominates the methanol market, Qatar dominates the LNG market, and the US, followed by Brazil, dominate the global ethanol market. With the proposed ethanol-blending roadmap, India would be able to find its footing in the global market. It would also help secure India's energy security keeping its carbon footprint in check.



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**Ronnie Ninan** is currently working at India Bound as a Risk Intelligence Consultant. He is pursuing the Young India Fellowship from Ashoka University. He completed his Masters in International Studies from Symbiosis School of International Studies, Pune. His research interests include defence policy, foreign policy, and science and technology policy.



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