

COVID-19 REPORT 10TH EDITION

GLOBAL OUTBREAK OVERVIEW AND ITS IMPACT ON THE ENERGY SECTOR

14 MAY 2020

PUBLIC VERSION

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Executive summary Reopening appears possible in some countries, could lead to new coronavirus waves in others

In this edition of the Covid-19 report we ask the broad question; Can societies return to near normal activity without being hit by a new wave of coronavirus outbreak? In more technical language, can the effective reproduction number be kept below 1 while societies return to pre-Covid-19 social and economic activity levels – before a vaccine is in place? Our Effective Prevention scenario, as laid out in the second part of this report, illustrates what a "yes" answer to these questions would look like.

As a part of our analyses, we have correlated Google mobility data with empirical reproduction numbers on a country by country basis. This offers insight into a few key findings, namely that certain levels of reduced activity at transit and recreational places will be required to achieve specific R_{eff} values. We also demonstrate that a handful of countries have significantly fewer people in the most infectious phase of the virus as of today, versus in March. Thus, reopening seems possible in these countries, while other nations are still far away from being able to reopen in a responsible manner.

Still, reopening appears imminent in many countries and new waves of coronavirus outbreak are likely to come, requiring further mitigation. This leads to what we call the Mitigation scenario. In the section discussing the impact of the pandemic on the oil market, we describe how oil demand recovery will unfold differently under these two scenarios, the Effective Prevention scenario and the Mitigation scenario. In the Effective Prevention scenario, we see 6 million barrels per day of oil demand returning every month for the next few months, driven by a comeback of road traffic.





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Global overview The true cumulative number of people infected globally today is likely 64 million

Number of true and reported cases



As of 11 May, 64 million people have likely been infected with Covid-19, according to our updated model based on reported fatalities.

There were 4.2 million reported cases as of 11 May, a number which our analysis suggests represents just 7% of true cases. Reported cases are now growing at only ~2% per day slightly lower than ~3% per day in preceding weeks.

Registered fatalities globally were almost 290,000 as of 11 May, a number which also grew by 2% over the last week versus the 3-4% in preceding weeks. True fatalitities is probably significantly higher, as many countries have insufficient reporting of covid-19 deaths outside hospitals.

The forecast assumes that current strict measures remain in place until the end of June, which is not likely since many countries are now in the process of reopening societies.

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*Assumes current measures remain in place during forecasting interval Source: Rystad Energy Covid-19 research and analysis; Worldometer

Global overview Still no sign of slow-down in spread in Brazil, Russia, India and Bangladesh

Number of reported cases, key countries



The spread is still growing in the US, although at a much slower rate than previously.

Brazil, Russia, India and Bangladesh each have populations of over 100 million people that are struggling with aggressive spreading of the Covid-19 virus – still doubling every 8-10 days.

However, according to our analyses it appears that Brazil, Russia and India currently are at the peak in terms of true active cases, and we expect this to show up in the reported active cases during the second half of May. For Bangladesh, the peak in true active cases is likely still ahead of us, probably around end-May, meaning that the peak in reported cases will likely be seen mid-June.

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



For further details

please see our Covid-19 dashboard at rystadenergy.com.

Global overview Drivers of the Reproduction number – transit station activity

Transit station activity (subway, bus, train stations) Percent from normal levels (7-day average)



Effective Reproduction number (R_{eff}) (7-day average)



These graphs show completely independent figures for activity at transit stations and R_{eff} based on our modelling, where fatalities are an important input factor.

As seen, "normal" public transport (phase 1) gives high R_{eff} , which means new covid cases are growing. Quick and fast reduction, like in France, seems to be needed to get R_{eff} below 1.0 and thus a decline in new cases.

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Global overview Differences in Scandinavia based on policies and population density

Transit station activity (subway, bus or train stations) Percent above or below normal levels based on Google mobility data (7-day average)



To the left we see stays at transit stations in Denmark, Norway and Sweden from mid-February to the start of May. As seen, Sweden had a more liberal approach with activity at transit stations only falling by 30%.

However, Norway having a lower R_{eff} than Denmark is not explained by transit station activity alone. One driver could be that Denmark is more densely populated.

Fatality rate as of 12 May per 100,000:

- Denmark: 9
- Norway: 4
- Sweden: 33

	Start of 21-day period											
	22 Feb	13 March	3 April									
Country	R_{eff}	R _{eff}	R_{eff}									
Denmark	2.5	1.0	0.9									
Norway	2.1	1.1	0.7									
Sweden	2.7	1.4	1.0									



Global overview

South America variations partly explained by timing and implementation of policies

Transit station activity (subway, bus or train stations)

Percent above or below normal levels based on Google mobility data (7-day average)



To the left we see transit station activity in Argentina, Brazil and Chile, which shows that Argentina had the fastest and deepest reduction in activity. Moreover, Chile was faster and more consistent than Brazil. Brazil also had carnival celebrations from 1 March to 6 March, which could help explain differences in fatality rates so far.

Fatality rate as of 12 May per 100,000:

- Argentina: 0.7
- Brazil: 5.5
- Chile: 1.8

	Start of 21-day period											
	22 Feb	13 March	3 April									
Country	R_{eff}	R_{eff}	R_{eff}									
Argentina	2.4	1.2	1.1									
Brazil	2.9	1.5	1.2									
Chile	2.8	1.4	1.1									



Global overview USA, Australia and New Zealand differences only partly explained by transit activity

Transit station activity (subway, bus or train stations)

Percent above or below normal levels based on Google mobility data (7-day average)



To the left we see transit station activity in Australia, New Zealand and United States, with New York City also shown separately. More restrictive policies on public transportation in Australia and New Zealand could explain some differences. However, the extreme virus spread in New York City also has other drivers, like population density.

Fatality rate as of 12 May per 100,000:

- Australia: 0.4
- New Zealand: 0.4
- New York City: 140
- USA: 25

	Start of 21-day period											
	22 Feb	13 March	3 April									
Country	R_{eff}	R_{eff}	R_{eff}									
Australia New Zealand	2.0 2.5	1.0 1.7	0.9 0.8									
USA	2.9	1.4	0.9									



Global overview Summary on Effective Reproduction number (R_{eff}) and mobility data

Effective Reproduction number (R _{eff})	Growth in new cases per day* (percent)	Doubling time/ halving time (days)	Transit activity (bus, train, subway)	Recreational activity (shopping, sports, party)	Comment
5.0	36%	2.3	Dense city	"Festival"	Festivals, very dense cities
3.0	23 %	3.3	Large city	Active city life	Large-city life with public transport
2.5	19%	4.0	Regular city	Active suburban life	Mixed suburban life, some public transit
2.0	14 %	5.3	Rural transport	Normal rural life	Normal rural life
1.5	8 %	9	~ -10%	No hugs/handshake	Social distance, like in Japan
1.2	4 %	20	~ -15%	~ -10%	No concerts/gyms/parties/seminars
1.1	2 %	38	~ -20%	~ -15%	+ wash hands, keep distance
1.0	0 %	flat	~ -30%	~ -25%	1 m and <50 people, like Sweden
0.9	-2 %	- 35	~ -50%	~ -40%	2 m and <5 people, home office, bars closed
0.8	-4 %	- 16	~ -70%	~ -50%	Home quarantine, schools closed
0.7	-7 %	- 10	~ -80%	~ -60%	Curfew, like France in April

The actual reproduction rate and growth/decline in new Covid-19 cases is the sum of many factors like mobility, events and greeting behavior. Mobility data shows that similar figures could lead to different R_{eff} . We have learned new ways of keeping social distance, many use facemasks, and sick people stay home. The key question is whether societies can get back to a desirable level of social and economic activity but still keep at R_{eff} at a level below 1.0.

*We are using Generation Time (GT) = 5.25 (ref: Ferretti et al, 8 May 2020: "Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing") Source: Rystad Energy Covid-19 model; Google Mobility data;



Global overview

Could we see a new wave? Are more people infectious in May versus in March? (1/2)

Number of Covid-19 people: True active cases and people in the infectious period



As of 13 March, most governments had introduced strict measures for social distance. This happened after two to six weeks of relatively free spread of the virus, leading to a large number of active cases and people in the most infectious period.*

As of 13 May, governments are planning to loosen measures. Do we then risk a second wave of infection?

For Italy, Spain and Germany, loosening seems possible given that the number of infectious people is far below March 13 levels. For Sweden, Netherlands and USA, the risk of loosening seems high given that there are more infectiouse people today than in March. However, with focus on policies adapted to state/city level, this could potentialy still be done.

* Ferretti et al and FHI: from being infected: 3 days of exposed period, then 2 days of presymptomatc, then 5 days of symptomatic. 40% are assumed asymptoimatic. Source: Rystad Energy Covid-19 model; Ferretti (May 8, 2020)



Key country focus US may have peaked in active cases, assuming measures are not eased too quickly

United States, estimated total and active true cases

Number of cases; Current measures scenario*



Daily new cases and deaths

Trailing seven-day average



Source: Rystad Energy research and analysis; Worldometer

The US is starting to ease preventive measures and open up the country again. This has still not resulted in any increase in reported cases and deaths – any effects from such changes will potentially not be seen in reported numbers until 10-14 days after the measures are eased.

Our forecast assumes that current preventive measures will remain in place during the forecast period. In this scenario, we expect the total number of infected to flatten out at around 14 million. If we assume the country is opened up to follow in line with our Mitigation Scenario, where measures are eased quicker, then the number of infected could rise to 15.5 million and we could see growth in reported new cases again in early-tomid June.

Daily reported new cases and deaths have been declining since the second half of April. Easing of measures will likely be slow and steady and happen in a controlled fashion to reduce the risk of an aggressive resurgence in new cases.

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



Key country focus Brazil is still growing in new cases, but may be about to peak



Daily new cases and deaths



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



Key country focus Bangladesh likely still has the peak ahead of it



Bangladesh, estimated total and active true cases

Daily new cases and deaths

Trailing seven-day average



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



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- Ground transportation and road fuels

Impact on the oil and gas industry



Global overview Two main recovery profiles: *Effective Prevention* and *Mitigation*



Jet fuel demand levels 2020-2021

f-shaped recovery:

- · Demand stabilizes at a new normal in 3Q20.
- Follows the previous year's trend for the rest of 2021, with moderate growth.

Key assumptions:

- Gradual opening of borders as government lockdowns loosen in 2Q20.
- Consumer confidence increases and short-haul and leisure travel begins to recover
- Business travel is expected to recover faster.

U-shaped recovery:

- Demand stabilizes at a new normal in 2Q21.
- Follows the previous year's trend for the rest of 2021 with low growth.

Key assumptions:

- Slow opening of borders as government lockdowns are extended through 3Q20.
- Consumer confidence remains low with short-haul and leisure travel slowly recovering.
- Business travel is still expected to recover at a faster pace than leisure travel.



Road fuel demand levels 2020-2021

V-shaped recovery:

- Demand hits bottom in April 2020, followed by a strong rebound in June and July.
- Demand impact lasts into 2021, with 2019 levels reached towards the end of year.

Key assumptions:

Effective Prevention

Mitigation

- Governments loosening measures.
- People preferring personal vehicles over public transport.
- · Unemployment remains at manageable levels.
- Work-from home policies are gradually phased out.

L-shaped recovery:

• Demand hits bottom in April 2020, with a weaker recovery period where road fuel remains below 2019 levels through 2022.

Key assumptions:

- Work-from-home policies continuing into 2021.
- Unemployment rates cause reduced commuter demand and less personal vehicle use.



Source: Rystad Energy research and analysis

Global overview

From a low of 72 million bpd, global demand recovers by 6 million bpd every month, May-July

Global oil demand impact analysis of Covid-19 by region, levels and changes vs. pre-virus estimates Thousand barrels per day



Remaining barrels

Oil demand has taken an **r**-shaped dip, reaching a low point in April and improving in May and June.

December 2020 level expected at 96 million bpd, with potential downside of 90 million bpd, with significant downside risks far into 2021.

Average demand for 2020 is expected at 89 million bpd, a drop of 11% from 2019, and 98 million bpd in 2021.

Europe is the worst hit, with demand in April down 35% year-on-year, and 13% demand decline expected for 2020 as a whole.

Lost barrels

About 4 billon 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.

In our downside scenario, we see global demand impact remaining down by 10.5 million bpd in December 2020 and 4.8 million bpd in December 2021.

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Source: Rystad Energy research and analysis

Ground transportation and road fuels Road traffic levels among top oil consumers clearly recovering from the bottom

Road traffic levels versus normal, 1 March to 10 May

7-day moving average, percent difference versus mean of traffic during the same weekday in same month for 2019



Source: TomTom Traffic Index; Google Maps; Baidu; Korea Expressway Corporation; Rystad Energy Global City Traffic Database



Ground transportation and road fuels

South Korea shows that recovery is possible, but it will require a lot from governments

Overall road traffic has been recovering since bottoming out in early March

7-day moving average, percent difference versus mean of traffic during the same weekday* in the same month for 2019



South Korea has successfully implemented a test, trace, and contain system that has seen robust road traffic activity levels compared to other countries.

After remaining below 2019 levels for most of 2020, data from the first ten days of May shows that road traffic is approaching normal levels.

Workday traffic has picked up pace in May

Hour-by-hour percentage difference in number of vehicles on roads during the same month in 2020 versus 2019

But weekend activity is still below normal

Hour-by-hour percentage difference in number of vehicles on roads during the same month in 2020 versus 2019



Activity levels look to have picked up significantly across different times of the day in May.

The largest jump in activity was seen during the middle of the day during workdays.

Weekend activity is still mostly lagging behind 2019 levels, with only early midday traffic reaching 2019 levels.

Activity levels during weekend evenings are still well below normal.



*Adjusted for public holidays Source: Korea Expressway Corporation; Rystad Energy Global City Traffic Database

Ground transportation and road fuels Europe sees positive activity trends on loosening measures

Rystad Energy Global City Traffic Database covers road traffic in 1,200+ cities and 150+ countries

Traffic levels versus normal for last 7 days

Percent difference, year-on-year, all days



Source: TomTom Traffic Index; Google Maps; Baidu; Korea Expressway Corporation; Rystad Energy Global City Traffic Database

Summary data table for total liquids demand after Covid-19 "effective retention" case

	MMbbl/d							Change year-on-year											
			2020		2020 Q1				2020				2020 Q1						
	2019	2020	2021	1Q	2Q	3Q	4Q	April	May	June	2020	2021	1Q	2Q	3Q	4Q	April	Мау	June
Global	99.5	88.8	98.2	92.0	78.1	90.3	94.8	71.9	78.0	84.4	-10.8%	10.5%	-7.3%	-20.7%	-9 .8%	-5.4%	-27.1%	-21.0%	-14.2%
Road	47.4	42.3	46.9	42.9	36.7	43.9	45.8	31.6	37.5	41.1	-10.6%	10.9%	-8.0%	-22.6%	-8.3%	-3.7%	-33.3%	-21.0%	-13.4%
Aviation	7.2	4.8	6.8	5.9	2.4	4.9	6.1	2.2	1.8	3.0	-33.5%	41.5%	-15.9%	-67.5%	-34.8%	-14.7%	-68.7%	-74.9%	-59.2%
Other	44.9	41.7	44.4	43.2	39.0	41.5	42.9	38.0	38.8	40.3	-7.3%	6.7%	-5.3%	-11.0%	-7.2%	-5.7%	-13.5%	-12.2%	-7.3%
United States	20.5	18.4	20.0	19.3	15.8	19.0	19.5	14.1	15.8	17.5	-10.0%	8.5%	-4.7%	-22.2%	-8.3%	-5.0%	-29.6%	-22.1%	-15.1%
Road	11.2	10.1	10.9	10.3	8.7	10.6	10.6	7.1	9.0	9.9	-10.5%	8.1%	-6.2%	-24.1%	-6.8%	-4.6%	-36.9%	-20.5%	-15.1%
Aviation	1.7	1.2	1.5	1.6	0.7	1.3	1.4	0.7	0.4	1.0	-29.0%	24.1%	-1.7%	-62.1%	-29.7%	-20.4%	-59.4%	-79.8%	-47.2%
Other	7.5	7.1	7.6	7.4	6.5	7.1	7.5	6.3	6.4	6.7	-4.9%	6.4%	-3.1%	-9.4%	-5.3%	-2.0%	-10.7%	-10.2%	-7.2%
China*	15.1	13.8	15.6	12.7	13.8	14.3	14.4	13.6	13.6	14.3	-8.4%	12.9%	-15.8%	-6.8%	-5.3%	-5.9%	-6.3%	-12.4%	-1.4%
Road	6.1	5.6	6.5	4.8	5.5	6.0	6.2	5.3	5.5	5.8	-7.6%	15.6%	-22.4%	-6.7%	-2.6%	1.6%	-8.7%	-12.4%	1.6%
Aviation	0.9	0.6	1.0	0.5	0.5	0.7	0.8	0.5	0.4	0.5	-29.4%	51.1%	-36.7%	-46.2%	-25.4%	-10.2%	-42.6%	-51.5%	-44.5%
Other	8.1	7.5	8.1	7.4	7.8	7.5	7.4	7.8	7.7	7.9	-6.7%	7.6%	-8.4%	-2.5%	-4.8%	-10.9%	-0.7%	-8.2%	1.8%
Europe	14.2	12.4	13.7	13.1	10.4	12.8	13.5	9.4	10.3	11.5	-12.6%	10.0%	-7.3%	-26.7%	-12.3%	-4.2%	-34.6%	-26.5%	-18.9%
Road	7.0	6.3	6.8	6.4	5.3	6.6	6.8	4.5	5.3	6.1	-10.9%	8.3%	-5.7%	-24.8%	-9.4%	-3.6%	-36.8%	-23.4%	-14.0%
Aviation	1.5	0.9	1.4	1.1	0.2	0.9	1.2	0.2	0.2	0.3	-39.3%	54.9%	-14.0%	-84.8%	-42.3%	-10.8%	-88.3%	-88.1%	-78.3%
Other	5.7	5.3	5.5	5.5	4.9	5.3	5.4	4.8	4.8	5.1	-8.0%	4.4%	-7.6%	-13.6%	-7.4%	-3.3%	-18.1%	-14.1%	-8.2%

*Includes Mainland China, Hong Kong and Taiwan Source: Rystad Energy research and analysis



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Global market outlook

More crude supply reductions needed to avoid running out of operational crude storage

Crude and condensate day-by-day balancing scenario (Day 0 = 30 April 2020)Storage or capacity (Million barrels)Runs or crude supply (Million barrels per day)



We have revised up our estimates for Rest-of-World available working crude storage capacity and now assess the available capacity at the start of May at nearly 600 million barrels. Most likely we will not reach the "storage wall", but that will require toil supply reduced more than our current estimates, as shown in this report. These reductions could stem from additional OPEC core cuts in June, more non-OPEC+ shut-ins not yet captured, and lower April-June supply in opaque geographies not yet visible to the market.

In practical terms, however, local storage constraints will hit bottlenecks before global capacity does. If only considering operational storage capacity (95% of working capacity), this will be exhausted around mid-July according to our analysis. If so, this will lead to additional upstream supply reductions to balance crude demand.



Source: Rystad Energy research and analysis, OilMarketCube

Global market outlook US oil* production outlook by forecast time stamp and scenario



^{*}Crude oil and lease condensate production Source: Rystad Energy ShaleWellCube, Rystad Energy OilMarketCube, Rystad Energy research and analysis



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Market segment focus Will Big Oil* continue to make capital investments in renewables?

Renewables capex by 10 E&P companies (million USD)



The chart plots the capital investments made by a group* of E&P companies into utility scale renewables.

In recent weeks, additional E&P companies have committed to net-zero carbon targets and reaffirmed their commitment to investing in renewables.

Over the last decade, renewable investments have averaged just under \$1 billion per year. From now, we expect to see a clear boom in renewable investment, increasing to \$4.5 billion in 2023. We believe this level will be maintained, as capital intensive offshore wind projects have already taken financials decisions (FID) and have been committed.

*Includes BP, Shell, Equinor, Chevron, ENI, TOTAL, Petronas, Pertamina, Repsol & GALP

Source: Rystad Energy RenewableCube



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RYSTAD ENERGY PRODUCT RELEASE



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



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



OIL MARKET DASHBOARDS and Excel data on:

- Oil demand analysis dashboard: split by country, transport type, aviation
- <u>COVID-19 dashboard</u>: oil demand impacting two COVID19 mitigation scenarios





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