

World Oil Outlook 2045

African Energy Week

Presented by OPEC Secretariat
African Energy Week, 9-12 November 2021



OPEC WOO - essential and detailed analysis of the prospects for the global oil industry

The WOO is one of OPEC's **flagship** publications, combining the **expertise** of the OPEC Secretariat and **professionals** in OPEC Member Countries.

The WOO is now also available as an **APP for Android and iOS**.



- Key assumptions
- Energy demand
- Oil demand
- Liquids supply
- Oil refining and trade
- Oil-related critical uncertainties
- Key takeaways

Key assumptions



- **COVID-19** is broadly contained
- The global population is expected to increase by **1.7 billion**, from around 7.8 billion in 2020 to **9.5 billion by 2045**.
- Growing **urbanization** and **labor productivity**, aging population and migration affect future economic growth
- **Tightening** of energy policy measures evident – but not to the extent of achieving major policy targets such as net zero growth by mid-century
- **No** major **technology breakthroughs** – but lower costs of renewable energy, battery cost; continued efficiency improvements across all sectors of consumption
- Faster **penetration of EVs** compared to past Outlooks - but ICEs remain the leading technology
- **Renewables**, led by wind and solar, expected to gradually **displace** mostly coal, as well as some natural gas and oil-fired electricity generation
- **Hydrogen** emerging as a new energy carrier

Global GDP growth between 2020 and 2045 is expected to increase at an average rate of 3.1% p.a.



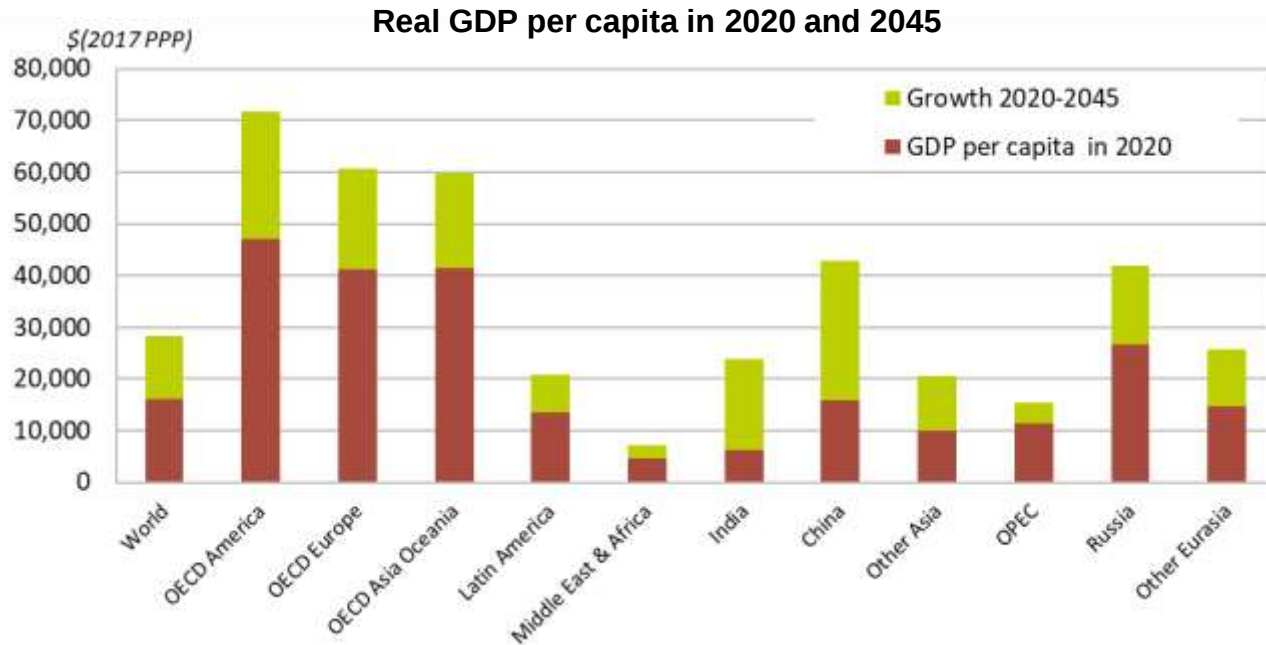
- Growth driven by **non-OECD** countries with **3.9% p.a.** growth on average
- **India** is expected to remain the **fastest growing** major developing country with average growth of **6.2% p.a.**
- **China** is expected to be the **second fastest growing** major economy, with average growth of **4% p.a.**; a maturing economy sees growth **decelerate** to **2.8% p.a.** from 2035-2045
- **Middle East & Africa** growth is estimated to average **3.9% p.a.** due to rise in populations and increase in middle class

Long-term annual real GDP growth rates (% p.a.)

	2020-2026	2026-2035	2035-2045	2020-2045
OECD Americas	2.9	2.0	2.0	2.3
OECD Europe	2.4	1.4	1.3	1.6
OECD Asia Oceania	1.9	1.2	1.0	1.3
OECD	2.6	1.7	1.6	1.8
Latin America	2.7	2.4	1.9	2.3
Middle East & Africa	3.2	3.9	4.4	3.9
India	6.9	6.3	5.5	6.2
China	6.1	4.0	2.8	4.0
Other Asia	4.6	4.0	3.0	3.7
OPEC	2.7	3.1	3.2	3.0
Russia	2.0	1.6	1.3	1.6
Other Eurasia	2.9	2.5	2.0	2.4
Non-OECD	4.8	4.0	3.4	3.9
World	3.8	3.1	2.7	3.1

Source: OPEC

Global average income is projected to rise from \$16,000 (2017 PPP) in 2020 to more than \$28,000 in 2045



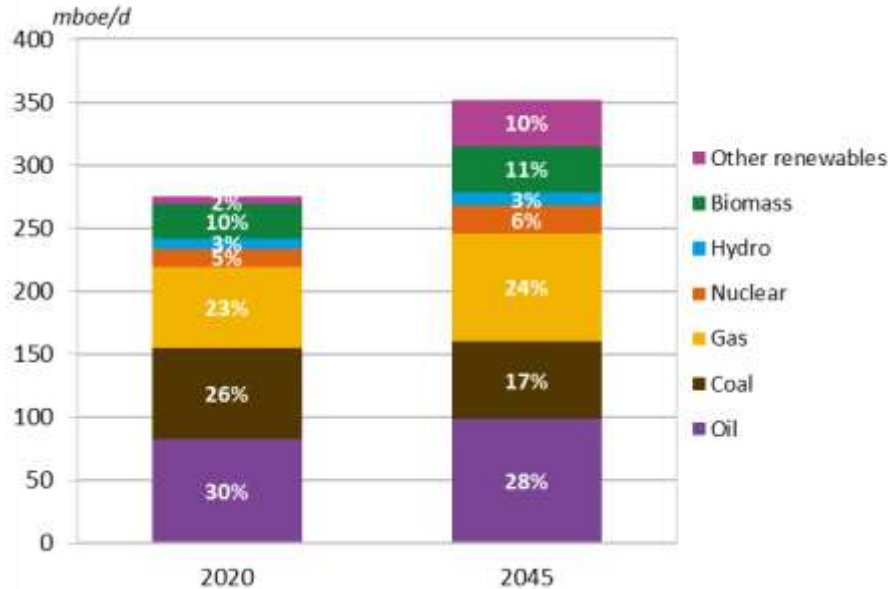
- **OECD Americas** is forecast to remain as the region with the **highest** GDP per capita
- **Middle East & Africa** will still have the **lowest** GDP per capita at less than \$10,000 in 2045

- Key assumptions
- **Energy demand**
- Oil demand
- Liquids supply
- Oil refining and trade
- Oil-related critical uncertainties
- Key takeaways

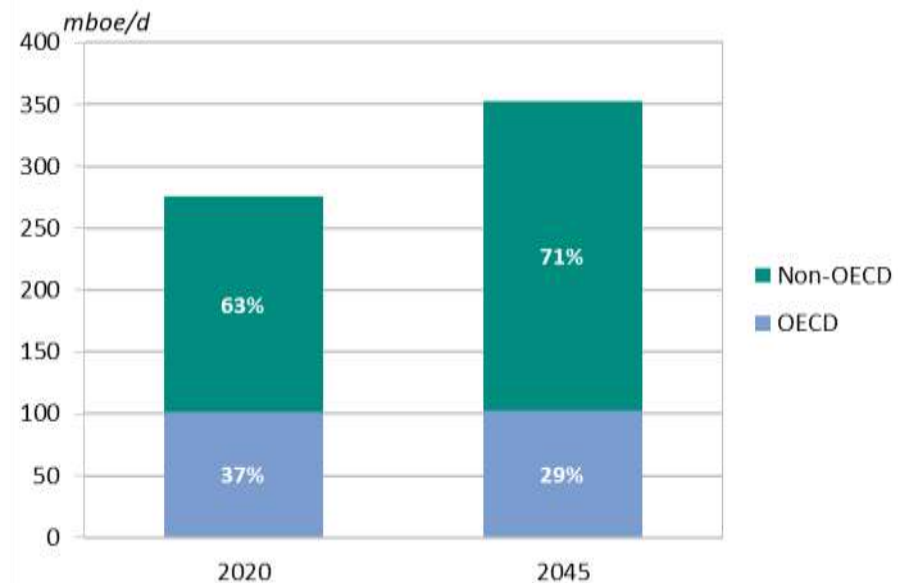
Global energy demand is set to increase by 28%, from 275.4 mboe/d in 2020 to 352 mboe/d in 2045



Primary energy demand by fuel



Primary energy demand by region

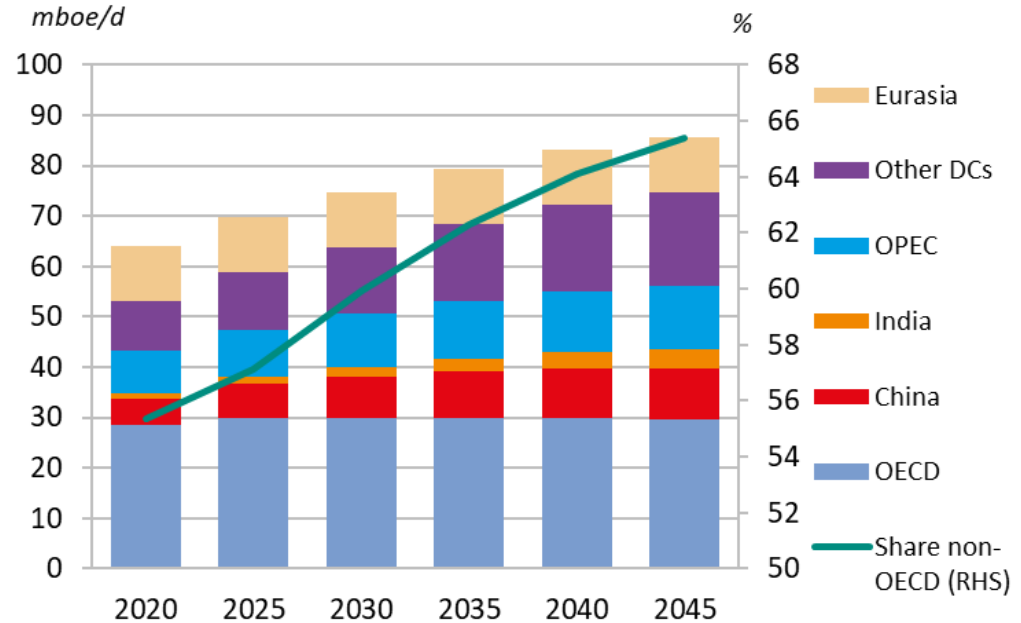


- Oil will **maintain its largest share in** the energy mix in the period to 2045
- Entire growth in energy demand will come from **non-OECD**

Natural gas is set to displace coal as the second-largest fuel share in the energy-mix

- Natural gas is the only fossil fuel that is set to increase **in both OECD and non-OECD** for the outlook period
- Natural gas is set to increase from 64.2 mboe/d in 2020 to 85.7 mboe/d by 2045, representing **24.4% of the global primary energy-mix in 2045**
- **Non-OECD** to account for a **65.4% share** of the global natural gas demand by 2045

Growth in gas demand by major regions, 2020 – 2045

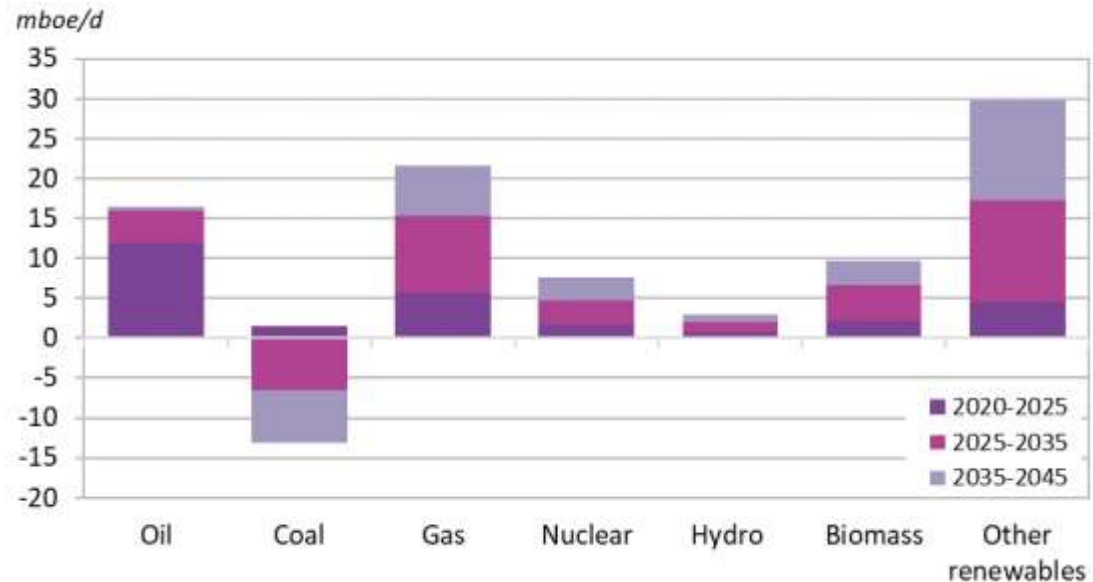


Other renewables and natural gas continue playing a significant role in the evolving energy mix



- Supported by energy policies, **other renewables** continue to expand adding almost **30 mboe/d** in the long-term
- Gas** continues growing to provide the second largest addition, increasing by almost **22 mboe/d**
- Oil** grows **strongly** in the short- and medium-term before **demand plateaus in the long-term**
- Declining **coal** demand

Growth in primary energy demand by fuel, 2020-2045

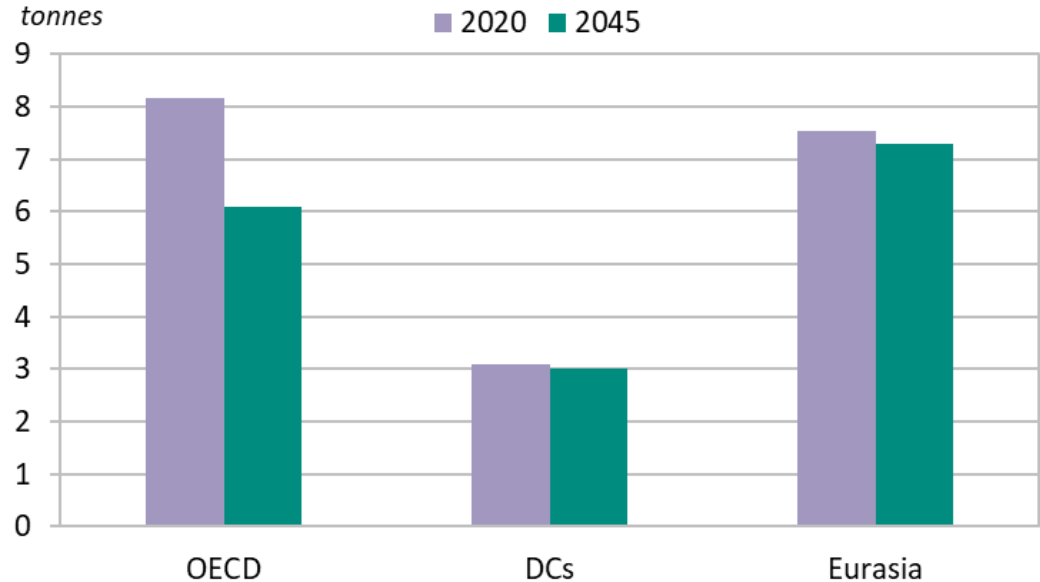


On a per capita basis, energy-related CO₂ emissions in OECD decline to 2045, but are still higher relative to developing countries



- Developed countries emitted almost **three times more** energy-sourced CO₂ per capita in 2020 compared to developing countries
- Emissions in developing countries are **stable** at around 3 tCO₂, in line with rising population

Per capita CO₂ emissions by major regions, 2020 and 2045

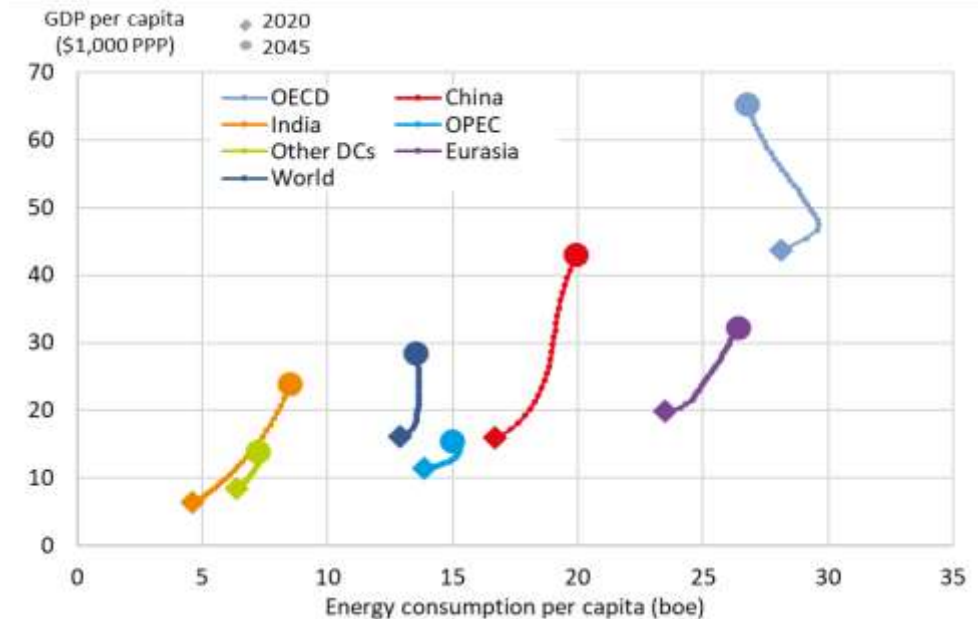


Energy poverty will continue to decline, but remains an issue



- The **gap** between energy consumption per capita in the OECD and non-OECD **narrows**, but **significant differences remain**
- **India** followed by **China** will have **highest** energy consumption and GDP growth rate

Energy consumption per capita vs. GDP at PPP per capita, 2020-2045



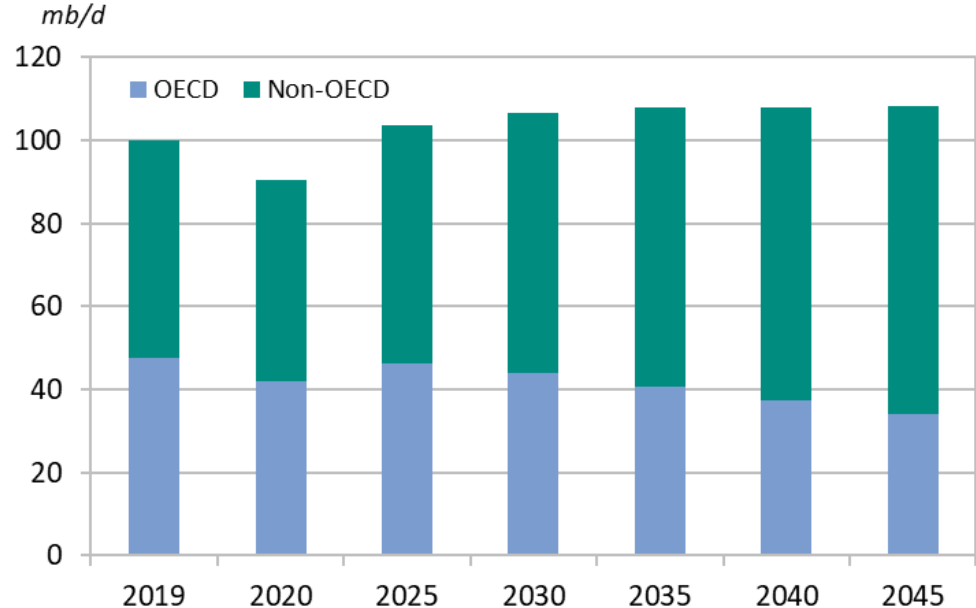
- Key assumptions
- Energy demand
- **Oil demand**
- Liquids supply
- Oil refining and trade
- Oil-related critical uncertainties
- Key takeaways

Global oil demand is expected to increase by 17.6 mb/d between 2020 and 2045



- Incremental demand by 2026 is almost **14 mb/d** higher than in 2020 but **only around 4.4 mb/d higher than in 2019**
- Oil **demand growth** will slow significantly after the **medium-term period**
- Oil demand projected to **reach around 108 mb/d** in the long-term
- Growth in non-OECD** region (+25.5 mb/d) will be partly offset by **declines in the OECD** (-7.9 mb/d)
- Largest incremental demand in India (6.5 mb/d), Other Asia (4.8 mb/d), OPEC (3.9 mb/d) and China (3.8 mb/d)

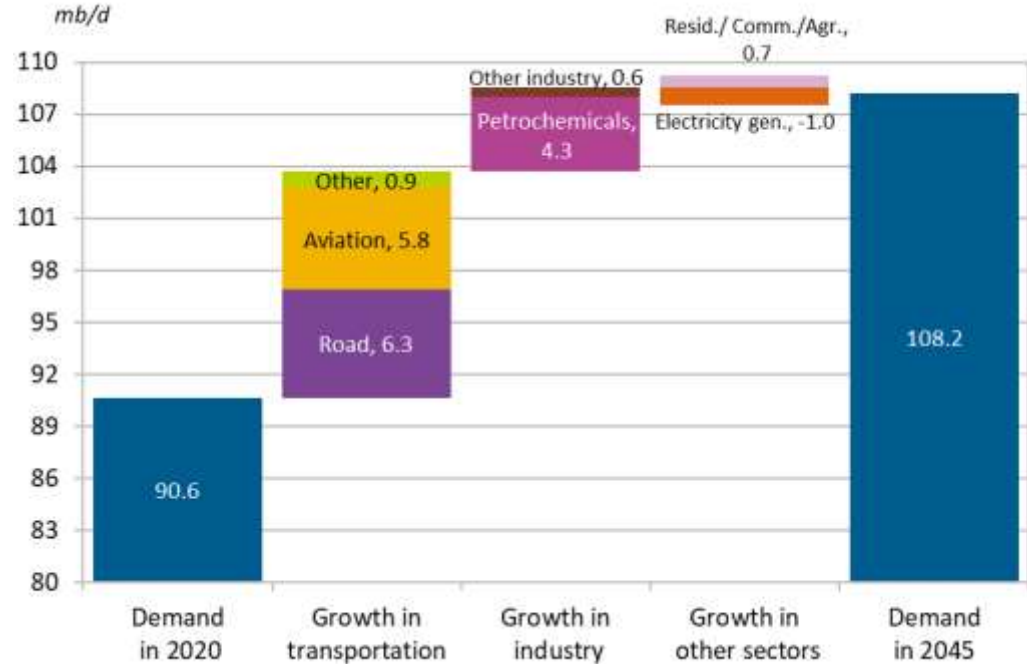
Oil demand by region



Significant demand increase projected from road transportation, aviation and petrochemicals sectors

- Pattern in the sectoral growth strongly depends on the base year due to different **impact of COVID-19**
- Compared to 2020, demand growth is dominated by **transport sector**
 - Road transport +6.3 mb/d
 - Aviation +5.8 mb/d
- Significant demand growth also in **petrochemicals (+4.3 mb/d)**
- **Electricity generation**: oil demand decline of 1 mb/d

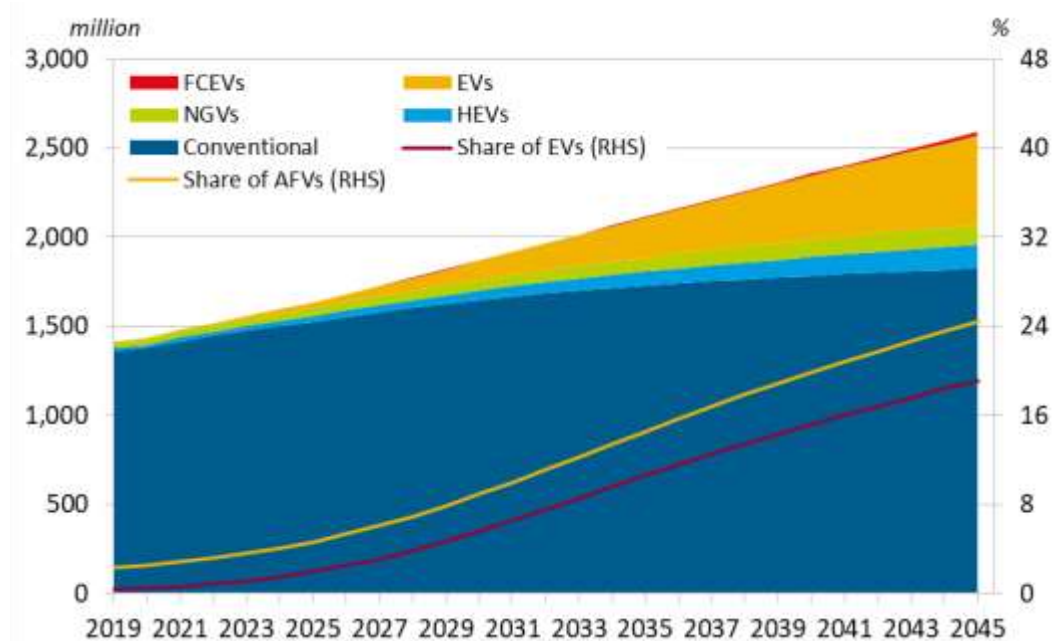
Oil demand growth by sector between 2020 and 2045



Long-term oil demand growth will be limited by growing penetration of electric vehicles

- Total vehicle fleet: **2.6 billion** by 2045
- **EV fleet** will approach **500 million vehicles** by 2045 (almost 20% of the global fleet)
- Some growth is also projected for **NGVs** (+80 million between 2020 and 2045)
- By 2045: **76% ICE** vehicles vs **24% of alternative vehicles**
- Oil demand in the road transportation sector projected to stay in a **narrow range of 46 mb/d to 46.5 mb/d** after 2025

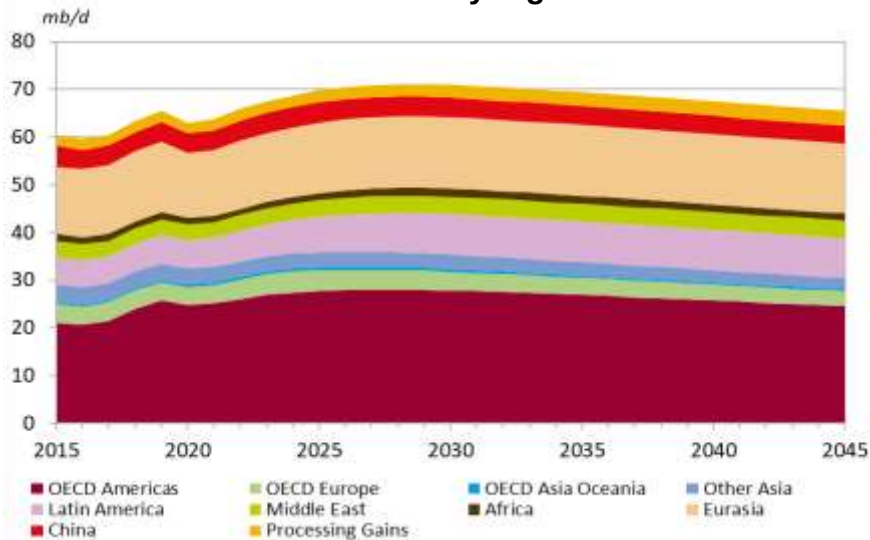
Global fleet composition, 2019–2045



- Key assumptions
- Energy demand
- Oil demand
- **Liquids supply**
- Oil refining and trade
- Oil-related critical uncertainties
- Key takeaways

Oil supply: non-OPEC peaks in late 2020s

Long-term non-OPEC liquids supply outlook by region



Long-term non-OPEC liquids supply outlook by type

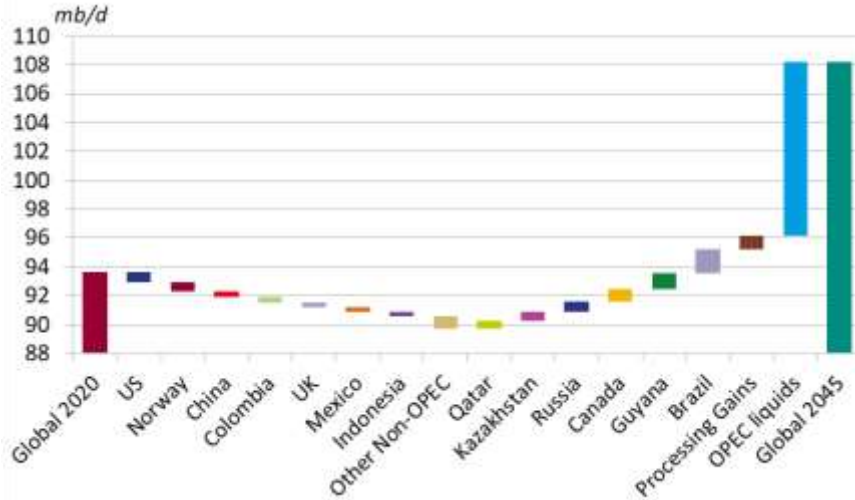
	2019	2020	2025	2030	2035	2040	2045	Change 2020-2045
Non-OPEC	65.5	62.9	69.8	71.0	69.4	67.5	65.5	2.5
Crude	45.8	43.5	48.0	47.5	44.7	41.9	39.3	-4.1
NGLs	11.0	11.2	12.3	13.3	13.8	14.0	14.1	2.8
Global biofuels	2.6	2.4	2.8	3.2	3.5	3.8	3.9	1.5
Other liquids	3.8	3.7	4.1	4.3	4.6	4.8	5.0	1.4
Total OPEC liquids	34.6	30.7	34.0	35.7	38.5	40.6	42.7	12.0
World	100.1	93.6	103.8	106.7	107.9	108.1	108.2	14.6

- **Non-OPEC liquids supply peaks in late 2020s in line with US tight oil**, then slowly declines to 65.5 mb/d by 2045
- Non-OPEC **crude oil falls by 4.1 mb/d in LT**, due to US tight crude, but also mature base in other non-OPEC
- All other non-OPEC liquids increase, led by **NGLs**, which **grow by 2.8 mb/d**

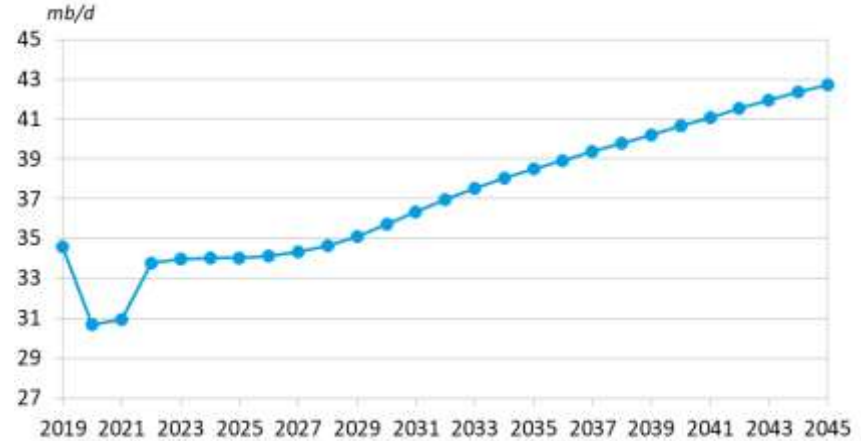
OPEC liquids to rebound and grow from late 2020s



Composition of long-term global liquids supply growth, 2020-2045



OPEC liquids supply

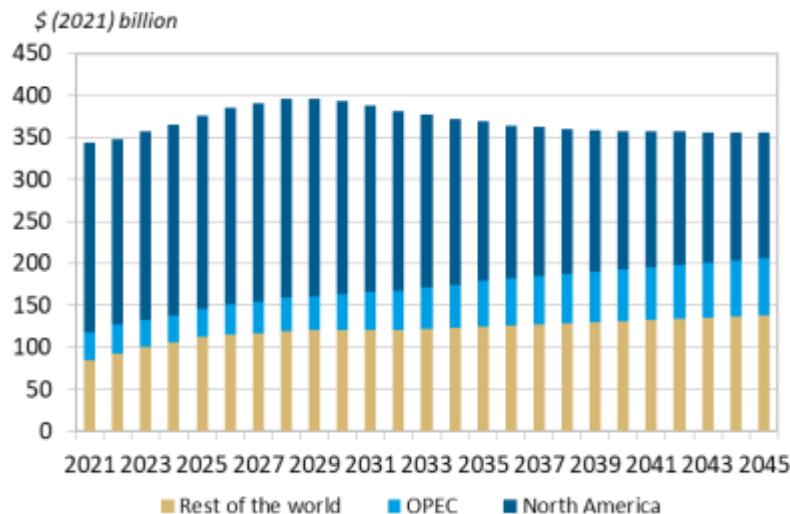


- As in previous WOOs, the **handful of LT sources of non-OPEC growth** (led by Brazil, Guyana, Canada et al) are largely **offset by decline in other non-OPEC** countries (e.g. US, Norway, China etc)
- **OPEC liquids rebound** after 2020 adjustments, settling at around 34 mb/d in the mid-2020s
- After non-OPEC supply peaks in late 2020s, **OPEC liquids see potential to grow to 42.7 mb/d** by 2045

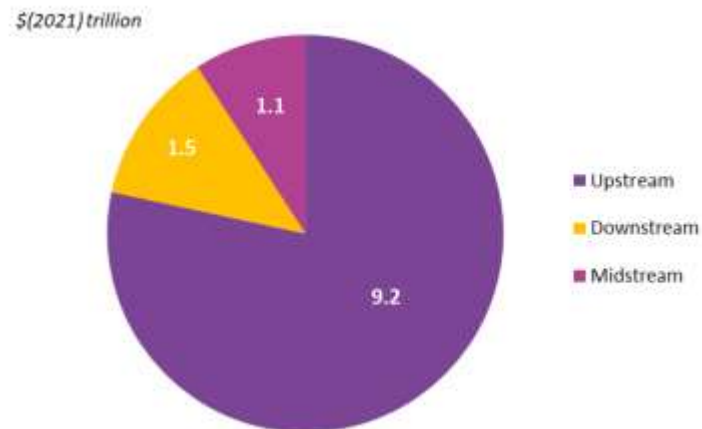
Cumulative long-term oil-related investment needs are \$11.8 trillion



Required annual upstream investment in oil



Cumulative oil-related investment requirements by sector, 2021-2045



- **Cumulatively, \$9.2 trillion (in 2021 dollars) will be required for long-term upstream investment** in order to meet demand needs.
- Added to \$1.5 trillion required in the downstream, and \$1.1 trillion in the midstream, **total oil-related investment requirements over the long-term will be \$11.8 trillion.**

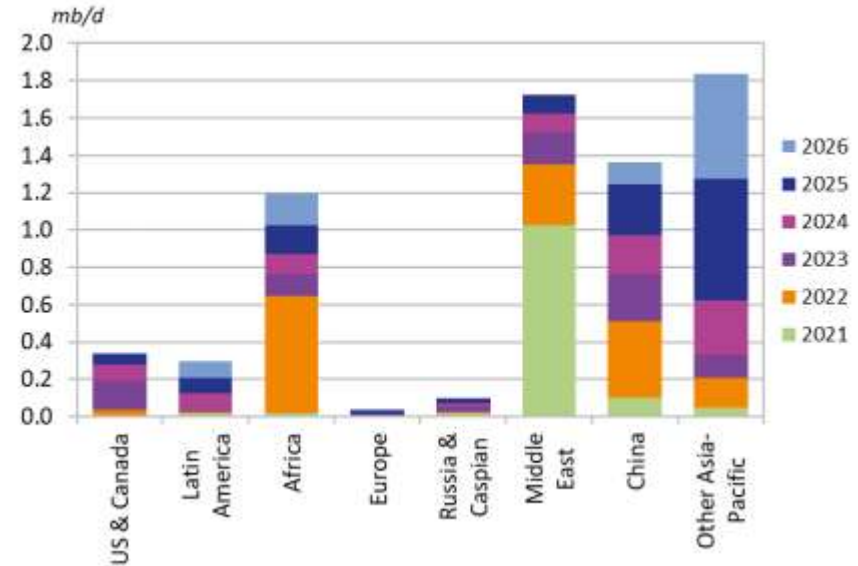
- Key assumptions
- Energy demand
- Oil demand
- Liquids supply
- **Oil refining and trade**
- Oil-related critical uncertainties
- Key takeaways

6.9 mb/d of new refining capacity scheduled to come online by 2026

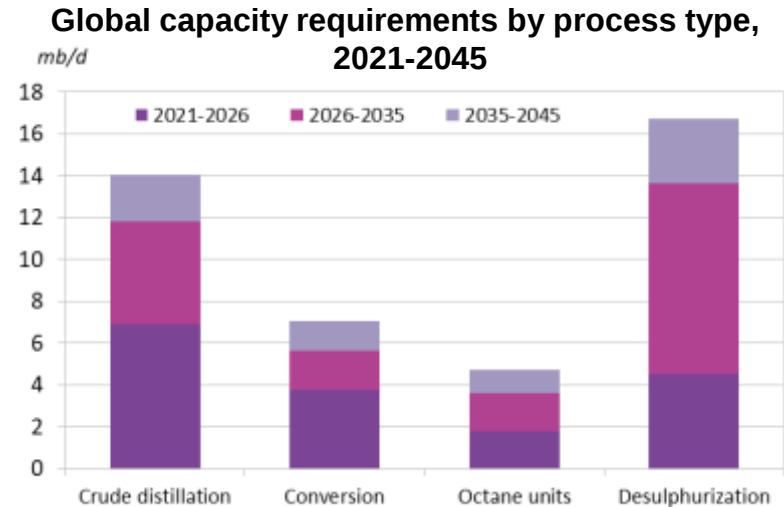
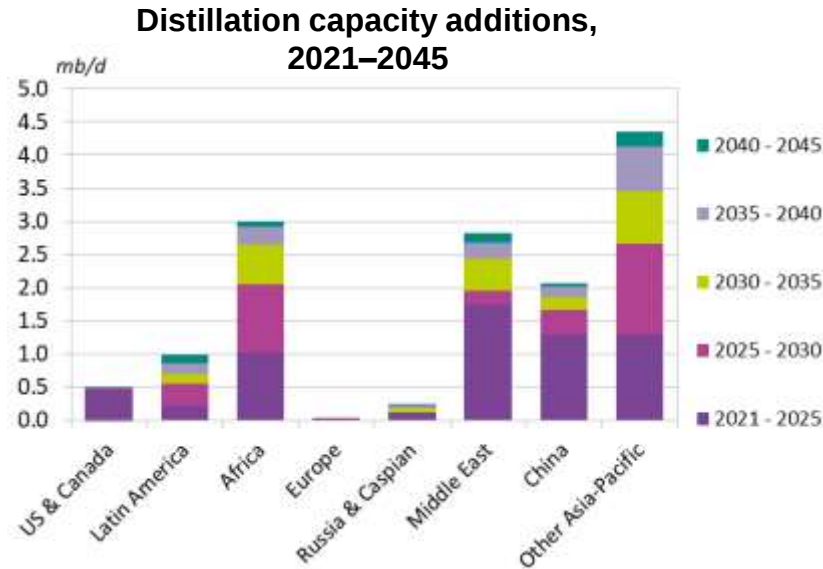


- **Nearly 90%** of the medium-term additions located in Asia-Pacific, the Middle East and Africa
- Several new projects have strong focus on **petrochemicals**
- Depending on the demand pathway in the medium-term, some projects could slip to beyond 2026

Distillation capacity additions, 2021–2026



Crude distillation capacity additions at 14 mb/d accompanied by significant additions in secondary units



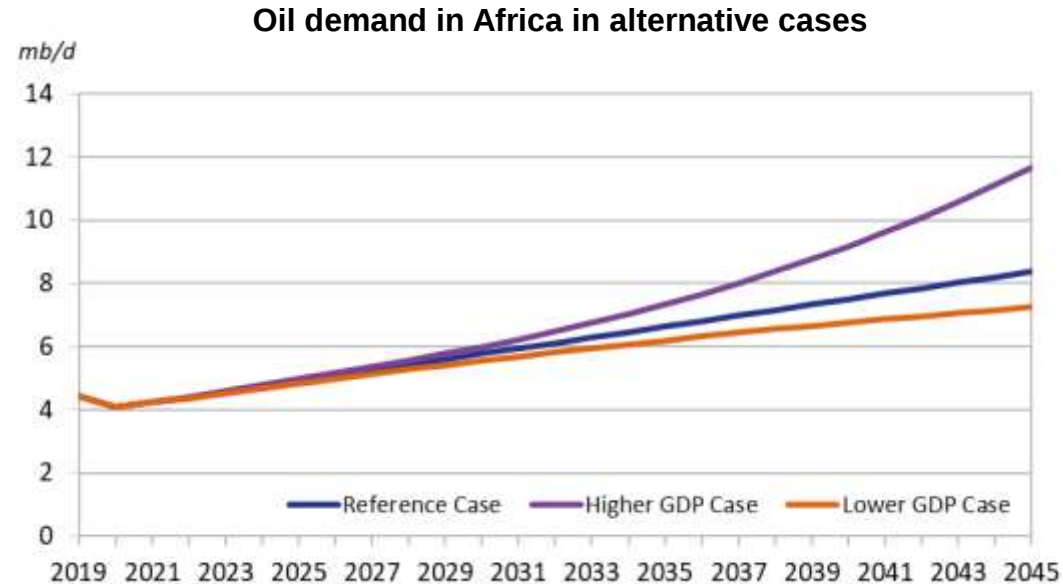
- Distillation capacity additions mostly in **developing countries** with a significant **slowdown** towards the end of the outlook period
- Product specifications and heavying of the crude slate in the long-term will drive secondary capacity additions

- Key assumptions
- Energy demand
- Oil demand
- Liquids supply
- Oil refining and trade
- **Oil-related critical uncertainties**
- Key takeaways

Oil demand in Africa could be as high as 12 mb/d by 2045



- African oil demand will likely be just **marginally affected** by alternative GDP cases during the **medium-term**
- **Substantial** effect in the long-term, especially in the **Higher GDP Case**:
 - difference to RC will expand to 0.7 mb/d in 2035 and 3.3 mb/d in 2045
- Much lesser effect in the **Lower GDP Case**:
 - Oil demand around 1.1 mb/d lower than in the Reference Case in 2045



Oil demand and supply uncertainties rise



- Considering **alternative GDP growth**: the range of demand uncertainty is **almost 13 mb/d in 2045**
- **Africa** could play an important role in supporting higher economic growth in the long-term; oil demand in Africa could be as high as 12 mb/d by 2045
- **Additional policy** measures supporting **faster fuel substitution** and penetration of more efficient **technology** could push global oil demand below 100 mb/d by 2045
- Supply risks are heavily skewed to the **downside**
- Current policy debate could further exacerbate demand uncertainty
- **Energy poverty** remains a global issue which **needs to be addressed**

- Key assumptions
- Energy demand
- Oil demand
- Liquids supply
- Oil refining and trade
- Oil-related critical uncertainties
- **Key takeaways**

Key figures in context

- The global **population** will grow by 1.7 billion people by 2045 or **5 times** the current population of the **US**
- The **world economy** is set to more than **double** in size between 2020 and 2045
- Global **energy demand growth by 2045** in the long-term is **two times larger** than current **EU** energy demand
- However, **per capita energy consumption** in developing countries is still **far below** OECD levels in 2045
- Global **oil demand growth** by 2045 is equal to the **combined** current demand of **China and India**
- Current combined supply of the **six largest oil producers**¹ needs to be added by 2045 to meet both **long-term demand** and **to offset natural decline**
- **56 new medium-sized grassroots refineries**² will be required in the long-term, mostly in developing countries

¹US, Saudi Arabia, Russia, Canada, China and Iraq

²capacity of 250,000 b/d

Key takeaways



- **Oil will remain the no. 1 fuel in the long-term**, even as the energy mix evolves
- **Renewables are growing fastest**, thus making the energy mix more **diversified**, but face substantial economic, technological and infrastructural challenges to scaling up
- **Climate challenges are huge**, but need to be balanced with economic recovery, an equitable transition and eradicating energy poverty
- **Sustained and large investments are needed** to ensure ample oil supplies and avoid market volatility
- The evolution of **energy policies related to emissions reduction** remains key to understanding our energy future
- **Different possible trajectories** for policy, economic development and technology mean **significant uncertainties remain**

THANK YOU