



RYSTAD ENERGY

COVID-19 REPORT

7TH EDITION

GLOBAL OUTBREAK OVERVIEW AND ITS IMPACT
ON THE ENERGY SECTOR

22 APRIL 2020

OPEN ACCESS

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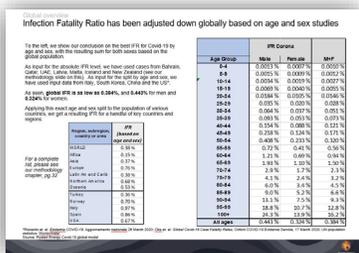
Methodology

Herd immunity will take too long, suppression until a vaccine arrives is a more likely strategy

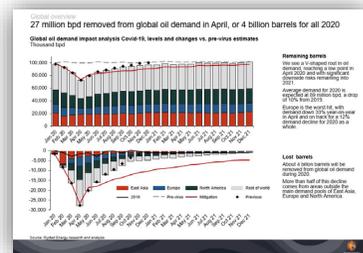
Countries outside of East Asia have now spent eight weeks desperately battling the Covid-19 virus, and our model suggests the true number of infected cases is around 47 million, or 0.6% of the global population. In some regions, such as in Northern Europe, up to 5% of the population is likely now infected. At peak in early March, 0.5% of the population in broader regions like Northern Europe became infected every week. In some countries suffering has been extreme, both in terms of loss of life and due to the economic impact of the lockdowns.

Thus, it seems that achieving herd immunity – meaning that at least 40% of the population has been infected and is immune – would take another 80 weeks, a timeline which could be much longer for some countries. This length of time would be more-or-less the same, or much longer, as the time required to develop a vaccine. We therefore believe that a strategy of continued suppression while waiting for the development of a vaccine will be a more rational strategy than going for herd immunity.

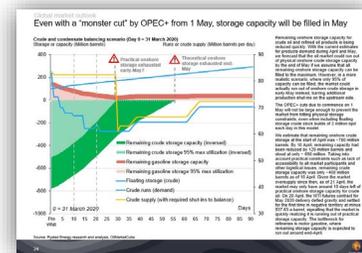
The global reduction in flights and car traffic seems to have reached a floor over the last two weeks, and is likely to slowly trend upwards again going forward. Thus, global oil demand destruction will probably peak in April at around 28 million barrels per day. However, we now expect a slower recovery and longer-term structural shifts that indicate that demand will not return to 2019 levels over next 12 to 18 months, if ever.



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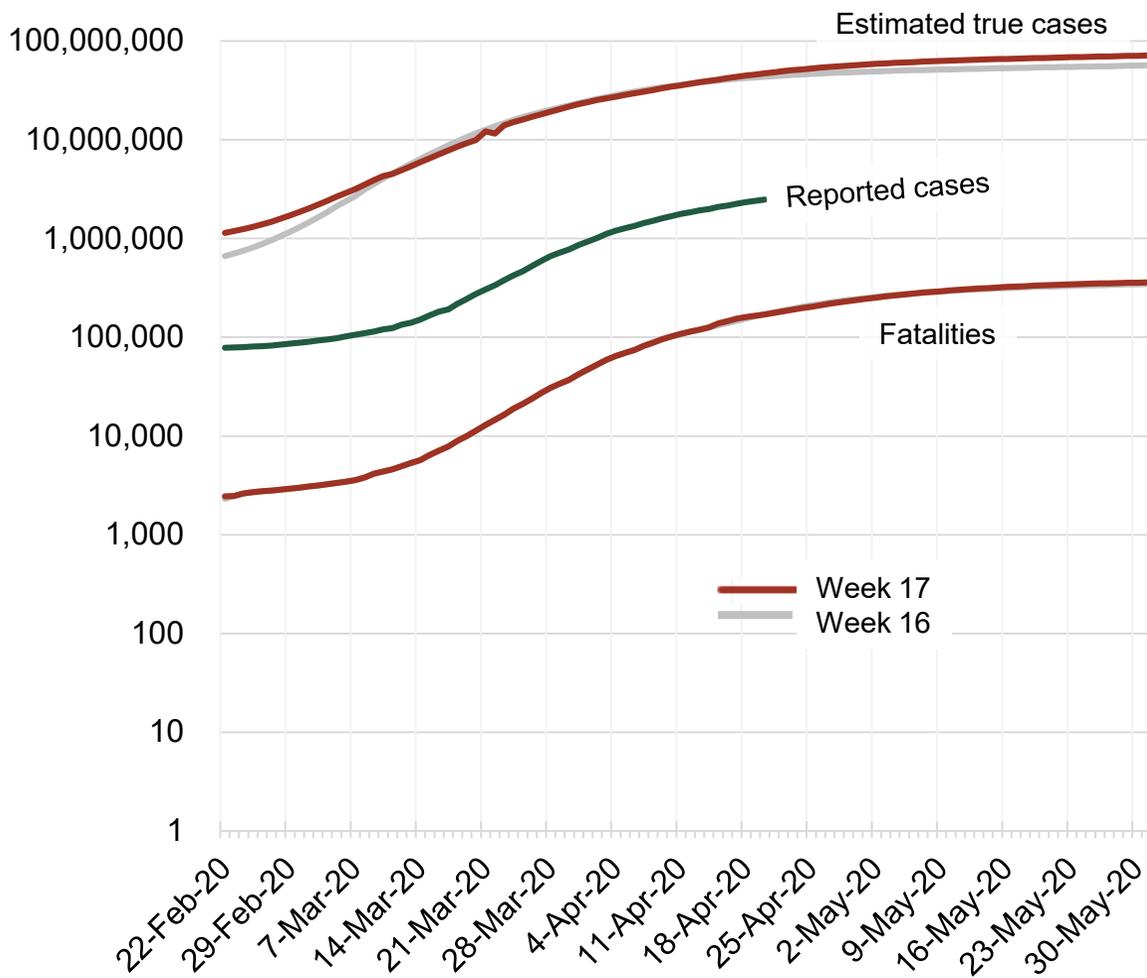
Impact on the oil and gas industry

Methodology

The true number of people infected globally today is likely 47 million

Number of true and reported cases

Cases (log scale)



As of 20 April, 47 million people have likely been infected with Covid-19, according to our updated model.

Reported cases were almost 2.5 million as of 20 April, a number which our analysis suggests represents just 5% of true cases. Reported cases are now growing at around 4% per day (trailing seven-day average), down from 5% last week and 8% the preceding week. This is an indication that quarantine measures are working. Growth is no longer exponential, but now appears linear, with 80,000 new reported cases per day, on average, over the last two weeks, trending slightly downwards.

Registered fatalities globally were 170,000 as of 20 April, a number which grew by 5% over the last week versus the 6%, 10% and 12% growth seen respectively over the previous three weeks (trailing seven-day average).

In this edition we present one scenario, wherein current strict measures are maintained in the forecast period to end of May. In this scenario, 71 million people will be infected across the globe by the end of May.

Source: Rystad Energy Covid-19 research and analysis; Worldometer

Infection Fatality Ratio has been adjusted down globally based on age and sex studies

To the left, we show our conclusion on the best IFR for Covid-19 by age and sex, with the resulting sum for both sexes based on the global population.

As input for the absolute IFR level, we have used cases from Bahrain, Qatar, UAE, Latvia, Malta, Iceland and New Zealand (see our methodology slide on this). As input for the split by age and sex, we have used input data from Italy, South Korea, China and the US*.

As seen, **global IFR is as low as 0.384%**, and **0.443%** for men and **0.324%** for women.

Applying this exact age and sex split to the population of various countries, we get a resulting IFR for a handful of key countries and regions:

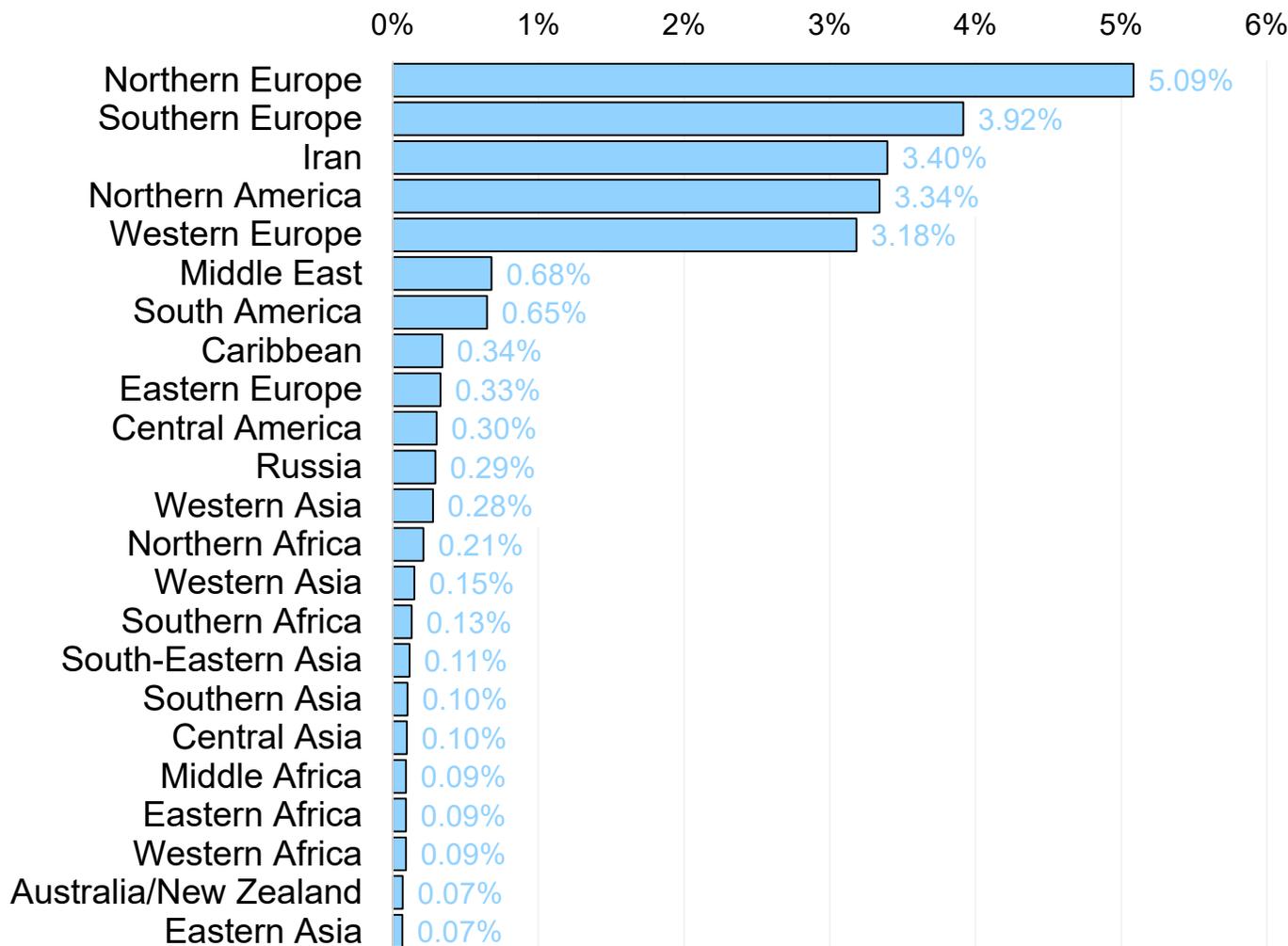
| Region, subregion, country or area | IFR (based on age and sex) |
|------------------------------------|----------------------------------|
| WORLD | 0.38 % |
| Africa | 0.15 % |
| Asia | 0.37 % |
| Europe | 0.76 % |
| Latin Am and Carib | 0.38 % |
| Northern America | 0.68 % |
| Oceania | 0.53 % |
| Turkey | 0.36 % |
| Norway | 0.70 % |
| Italy | 0.97 % |
| Spain | 0.86 % |
| USA | 0.67 % |

For a complete list, please see our methodology chapter, pg.32

| Age Group | IFR Corona | | M+F |
|-----------------|----------------|----------------|----------------|
| | Male | Female | |
| 0-4 | 0.0013 % | 0.0007 % | 0.0010 % |
| 5-9 | 0.0015 % | 0.0009 % | 0.0012 % |
| 10-14 | 0.0034 % | 0.0019 % | 0.0027 % |
| 15-19 | 0.0069 % | 0.0040 % | 0.0055 % |
| 20-24 | 0.0184 % | 0.0105 % | 0.0146 % |
| 25-29 | 0.035 % | 0.020 % | 0.028 % |
| 30-34 | 0.064 % | 0.037 % | 0.051 % |
| 35-39 | 0.093 % | 0.053 % | 0.073 % |
| 40-44 | 0.154 % | 0.088 % | 0.121 % |
| 45-49 | 0.218 % | 0.124 % | 0.171 % |
| 50-54 | 0.408 % | 0.233 % | 0.320 % |
| 55-59 | 0.72 % | 0.41 % | 0.56 % |
| 60-64 | 1.21 % | 0.69 % | 0.94 % |
| 65-69 | 1.93 % | 1.10 % | 1.50 % |
| 70-74 | 2.9 % | 1.7 % | 2.3 % |
| 75-79 | 4.1 % | 2.4 % | 3.2 % |
| 80-84 | 6.0 % | 3.4 % | 4.5 % |
| 85-89 | 9.0 % | 5.2 % | 6.6 % |
| 90-94 | 13.1 % | 7.5 % | 9.3 % |
| 95-99 | 18.8 % | 10.7 % | 12.8 % |
| 100+ | 24.3 % | 13.9 % | 16.2 % |
| All ages | 0.443 % | 0.324 % | 0.384 % |

*Riccardo et. al. *Epidemia COVID-19*, Aggiornamento nazionale 26 March 2020; Oke et. al. *Global Covid-19 Case Fatality Rates*, Oxford COVID-19 Evidence Service, 17 March 2020; UN population statistics; Worldometer
Source: Rystad Energy Covid-19 global model

Still long way to go before herd immunity is achieved



Currently about 0.6% of the global population is likely infected by the virus, despite stringent measures taken across the globe.

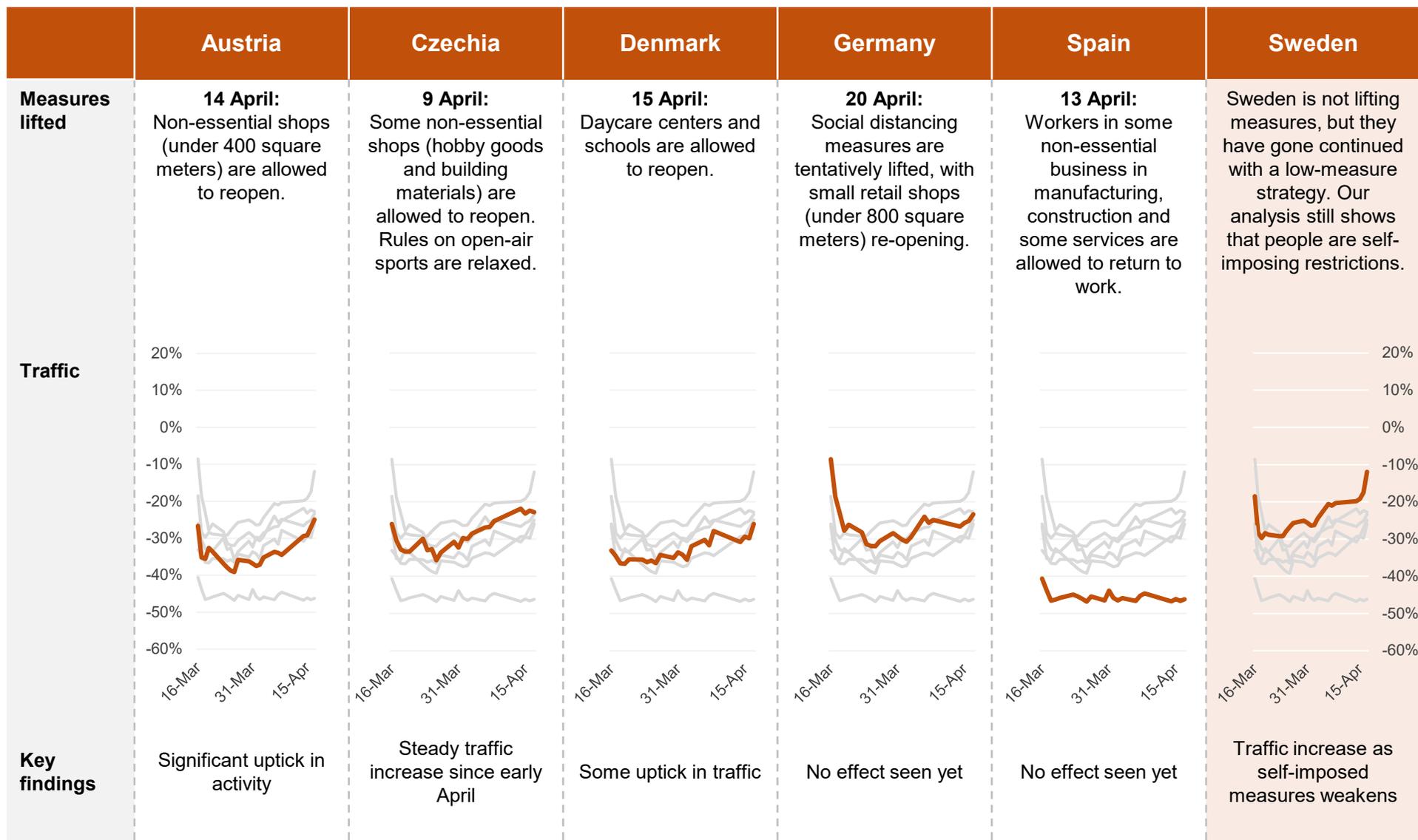
In Europe and North America, we believe 3% to 5% of the population is infected, or up to 0.5% per week at maximum.

To achieve herd immunity, it is likely that more than 40% of the population will need to have been infected. Thus, another 80 weeks, or 1.5 years, would be needed to achieve herd immunity, which is about the same time as the expected time required to develop vaccination.

Thus, a strategy of continued suppression while waiting for a vaccine seems to be the more likely strategy than going for herd immunity.

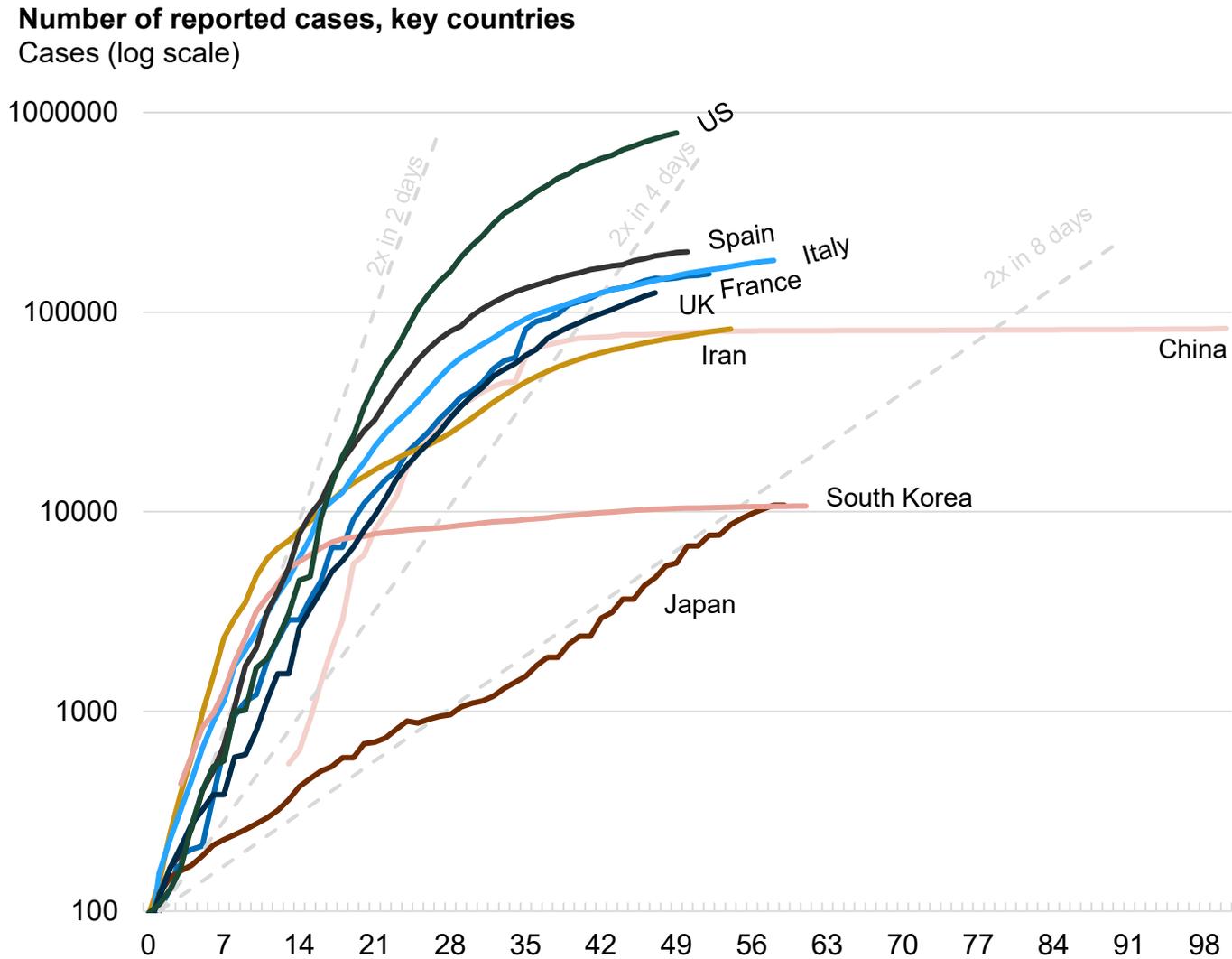
Source: Rystad Energy Covid-19 global model; UN population statistics regions (except for West Asia, split by Iran and rest of Middle East)

Countries easing measures are showing gradual increases in road traffic



Source: Rystad Energy research and analysis; Rystad Energy Global City Traffic Database; TomTom Traffic Index; Google Maps

Spread appears under control as curves flatten, Japan still growing



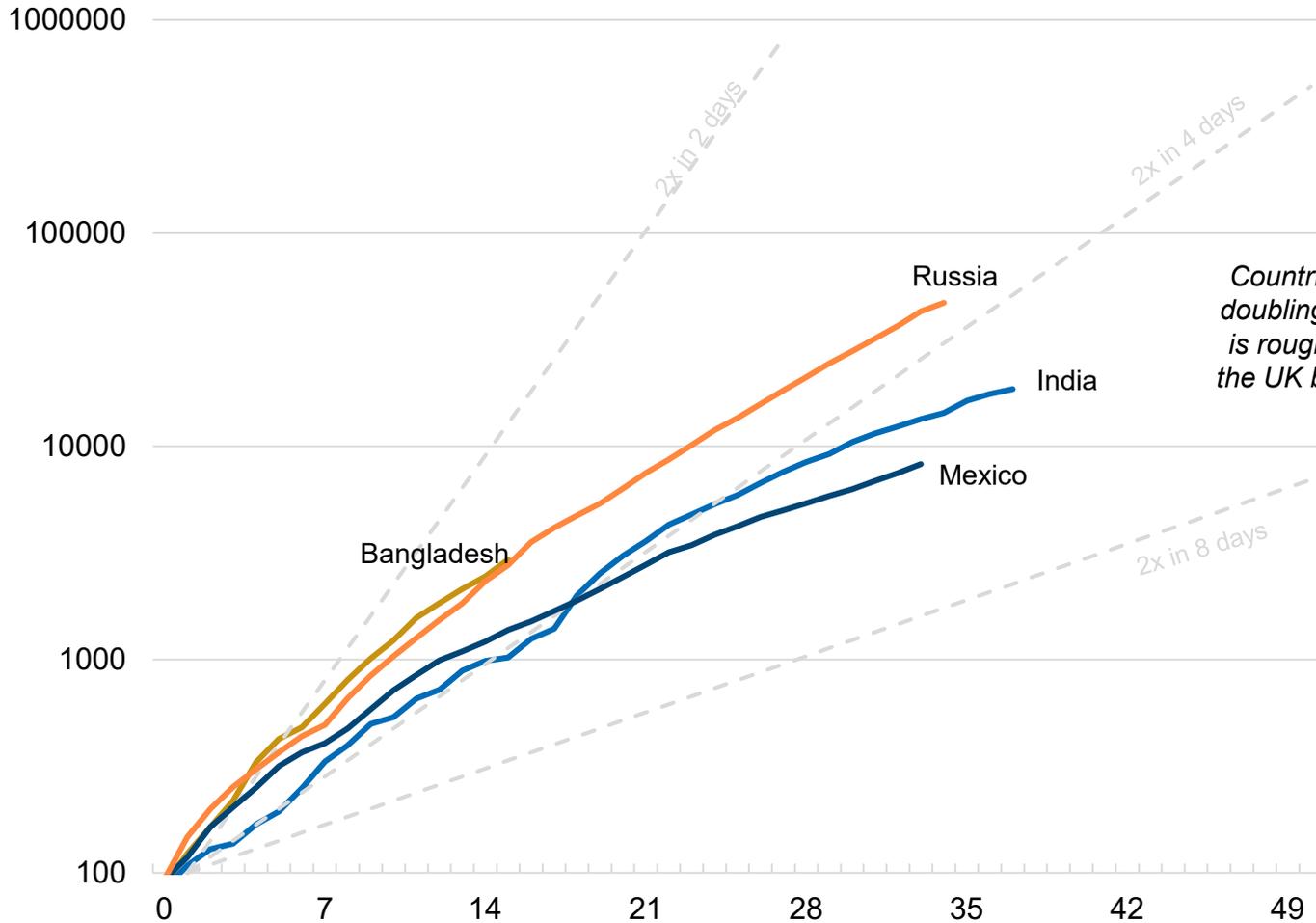
For further details
please see our
Covid-19 dashboard
at rystadenergy.com.

Source: Rystad Energy Covid-19 research and analysis; Worldometer

Virus still appears to be spreading quickly in some countries with populations over 100 million

Number of reported cases, selected countries

Cases (log scale)



Countries are on the path of doubling every 3-5 days. This is roughly the same pace as the UK before measures were implemented.

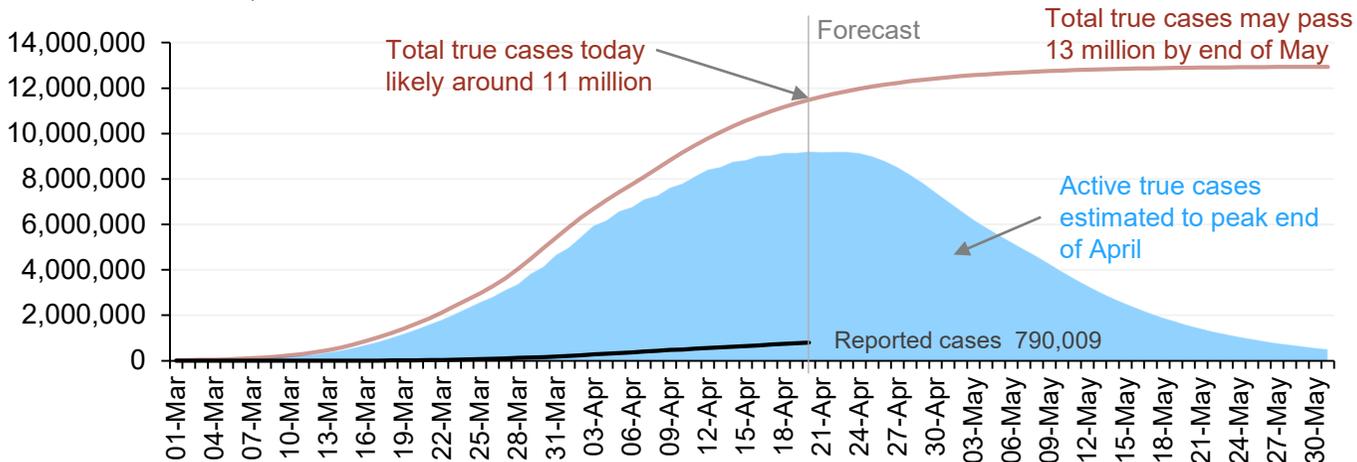
For further details please see our Covid-19 dashboard at rystadenergy.com.

Source: Rystad Energy Covid-19 research and analysis; Worldometer

Active cases in the US may be about to peak, assuming measures are not eased too quickly

United States, estimated total and active true cases

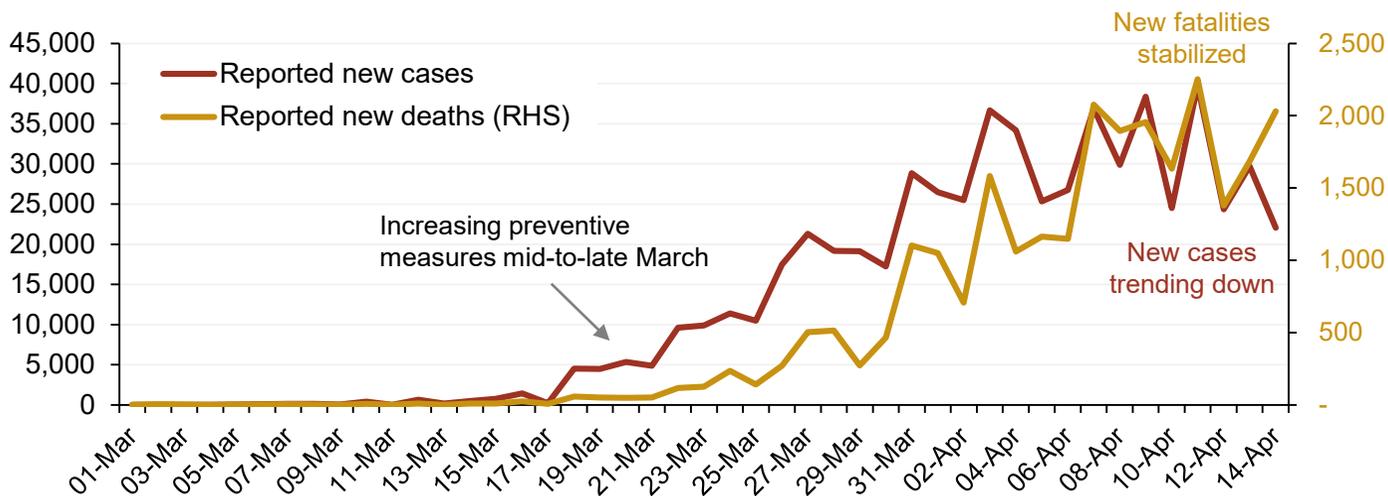
Number of cases; Current measures scenario*



The last step-up in preventive measures in the US came in mid/late March (varying by state), after we had seen a steep increase in the number of reported new cases per day. Reports indicate that 90% of Americans are now “sheltered at home”. Essential business continues, while many companies have reverted to remote work from home where possible.

We can now clearly see the effects of these strict measures in the reported numbers. The number of new cases is trending down and the number of new fatalities has flatlined. In New York state, Governor Cuomo has said that the situation is stabilizing and improving.

Daily new cases and deaths



Our forecast assumes that current preventive measures will remain in place during the forecast period. This may not be the most likely outcome, as the US administration has signaled it will begin easing measures from 4 May. The administration also indicates that the spread is currently at peak and under control. If the administration slowly eases measures, we believe they will probably maintain control.

Please note there are large regional differences between each state and city.

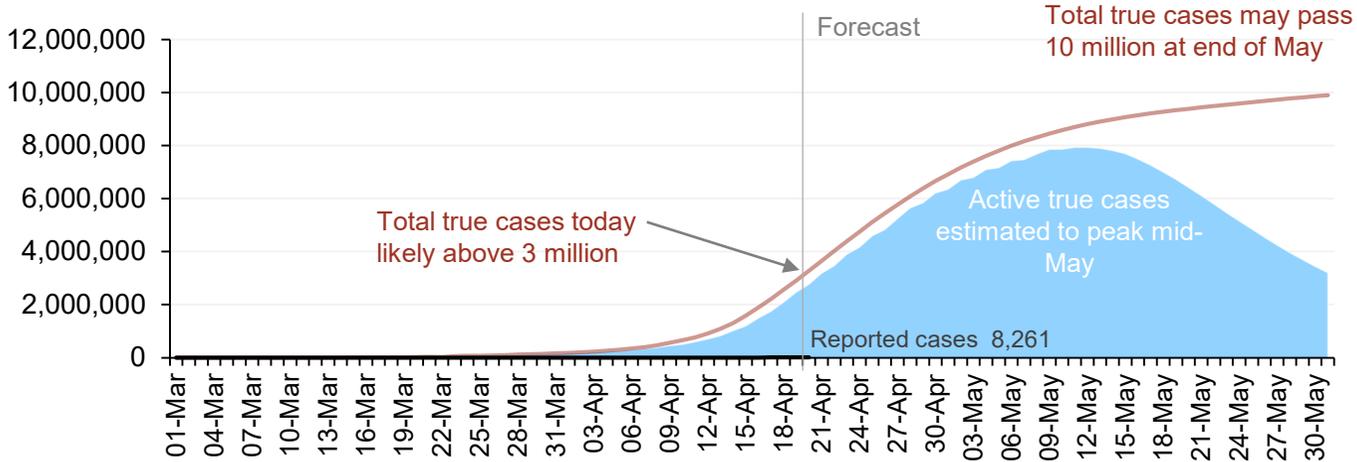
For further details please see our Covid-19 dashboard at rystadenergy.com.

*Assumes current measures remain in place during forecasting interval
Source: Rystad Energy research and analysis; Worldometer

Mexico is still on an upwards trend in new cases, but may be about to stabilize

Mexico, estimated total and active true cases

Number of cases; Current measures scenario*

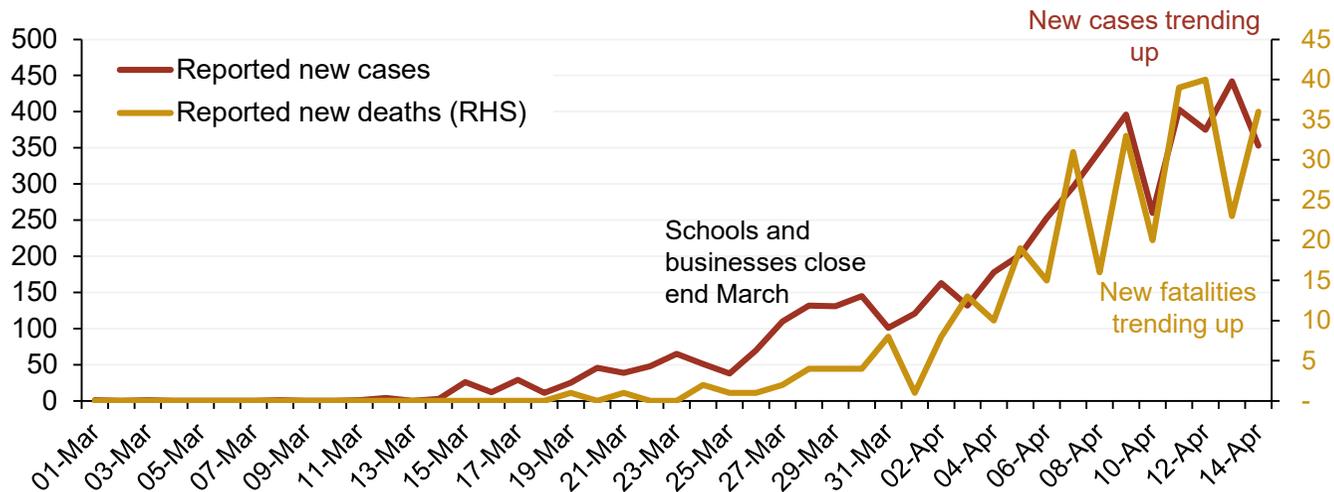


Mexico had its latest increase in preventive measures at the end of March, when schools and businesses were closed down. On 16 April, President Obrador announced that in the 979 municipalities that have not registered one single case, schools may reopen and people return to work on 17 May. Still, the physical distancing policy will be enforced until 30 May.

Reported new cases and new fatalities are still trending upwards, although they seem to have stabilized over the past few days.

Our forecast assumes that the current lockdown will remain in place during the forecast period shown, and indicates a peak in active cases in mid-May.

Daily new cases and deaths



*Assumes current measures remain in place during forecasting interval
Source: Rystad Energy research and analysis; Worldometer

For further details, please see our Covid-19 dashboard at rystadenergy.com.

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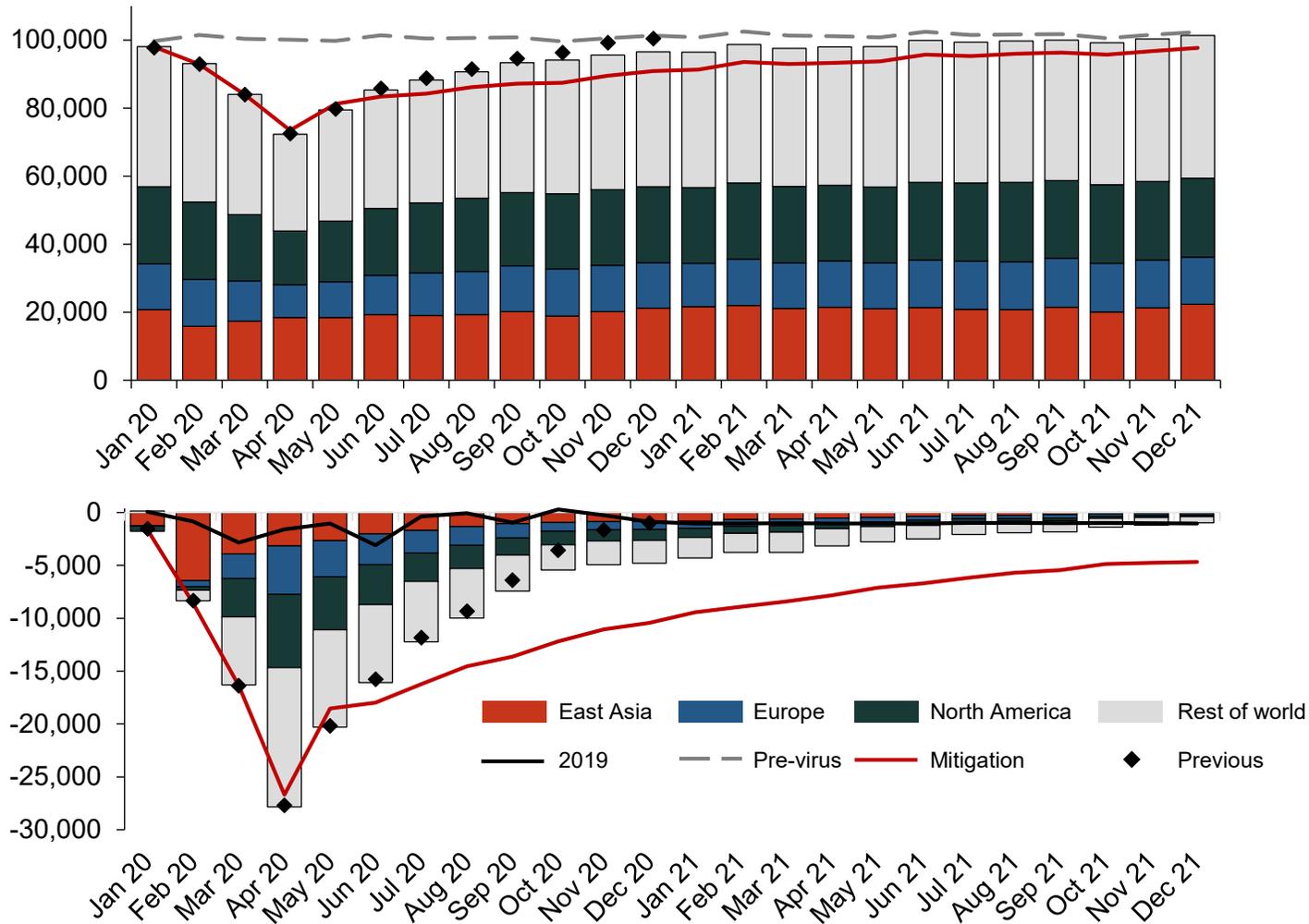
Impact on the oil and gas industry

Methodology

27 million bpd removed from global oil demand in April, or 4 billion barrels for all 2020

Global oil demand impact analysis Covid-19, levels and changes vs. pre-virus estimates

Thousand bpd



Remaining barrels

We see a V-shaped rout in oil demand, reaching a low point in April 2020 and with significant downside risks remaining into 2021.

Average demand for 2020 is expected at 89 million bpd, a drop of 10% from 2019.

Europe is the worst hit, with demand down 33% year-on-year in April and on track for a 12% demand decline for 2020 as a whole.

Lost barrels

About 4 billion barrels will be removed from global oil demand during 2020.

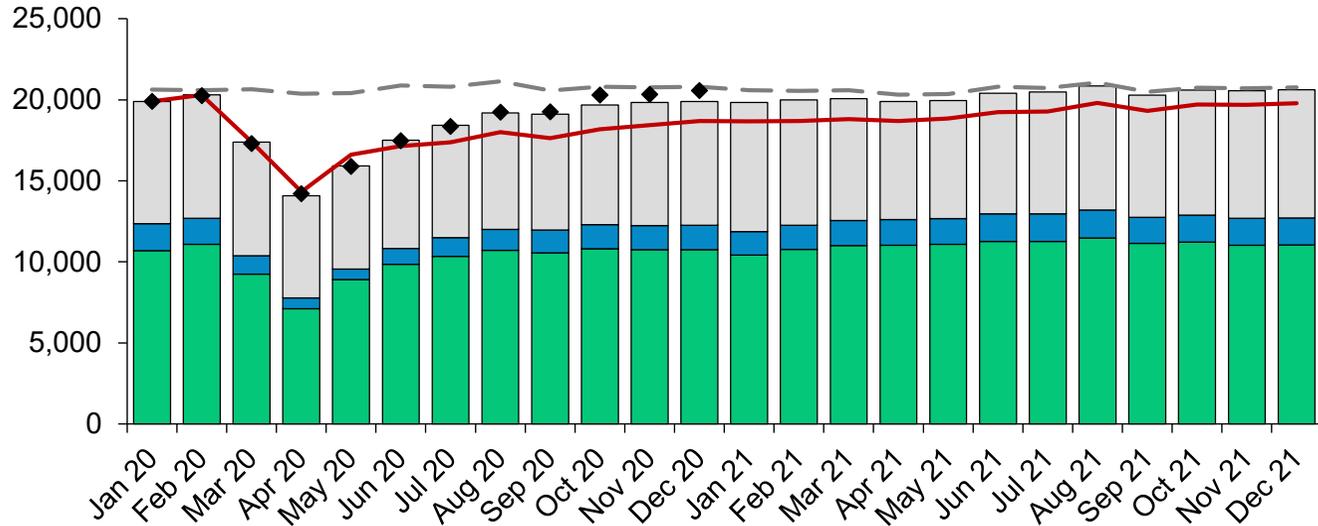
More than half of this decline comes from areas outside the main demand pools of East Asia, Europe and North America.

Source: Oil Market Cube by Rystad Energy

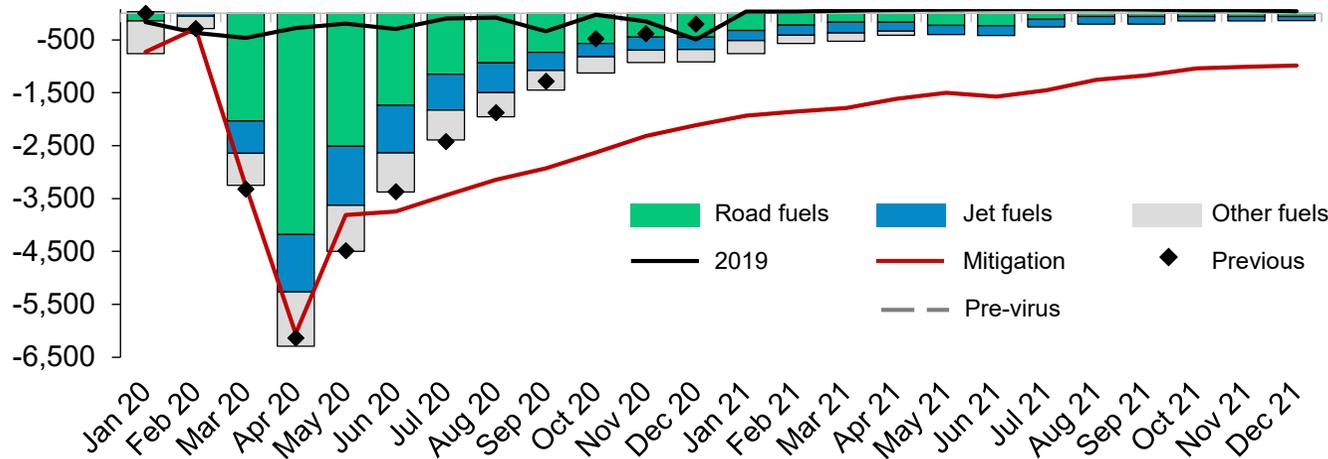
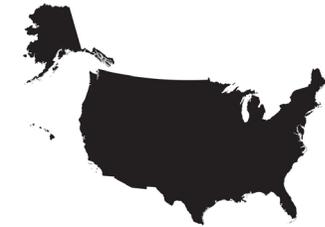
US oil demand falls 30% to 14.1 million bpd in April, down 18.4 million bpd for the full year

Global oil demand impact analysis Covid-19, levels and changes vs. pre-virus estimates

Thousand bpd



US road fuel demand was 7.1 million bpd in April, jet fuel demand was 650,000 bpd and demand for all other fuels totaled 6.3 million bpd.



About 4.1 million bpd was removed from US road fuel demand in April, while the decline was 1.1 million bpd for jet fuel and 760,000 bpd for all other fuels.

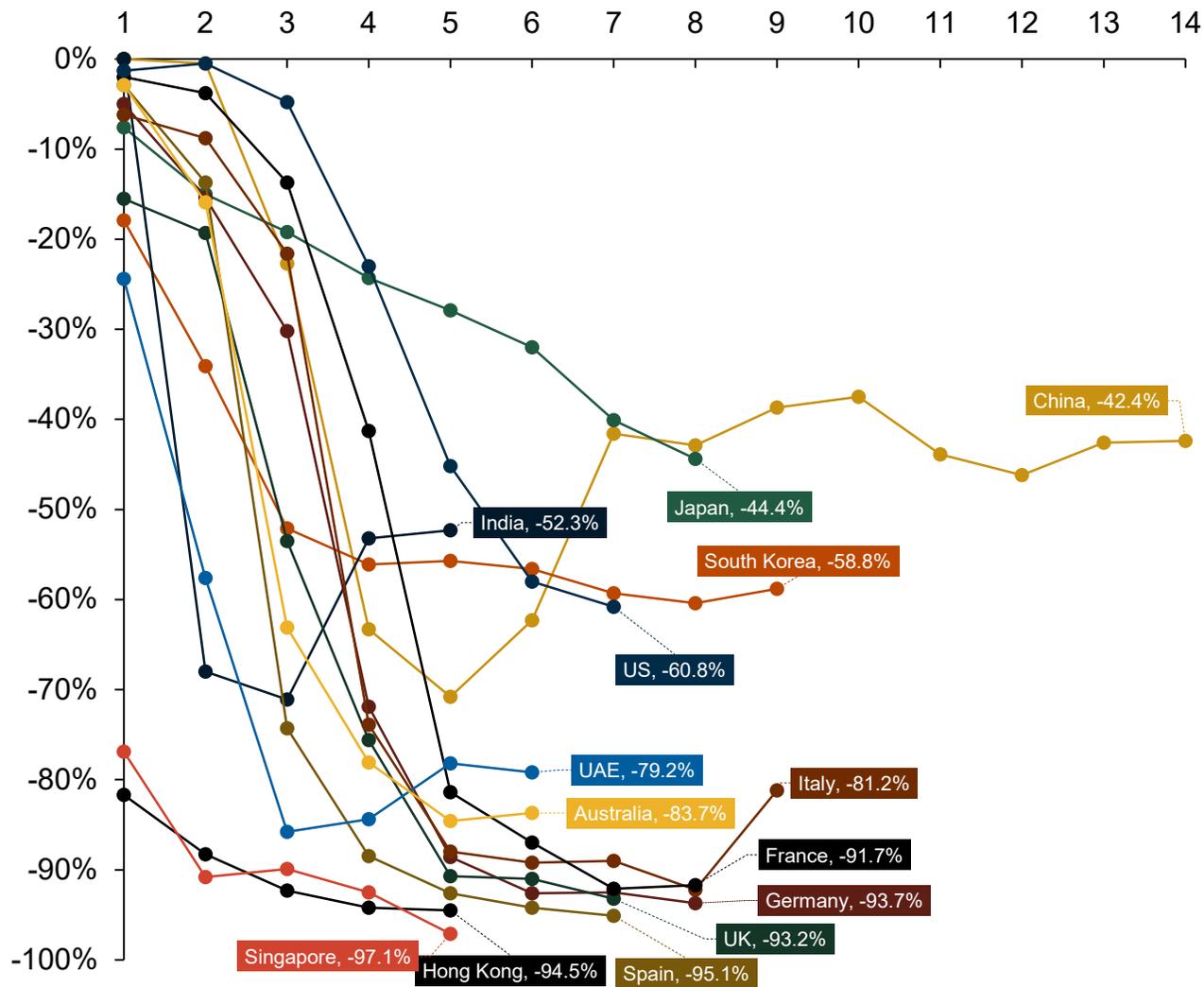
All in all, 830 million barrels have been removed from total demand in the US over the year 2020.

Source: Oil Market Cube by Rystad Energy

Travel restrictions in Europe forces nine out of ten flights to stay on the ground

Cancellations of scheduled flights after 500 reported cases, by week in 2020

Change in scheduled flights year-on-year



Aviation activity in many countries shows signs of stabilization with only small changes compared to last week.

The US seem to have reached a floor for cancellations at a drop of 61% y/y. Major airlines (e.g. American, Delta, United) have communicated plans to suspend the majority of their fleets in 2Q20. Cancellation rates of around 60% is expected in the US in the coming weeks.

Year-on-year scheduled flight cancellations in China continued to be stable in week 14, at a 42% reduction. A linear trend is observed for Japan with 44% cancellations.

With almost no airplanes in and out of Italy in weeks 5 through 8, aviation activity finally started increasing after week 9, however, we still see an 80% reduction in flights.

If other European countries follow the Italian profile, aviation activity is set to slightly increase in the next few weeks.

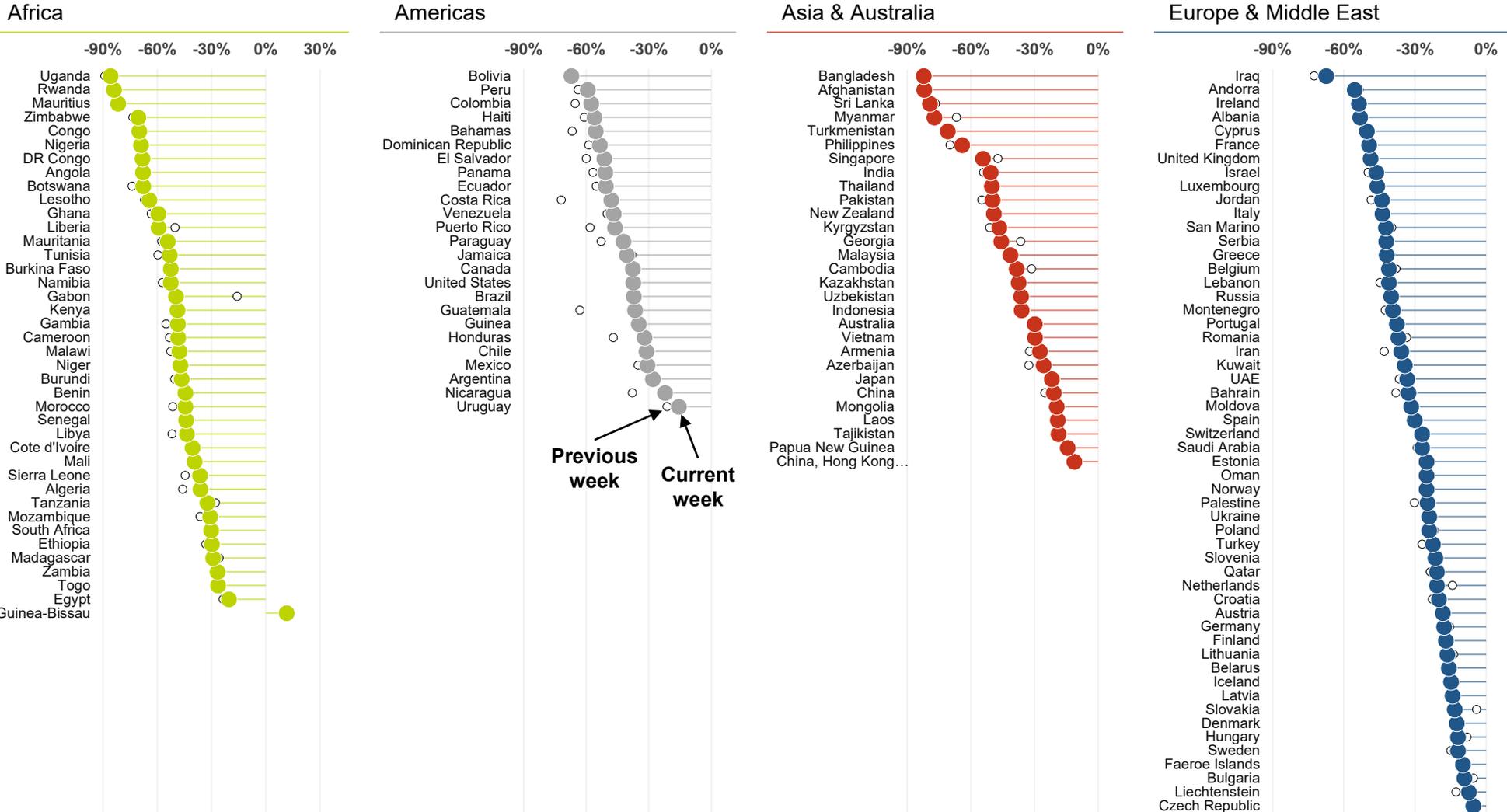
Source: OAG, IATA, ICAO, Rystad Energy research and analysis

Major countries seem to have found a floor for road traffic reduction



Traffic levels versus normal for last seven days

Percent difference, year-on-year, all days

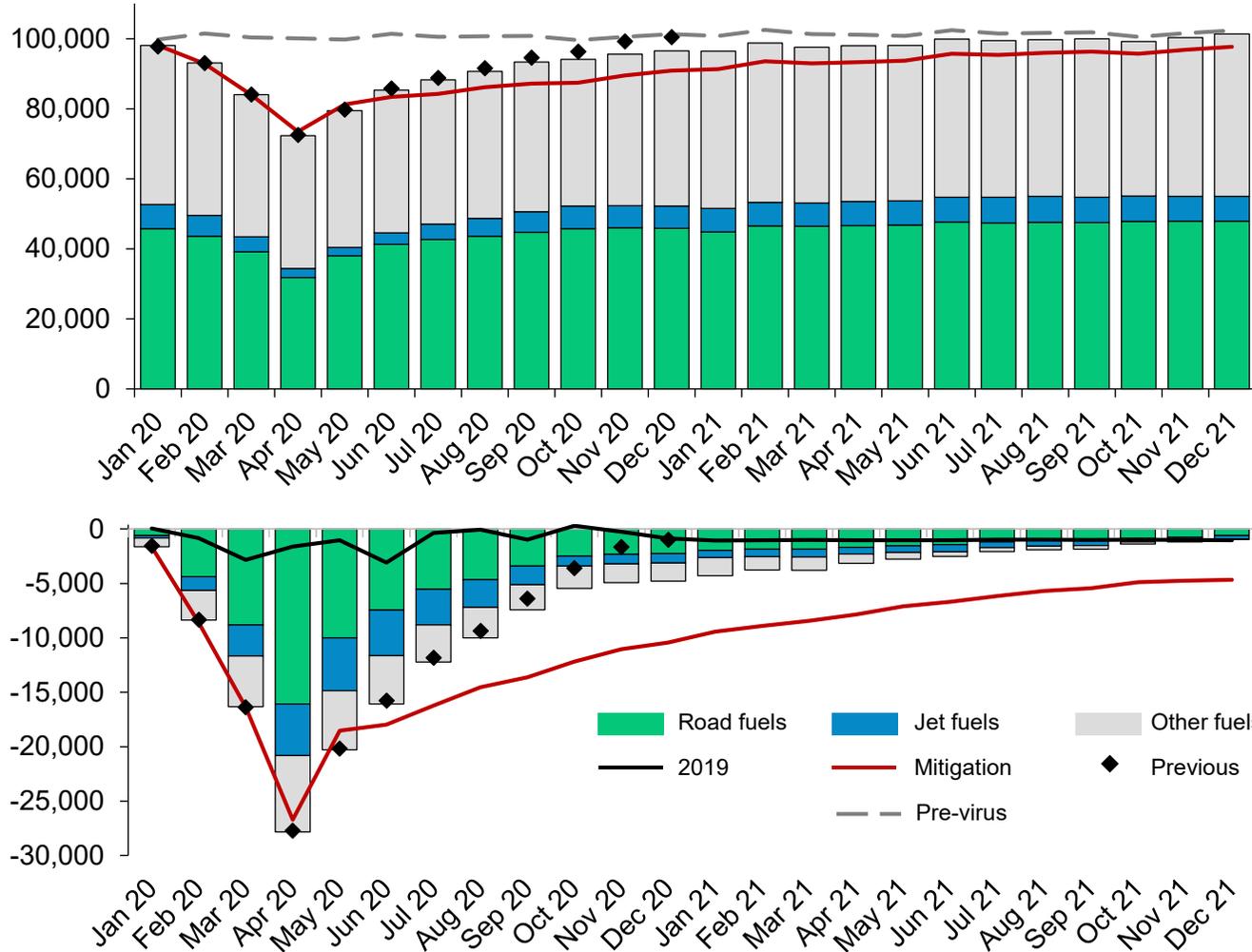


Source: Rystad Energy Global City Traffic Database; TomTom Traffic Index; Google Maps; Rystad Energy research and analysis

Road fuel falls 33% in April and 11% for the year; jet fuel drops 64% in April, 31% for the year

Global oil demand impact analysis Covid-19, levels and changes vs. pre-virus estimates

Thousand bpd



Global demand for road fuel was 31.8 million bpd in April, jet fuel demand was 2.6 million bpd, and demand for all other fuels stood at 37.9 million bpd.

About 15.5 million bpd was removed from road fuel demand in April, while the decline was 4.6 million bpd for jet fuel and 6.1 million bpd for all other fuels.



Source: Rystad Energy research and analysis

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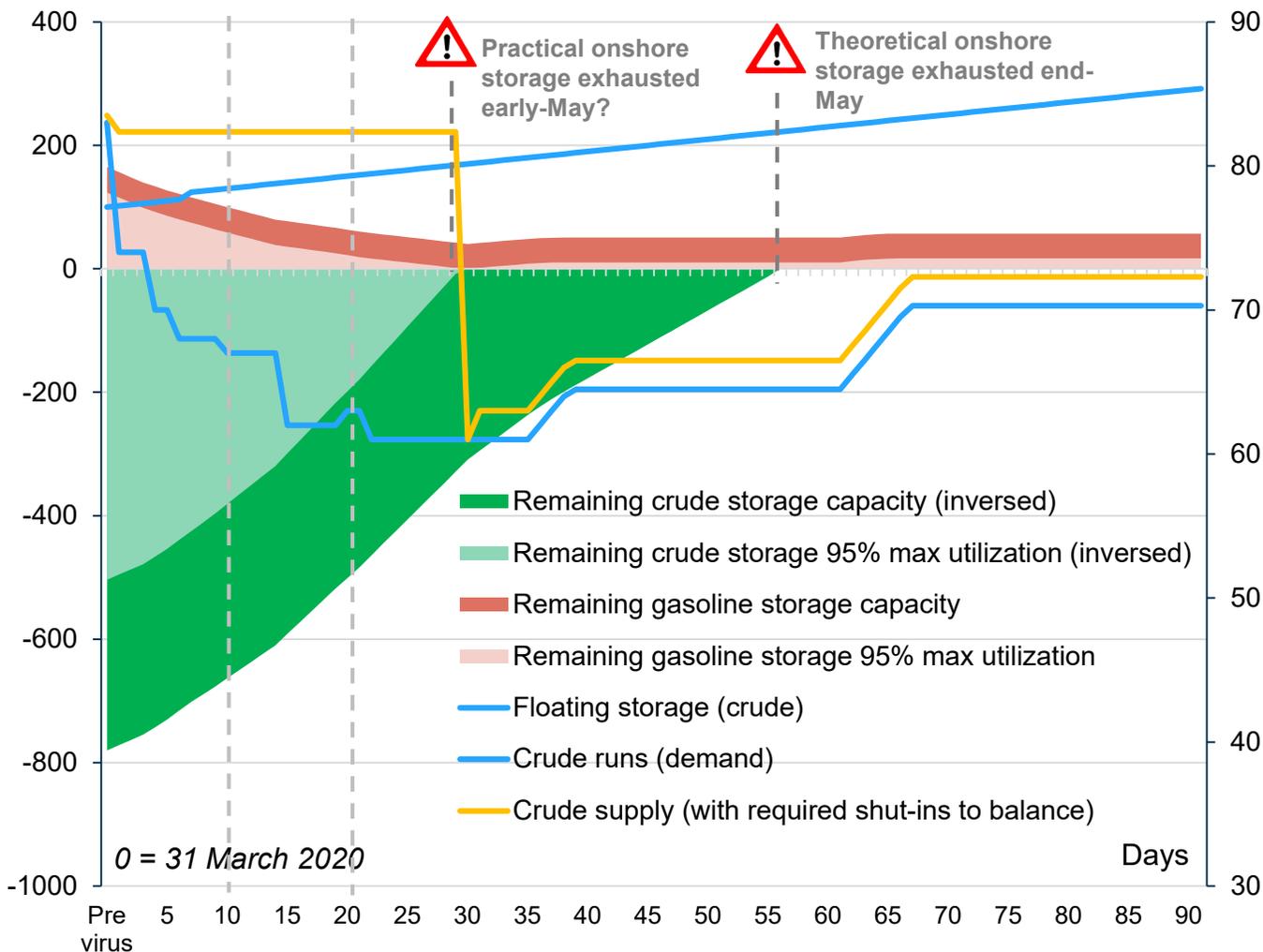
Methodology

Even with a “monster cut” by OPEC+ from 1 May, storage capacity will be filled in May

Crude and condensate balancing scenario (Day 0 = 31 March 2020)

Storage or capacity (Million barrels)

Runs or crude supply (Million barrels per day)



The oil market could run out of physical onshore crude storage capacity by the end of May if we assume that all remaining onshore storage capacity can be filled to the maximum.

However, in a more realistic scenario, where only 95% of capacity can be filled, the market could actually run out of onshore crude storage in early-May instead, barring additional production shut-ins on the upstream side.

The OPEC+ cuts due to commence on 1 May will not be large enough to prevent the market from hitting physical storage constraints, even when including floating storage crude stock builds of 2 million bpd each day in this model.

Taking into account practical constraints such as lack of accessibility to all market participants and other logistical issues, remaining crude storage capacity was only ~400 million barrels as of 10 April. Given the market oversupply since then, as of 21 April, the market may only have around 10 days left of practical onshore storage capacity for crude oil.

On 20 April, the WTI futures contract for May 2020 delivery defied gravity and settled for the first time in negative territory at minus \$37.63 a barrel, signalling that the market is quickly realizing it is running out of practical storage capacity.

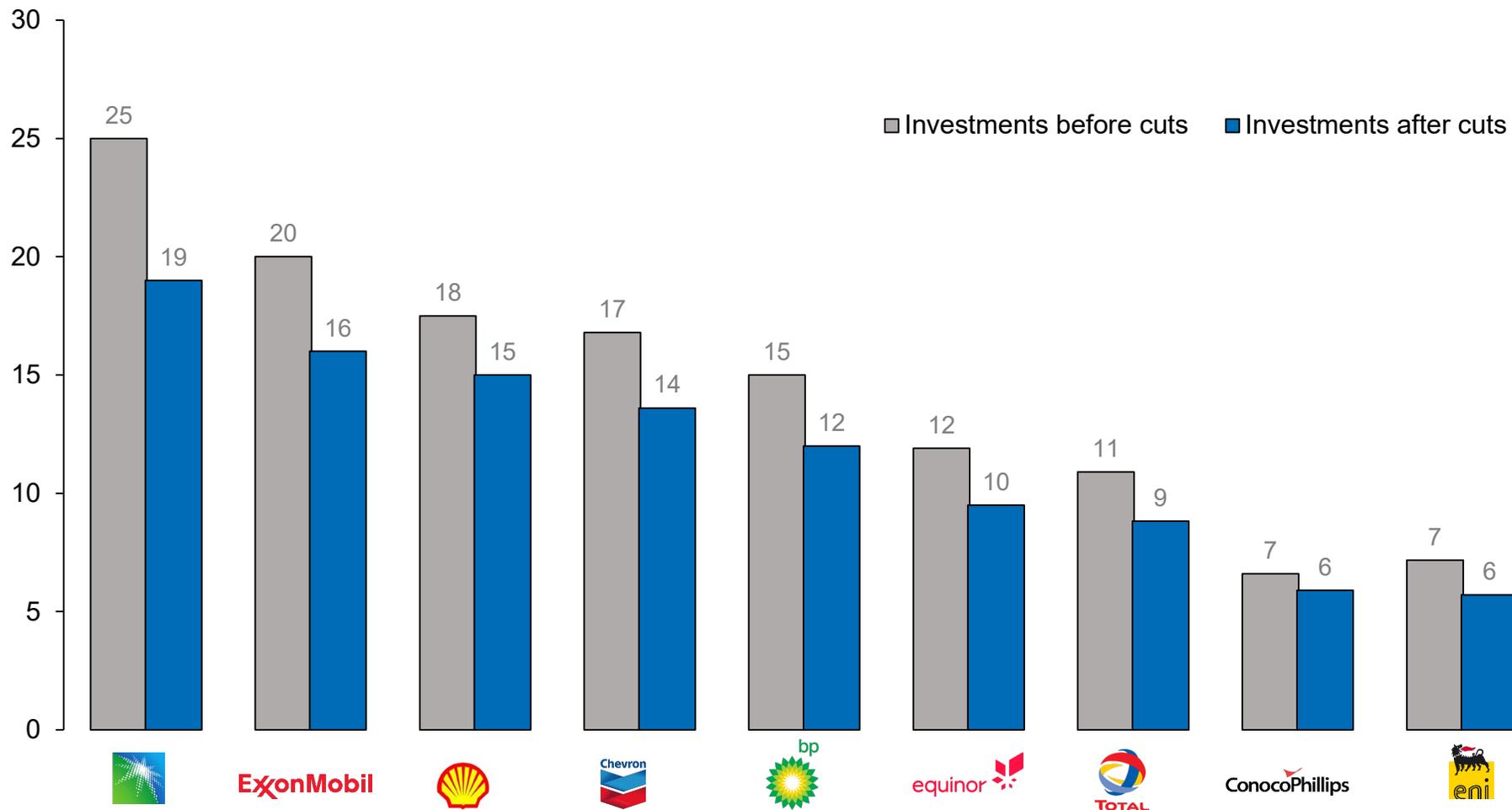
The bottleneck for refineries is motor gasoline, where remaining storage capacity is expected to run out around end-April.

Source: Oil Market Weekly by Rystad Energy

Capex cuts – Global E&P players are slashing budgets

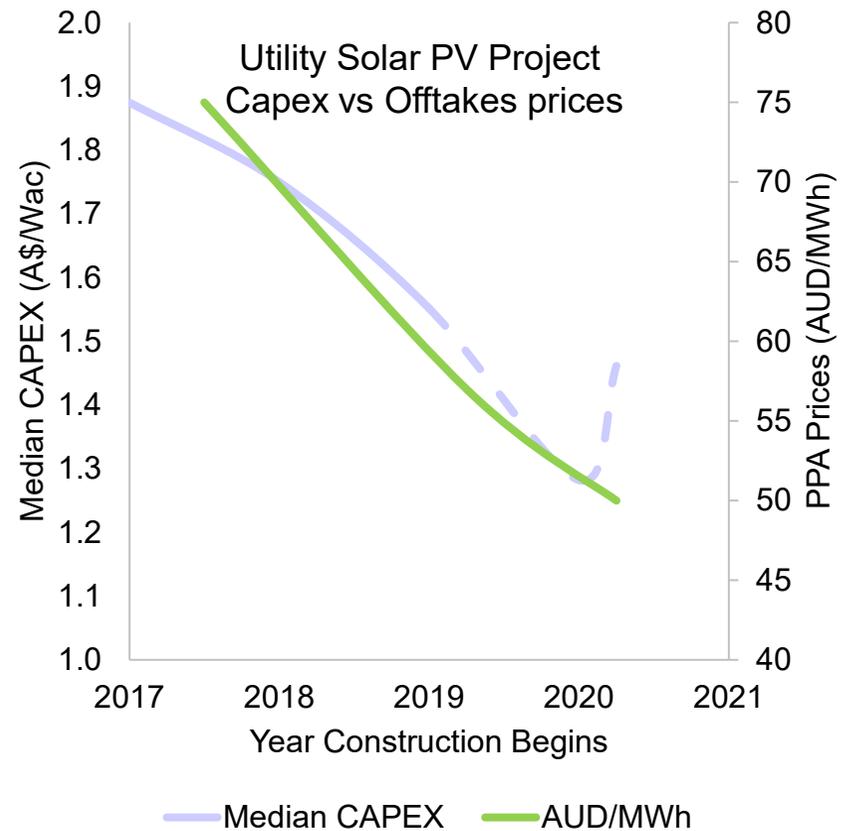
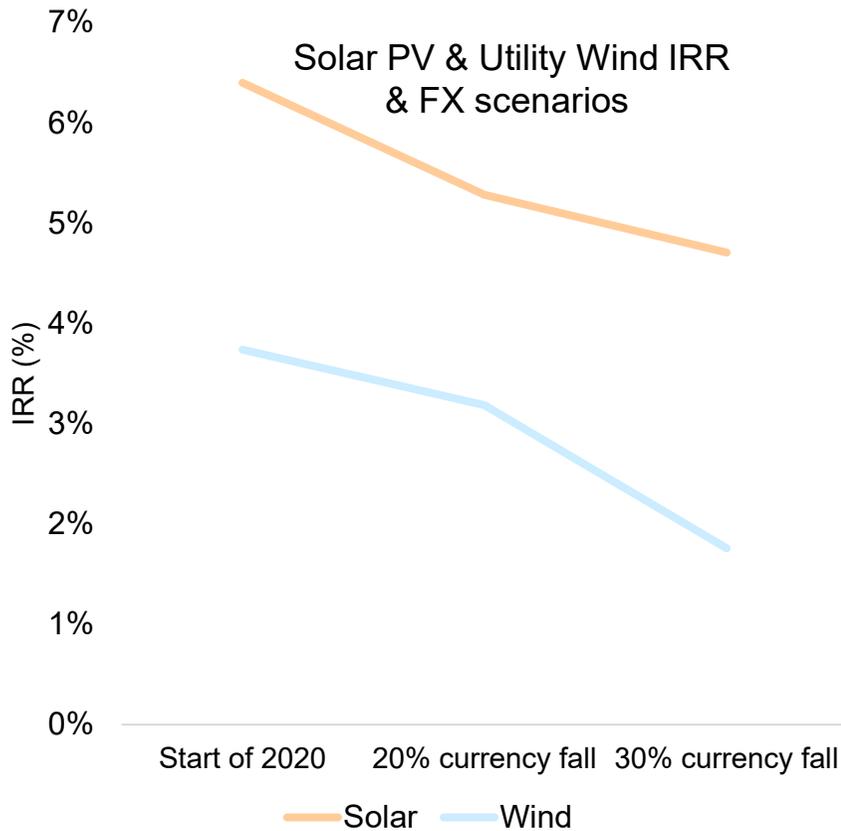
Planned E&P capex cuts by major oil players for 2020

Billion USD, real



Source: Rystad Energy research and analysis

Project economics in emerging countries slashed by the strengthening US dollar



Source: Rystad Energy RenewableCube

* Australian PPA prices vs median capital cost per MWac

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Infection Fatality Ratio – based on countries with high testing and low infected cases

In this version of the report, we have updated our methodology to adjust for demographic parameters per country, i.e. age and sex (see next page). We have also calibrated the Infection Fatality Rate (IFR) with the latest figures for 211 countries.

We have selected countries with:

- 1) A large share of the population being tested (above 1.6%).
- 2) Relatively few infected people of those tested (median 2.0%).
- 3) Infection has peaked.
- 4) Isolated and well defined country (Islands or similar).

We have grouped countries into two groups; Group 1 are countries with an older population (~40 yrs) and Group 2 are countries with a younger population (~32 yrs)

Since there are still active cases, we expect a few additional fatalities (empirical IFR up), but also that more infected people will be detected as testing continues (empirical IFR down).

Results: For the group of countries with an older population, empirical IFR is now 0.66% (or 0.58% when including Singapore and Australia), slightly below our modelled IFR.

| Country Standard | Modelled | | | | Empirical | | | | |
|--------------------------------|--|-------------|--------------|-----------------------|-----------|----------------------------|--------------|----------------|-------|
| | Population (Thousands) | Average Age | Share female | Age and Sex based IFR | Deaths | IFR based on reported case | Share tested | Share infected | |
| Group 2 | Bahrain | 1 702 | 32.1 | 35.3 % | 0.18 % | 7 | 0.37 % | 5.2 % | 2.1 % |
| | Qatar | 2 881 | 32.6 | 24.8 % | 0.16 % | 9 | 0.15 % | 2.2 % | 9.3 % |
| | UAE | 9 890 | 32.3 | 30.9 % | 0.15 % | 43 | 0.59 % | 7.8 % | 0.9 % |
| Group 1 | Singapore | 5 850 | 41.5 | 47.7 % | 0.55 % | 11 | 0.14 % | 1.6 % | 8.5 % |
| | Australia | 25 500 | 39.2 | 50.2 % | 0.67 % | 71 | 1.07 % | 1.7 % | 1.5 % |
| | New Zealand | 4 822 | 39.2 | 50.8 % | 0.66 % | 12 | 0.83 % | 1.8 % | 1.7 % |
| | Iceland | 341 | 38.9 | 49.8 % | 0.64 % | 9 | 0.51 % | 12.0 % | 4.3 % |
| | Latvia | 1 886 | 43.2 | 53.9 % | 0.81 % | 5 | 0.68 % | 1.9 % | 2.0 % |
| | Malta | 442 | 43.2 | 49.9 % | 0.80 % | 3 | 0.70 % | 5.3 % | 1.9 % |
| | Latvia, Iceland, Malta and New Zealand | 7 491 | 40.4 | 51.5 % | 0.724 % | 29 | 0.66 % | 2.5 % | 2.3 % |
| as above+ Australia, Singapore | 38 841 | 39.8 | 50.1 % | 0.686 % | 111 | 0.58 % | 1.8 % | 2.7 % | |
| Bahrain, UAE, Qatar | 14 473 | 32.3 | 30.2 % | 0.162 % | 59 | 0.39 % | 6.4 % | 1.6 % | |

Source: UN age statistics 5 year interval; Rystad Energy COVID -19 model

For the group of countries with a young population, empirical IFR is now 0.39%, significantly above our modelled IFR. Still, if three times more people are tested here with a similar share infected, empirical IFR will be below the modelled IFR.

These results are consistent with findings from the Santa Clara county screening* and research from the Diamond Princess cruise ship. However, when applying these figures on young populations (and thus, the global population), IFR will be considerably lower than the 0.66% cited most places so far, namely 0.38%.

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OIL MARKET WEEKLY

RYSTAD ENERGY PRODUCT RELEASE



ANALYTICS

OIL MARKET WEEKLY – Demand report, a weekly report with:

- An overview of **global oil demand**
- Oil demand impact in two **COVID-19 mitigation scenarios**
- Impact of oil demand in **aviation, ground transportation and road fuels**



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OIL MARKET WEEKLY – Balances report:

- A weekly **Commentary** with the latest oil market observations
- A weekly **Executive Summary** on the oil market balances, oil supply and demand, and the overall oil market view



CUBE DASHBOARDS

OIL MARKET DASHBOARDS and Excel data on:

- **Oil demand analysis dashboard**: split by country, transport type, aviation
- **COVID-19 dashboard**: oil demand impacting two COVID-19 mitigation scenarios



RYSTAD ENERGY

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Headquarters

Rystad Energy
Fjordalléen 16, 0250 Oslo, Norway

Americas +1 (281)-231-2600

EMEA +47 908 87 700

Asia Pacific +65 690 93 715

Email: support@rystadenergy.com

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