

# Refining and Marketing Insight

Behind the data: Outlooks from our Annual Strategic Workbook

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## Jet fuel demand flies high, but some clouds on the horizon

**Louise Vertz**, Director, Research and Analysis

**Sandeep Sayal**, Vice President, Research and Analysis

### Key implications:

- **A fast-growing product:** Jet fuel demand growth has comfortably exceeded 4% in the last two years, in a refined product market that has been growing at just 1.3% overall, and jet remains one of few products to show consistent gains through 2040, expected to average 1.4% per year over the forecast period.
- **Growth drivers:** A combination of low oil prices and a rapidly expanding middle class are driving major growth in passenger travel, and freight markets are booming on increased world trade, particularly e-commerce. Supported by airport construction and expansion, relief of capacity constraints in key regions can help secure future growth.
- **Downside risks** include greater penetration of sustainable aviation fuels (SAF) and efficiency gains, notably under initiatives like the Carbon Offsetting and Reduction Scheme for International Aviation scheme starting 2021. Localized congestion and capacity constraints, as well as alternative transportation modes, however, will temper prospects in some regions.
- **Supply-side gains** are to be expected, driven by new refinery builds in Asia and the Middle East, but yields expected to be higher in Europe and North America also, as lower availability incentivizes higher runs. Post-IMO, jet production—along with petrochemicals—may well emerge as a potential route for ‘future-proofing’ older refineries.
- **Trade flows** will be impacted by growing imbalances, and infrastructure requirements will need boosting to cater to increased long-distance jet trade.
- **SAF** will play a greater role in the fuel mix towards the end of the forecast period; however, electric planes are unlikely to impact demand until after 2040.

### Contacts

**Sandeep Sayal**, Vice President, Research

**Louise Vertz**, Director, Research and Analysis

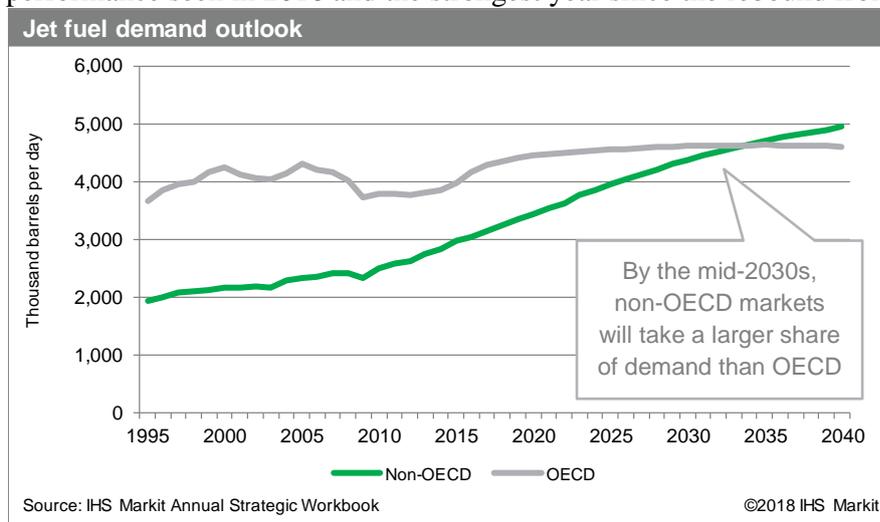


## The IHS Markit outlook is for robust jet fuel demand growth, especially in emerging markets

Air travel growth is set to continue its strong performance. The International Air Transport Association's (IATA's) mid-year economic report was for passenger traffic—measured in revenue passenger kilometers (RPKs)—to grow by 7% in 2018, after increases of 7% and 7.3% in 2016 and 2017, respectively, while freight, measured in freight ton kilometers (FTKs) is expected to grow 4% in 2018, down from 9% in 2017, which, for context, was more than double the 3.6% performance seen in 2016 and the strongest year since the rebound from the global financial crisis. It is little surprise then, that jet fuel has

outperformed most other oil products in registering growth of over 4% in 2016 and 2017, and will continue to perform well, with average growth projected at over 2% to 2025. From the mid-2020s, efficiency gains can be expected to accelerate, bringing growth to nearer 1% on an average annual basis by 2040. Although growth is expected in all world regions, OECD markets will no longer dominate longer term: from holding 65% of the jet fuel market in 1995,

OECD's share is now down to 58%. By 2040, IHS Markit expects OECD to account for about 48% of world jet demand, as non-OECD begins to overtake OECD in the mid-2030s. Overall, jet fuel demand will rise from around 8% of total refined product demand in 2017 to over 10% by 2040, for a market size of 9.57 MMb/d compared with 7.43 MMb/d today.



## Recent highs: A price-driven boost?

Although low oil prices have been a major contributor to recent growth in air transportation, price is only part of the picture. With fuel costs running at around a third of overall airline costs, passing on lower oil prices in the form of lower ticket costs has certainly contributed to the strong performance, and jet fuel has a high degree of price elasticity.

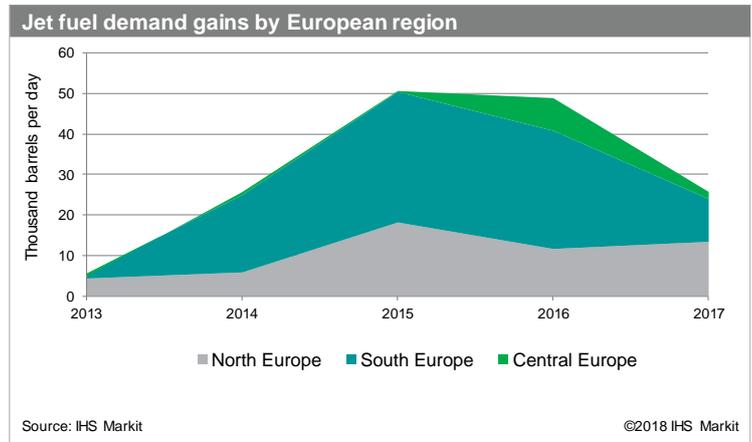
At a global level, increased wealth in the form of rapid expansion of the middle class has had a major impact on air travel, and this can be expected to continue, as about 160 million people—particularly in emerging markets—are set to join the middle class each year to 2025.

Deregulation of air travel, providing greater accessibility, is widely acknowledged to have been a key driver of lower ticket prices, heralding the expansion of air travel in the United States and later Europe, particularly in the form of the low-cost carrier (LCC). Now we see non-OECD markets following a similar path—China, for example, has been undergoing progressive liberalization since the early 2000s, lifting price caps on domestic flights in 2018, while India, deregulated since 1994, continues to work on openness; the country now has the largest LCC sector, seconded by Indonesia, with China running third.

Price competition has also been boosted by internet search capabilities providing price transparency, and the use of regional airports by the LCCs, resulting in expansion of smaller airports, while forcing legacy operators to adapt. LCCs now command a higher market share than legacy operators in some markets, and growth shows little sign of slowing.

## Europe enjoys growth spurt, particularly in the south, but longer term is among the low-growth regions

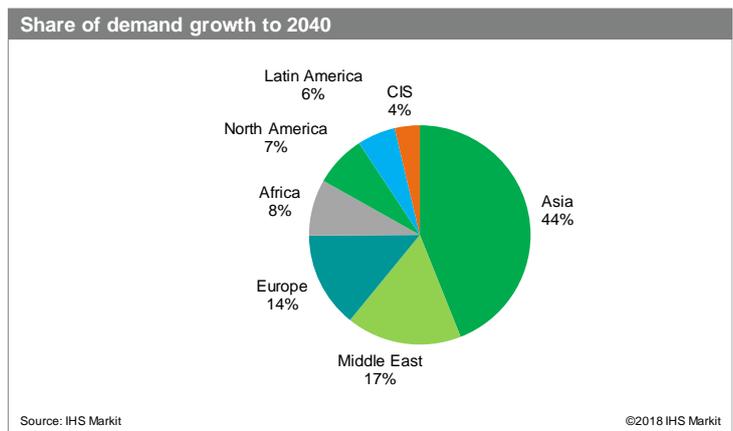
Europe is one of the regions where LCCs now command a higher market share than legacy operators, and this is one of the key drivers behind strong jet fuel demand in recent years. One example of recent strong growth can be seen in Europe—and in particular in Southern Europe, which has registered gains of over 90,000 b/d over the last five years, compared with 50,000 b/d in Northern Europe. This is partly linked to tourism moving away from perceived high-risk destinations in North Africa, and also partly due to intense competition and new routes in the LCC sector. Tourism is not the only driving factor; European freight volumes in FTK terms are forecast to grow by over 5% over the next five years. Europe’s freight sector is dominated by Germany and the United Kingdom, which together account for around 35% of the market’s value, and continue to support North Europe’s steady fuel demand. European LCCs are now looking to enter the long haul markets, adding low price routes to further boost passenger demand.



Furthermore, European countries, although not the highest in terms of airport expansion capex, are investing in airport capacity. The latest IHS Markit outlook shows additional jet fuel requirements of around 300 thousand b/d in Europe by 2040, versus previous iterations, to take account of some major expansions that are now firming up. The recently approved expansion of Heathrow in the United Kingdom is expected to relieve capacity constraints at the world’s largest airport hub, while Germany’s long-delayed Brandenburg airport is now set for launch in 2020. Turkey’s new Istanbul airport, due to open in 2018, will see four phases of expansion, eventually catering to 200 million new passengers, making it the world’s largest single site. Backed by this additional capacity, European jet fuel demand growth rates will be sustained, albeit at more moderate rates than the current highs, averaging 1.4% annually for the next 10 years, then 0.6% to 2040.

## Asia leads longer-term growth outlook, driving non-OECD volumes

By 2022, passenger traffic in emerging economies is expected to surpass that of advanced economies<sup>1</sup>, with most of the growth in Asia Pacific, as this is where the emergent middle class is strongest. Asian air travel is undergoing a major change. Passenger yields have actually declined in recent years, despite the region showing the highest growth in passenger demand. The reason for this is the growth in competition, in particular from LLCs. Chinese airlines are reporting the highest profits in years, as a tourism boom sees more than 5 billion domestic trips (up nearly 13% over 2016) and 129 million overseas



<sup>1</sup> According to ACI (Airport Council International)

trips (5.7% increase), and while higher jet fuel prices may impact results for 2018, China will continue to show one of the highest growth rates of all Asian countries to 2025. Longer term, the IHS Markit forecast is tempered somewhat—and this is mainly owing to the expected completion of new rail links: the Belt and Road Initiative will see modernization of the former Silk Road route, allowing for container transport through Central Asia and on to Europe, disrupting potential for pure GDP per capita/middle class income-based growth in terms of air transport, particularly in the freight sector. Already, reports suggest that in 2017, in part due to upgrading works in Kazakhstan, 180,000 tons of cargo travelled from China to Europe by train, versus 700,000 tons by air—prior to 2013, this trade was non-existent.

India, currently the fourth-largest aviation market globally, is another market with high growth potential, with ambitious plans to double capacity at its airports, with massive investments in both state and private airport developments. Indian airports are currently straining to cope with skyrocketing growth in passenger demand, with the fastest expansion of all countries. However, continued double-digit passenger growth rates will see the country reach capacity by 2022 or earlier, according to the Centre for Aviation (CAPA). Investment to the tune of \$36–45 billion has been cited as necessary to meet growth of additional 500–600 million passengers, nearly double the current number of airport users. Mumbai's second airport, scheduled for a 2019 start, will be a mere drop in the ocean at 60 million passengers by 2030. Government plans are for a \$60 billion spending spree to double its own airport capacity longer term, but these plans appear overly ambitious in view of land acquisition and approvals, raising capital and investment, and the country's prior record of meeting large-scale infrastructure goals—the IHS Markit forecast reflects a tempered approach to relief of capacity constraints, with upgrade works at existing locations more likely than major new sites, pending concretization of larger projects.

Elsewhere in Asia, plans are also afoot for increasing capacity. Indonesia, which recently inaugurated a new 6.9 million passenger terminal (with possible capacity extension to 15.4 million passengers by 2037) at Semarang, is looking to site the 'New Jakarta' airport to complement the existing Jakarta Soekarno-Hatta site for an additional 70 million passengers by 2020, a goal that also seems ambitious at least within the proposed timeframe. Southeast Asia is boosting capacity, with Airports of Thailand planning \$3.9 billion investment in two airports in an attempt to cater to double-digit predictions for passenger transport by 2025—serving 10 million passengers. Japan's current surge in tourism will also support demand in North Asia; Japan Air is launching an LCC subsidiary aimed at capturing market share in southeast Asia initially, but also potentially entering long haul to Europe, which should help ensure that the Japanese jet market remains positive for the next five years, and this despite operating some of the most fuel-efficient fleets in the region.

## Middle Eastern growth driven by connectivity, mega-hubs

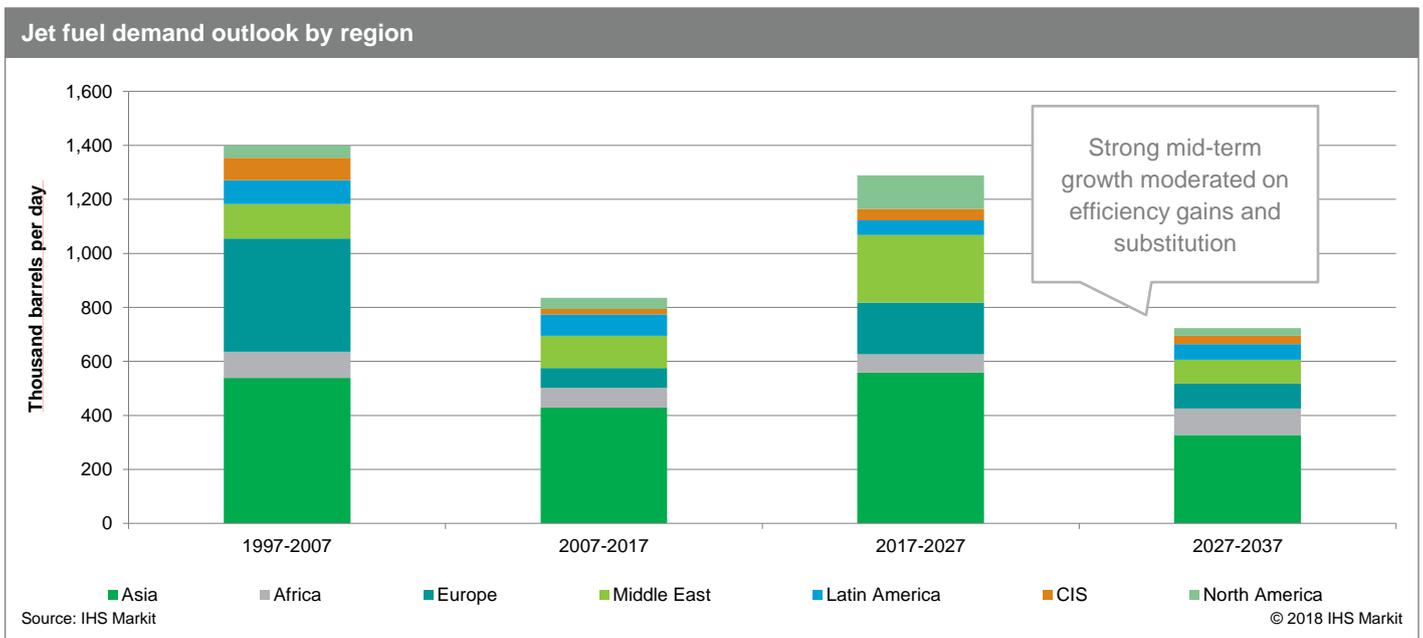
The next largest contributor to growth is the Middle East, with approximately 340,000 b/d growth to 2040, gaining a 2% market share to reach 9% of global jet demand. Recent jet fuel demand in the region has proven resilient, despite the recent severing of ties between Gulf nations and Qatar, with the latter losing about 20% in tourism inflows during the first six months of the blockade. This benefited Kuwait and Oman, which both experienced double-digit growth, absorbing intermediary traffic due to the shutting of air routes from Saudi Arabia, Egypt, and Bahrain; indeed, most Middle Eastern countries are well served in terms of airport capacity.

Future growth will be assured thanks to a major investment round, set to cement the region's role as a hub for new traffic emerging from Asia—rising population and income are not as strong drivers as in Asia, but Gulf States are targeting transit traffic, making the most of the region's geographical position to connect worldwide travelers. New airport construction projects are valued at around \$60 billion. Saudi Arabia alone is expanding or modernizing 27 airports, to keep pace with high growth (7.7% passenger increase in 2017), while the United Arab Emirates (UAE) and Kuwait are also investing large sums. Key upcoming projects include the \$8 billion Al Maktoum International in Dubai (+19 million passengers) and the Abu Dhabi International Airport expansion

(+30 million passengers), while the new terminal under construction at Kuwait International will add a further 25 million passengers.

IATA forecasts a doubling of passenger traffic over the next 10 years, warranting these significant investments. However, hubs in countries like Qatar and the UAE will be able to build on new traffic flows from India, China, and Southeast Asia provided infrastructure is available. To this end, the Middle East is undertaking a host of new airport construction projects, and Gulf carriers have been expanding aggressively.

Growth in the Middle Eastern jet fuel markets, however, will not be as strong as might be expected, as efficiency gains are expected to work through the fleet to a greater degree than in most other world regions. For example, Emirates, Etihad, and Qatar Airways have collectively placed orders for about 200 new fuel-efficient Boeing 777x models, about 70% of the order book—expansion should result in an increase in efficiency versus previous expansions. Overall, Middle East jet fuel demand is nevertheless the fastest-growing, with an annual average rate of 2.2%, growing by 40% versus the current 530,000 b/d market by 2040.



## Underserved markets in Africa to gain attention as infrastructure improves, but CIS and Latin America will stagnate

Second to the Middle East in terms of growth rates, despite a modest 200,000 b/d contribution to overall growth to 2040, is Africa—a region that is currently performing below potential in terms of air traffic demand. The region is expected to see many of its markets top the growth tables in terms of passenger number increases, with some markets doubling in size over the next decade. Funding the infrastructure required to support this growth, however, will remain challenging, as will greater liberalization of the sector, a key stepping stone to realizing the market’s potential. Our growth forecast for Africa is for annual average growth of 2.1% to 2040, a cautiously optimistic outlook in view of the sector’s challenging expansion targets.

With annual average growth rates of 1.41% and 1.28% respectively, CIS and Latin America are expected to register a lackluster performance through 2040, mainly on a lack of construction projects, a lower level of open market access, and uncertain tourism and freight development. Improved economic prospects should provide a

short- to mid-term lift in both regions, but the need for additional capacity at key hubs remains uncertain, and LCCs have yet to provide rich connectivity in Latin America, while Russia's LCCs have been slow to develop owing to a challenging regulatory environment. Nevertheless, strong recent jet fuel demand in Russia has led to a dip in exports to neighboring countries, which are themselves coping with extremely high passenger numbers and a lack of ready supply.

## Regional supply imbalances to worsen

With a strong demand outlook, refiners will be looking to ensure jet yields are high enough to meet demand. With strong jet demand projections, supply will be boosted; our forecast is for supply to reach around 8.7 MMb/d by 2040, compared with just under 6.7 MMb/d in 2017. New refineries and projects will contribute to this supply, but as most new builds post 2025 are expected to be in Asia and the Middle East, markets West of Suez add very little supply.

Europe, for example, already imports over half of its jet fuel requirements, as production fails to keep pace with growing demand. Anticipated refinery closures are expected to exacerbate the supply shortfall, and while diesel demand will ease on reduced passenger car demand, allowing potential for yield increases in jet, this is highly unlikely until the IMO bunker requirements for gasoils settle, post 2021. Our forecast is for Europe's import requirement to grow from about 750 thousand b/d to over 1 MMb/d by 2040, with nearly all of the shortfall to come from the Middle East and Asia—a situation which may leave Europe vulnerable to competition, from other short regions such as Africa and the United States, and also seasonally, as a result of weather-related demand spikes for kerosene for heating grades in North Asia. CIS markets are also potentially vulnerable: already, a spike in Russia's domestic requirements has seen knock-on effects in its export markets in recent years, with Kazakhstan, Turkmenistan, Azerbaijan, and Belarus left short.

As more jet will be needed West of Suez, transportation could also be a potential bottleneck—from sufficient port facilities to receive large cargoes to these markets, to pipelines, storage and trucking for ongoing transportation to airports, which are often located in cities where construction is problematic. Spanish operator CLH, for example, is undertaking a five-year overhaul of aged pipelines in the United Kingdom in order to ensure efficient supplies, while expanding its jet infrastructure in anticipation of increased supplies.

## Fuel efficiency and alternatives will impact demand, but not offset growth

A recent ICCT study on fuel efficiency saw wide gaps—as much as 64%—between airlines in terms of fuel efficiency.<sup>2</sup> Estimating efficiency gains is challenging, as aircraft efficiency is only one factor—load factors, particularly freight load, routing, slot management, improved air traffic systems, and other operational measures also affect fuel usage. IHS Markit uses an efficiency factor to differentiate between high and low efficiency gains on a regional basis, broadly based on fleet renewal expectations—efficiency gains have reportedly been around 1.1% per year on a fuel per passenger-km basis to 2014, but the advent of newer fuel-efficient aircraft such as Boeing's 787-8, 787-9, and 737 Max, and Airbus' A320 and A330neo, for example, could hasten efficiency gains, and take-up of these models is likely to be accelerated in a higher oil price environment. However, renewal of the global fleet is a slow process: on average, a plane will be in service for around 30 years before replacement, and unless oil prices are high, renewal is not necessarily a priority.

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<sup>2</sup> Measured in passenger-kilometers per liter of fuel, ICCT Transpacific Airline Fuel Efficiency Ranking 2016, White Paper.

## Sustainable aviation fuels (SAF): Will lower oil prices aid bio jet penetration? Not without policy support.

SAF is an acronym we can expect to hear a great deal about in the coming years. SAF—low carbon fuels, mainly bio jet produced from sustainable oil crops—are increasingly being touted as a solution to the high emissions levels caused by increased air travel.

Biojet derived from crops such as jatropha, camelina, and algae, or wood and waste biomass can be blended with conventional jet fuel to reduce carbon footprint of air travel by around 80%, while meeting technical specifications. Indeed, there are already multiple American Society for Testing and Materials standards in place for both hydro-processed ester and Fischer-Tropsch produced biofuels.

Despite 10 years of bio jet use—IATA claims that from the first flight in 2008, 100,000 commercial flights have used SAF by 2017—adoption remains limited, and principally consists of demonstration flights or local airport initiatives. The cost of production—typically double that of petroleum-based jet fuel—is prohibitive, and infrastructure investors are hesitant owing to a lack of strong policy support, notably incentives. However, this may change as worldwide efforts to reduce carbon dioxide (CO<sub>2</sub>) emissions gather pace. One initiative launched in 2016, the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), will be implemented beginning 1 January 2019, albeit on a voluntary basis in a first step.

Few countries have sought to implement their own targets; however, Norway is seeking a 1% biojet target by 2019, while Sweden has longer-term aims, a fossil-free aviation sector by 2045, beginning with fossil-free domestic flights as early as 2030. The policy will test the country's ability to leverage large-scale forest residue, and will also target efficiency gains and electrification. Indonesia has implemented a 2% mandate by 2018, while Mexico, which has had a 1% biojet target since 2015, is increasing its target to 4% by 2020. One additional driver may be legislation in Europe—approvals are pending for the use of hydro-processed esters and fatty acids (HEFA+), which could see Neste's renewable diesel process used for biojet use as a 'drop in' fuel. As Europe seeks to remodel its renewables policy under the revised Renewable Energy Directive (RED II), advanced biofuels are expected to benefit from a multiplier of 1.2 against overall targets, which may also incentivize the development and adoption of bio-based alternatives.

Finally, substitution may come from electricity. Although the first e-plane to fly under its own power was developed in the 1970s, there has been little incentive to develop the technology, particularly as—unlike the road

### CORSIA: The 'IMO' for international aviation?

The UN climate initiative is a market-based measure designed to reduce carbon emissions from the international air transportation sector. Offsetting allows a company to compensate for its emissions by financing emissions reductions elsewhere.

- **Target is for carbon-neutral growth from 2020:** Average emission levels are monitored from 2019 to 2020, providing basis point for comparison against which to measure carbon neutral growth in future years.
- **Gradual phase-in:** Pilot (2021–23) and First Phase (2024–26) apply to states that volunteer, while Second Phase (2027–35) applies to all states with exception of smaller developing countries.
- **Single worldwide initiative:** Nature of air travel industry means that national or local measures may be inefficient and provide 'patchwork' approach. The European Union will not automatically forego EU Emissions Trading Scheme regulations, and the United States may disregard, if Paris agreement sets new precedent.
- **Aircraft operators must meet the targets:** Onus is on operators rather than fuel suppliers, with exemptions for operators emitting less than 10,000 tons of CO<sub>2</sub> per year.

and shipping sectors—global initiatives on air emissions have been lacking. While there is certainly development in this area, IHS Markit does not expect penetration to begin until at least 2040, and, similarly to trucking sector electromobility, initial use is likely to be on shorter commuter trips before mainstream adoption for longer-haul flights.

## Higher oil prices could dampen growth outlook

Although jet—along with petrochemicals naphtha demand—is widely acknowledged to be one of the most robust refined product markets in the medium to long term, some caution must be exercised, as several factors may come in to play to offset population and income-based forecasts of future demand. The sector is typically vulnerable to exogenous shocks—as seen during the 2009 global economic and financial crisis, when world jet demand fell 5.9%—and the prospect of trade wars, particularly between the United States and China, is being watched carefully, owing to the potential for erosion of an otherwise healthy outlook for the freight sector.

Most important, however, is the oil price outlook, as oil prices account for around 30% of airline operating costs. Initially, a lift in prices is expected to result in the culling of newer marginal routes, with operators seeking to boost passenger and freight yields in a first step. Longer term, however, high oil prices could dramatically impact airline profitability, potentially squeezing out some of the LCCs and reducing competition on prices, resulting in higher ticket prices or fuel surcharges, dissuading leisure travel in particular. Already in recent years—and without elevated oil prices—high-profile LCCs such as Monarch and Air Berlin entered bankruptcy owing to stiff regional competition.

Jet fuel prices are also vulnerable to increased demand on diesel. An unprecedented change is about to take place in the shipping industry, as IMO regulations call for low sulfur fuel to be used as bunker fuel in all regions – to date, one of the expected mitigation policies—installation of scrubbers to remove sulfur from HFO on the ship itself, has been slow to emerge, resulting in the necessity of ships to switch to diesel. Increasing diesel requirements, and higher diesel prices, will potentially squeeze jet production, resulting in even higher prices than those a ‘business as usual’ scenario would entail.

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