RYSTAD ENERGY

COVID-19 REPORT
4TH EDITION

GLOBAL OUTBREAK OVERVIEW AND ITS IMPACT ON THE ENERGY SECTOR

1 APRIL 2020

PUBLIC VERSION

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Larger impact than expected, but evidence that measures are working

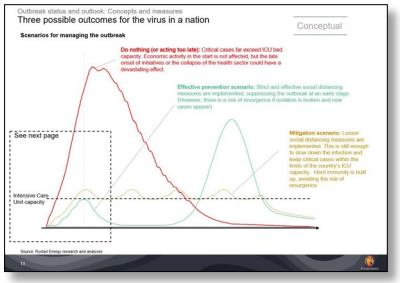
The whole world is now affected by the Covid-19 virus, with nearly all countries globally implementing quarantine measures or social distancing strategies. Our global traffic data shows that people are largely abiding by these regulations and staying home; road traffic is 45% below normal levels this week compared to 34% below the norm last week.

On the positive side, evidence is streaming in to suggest that quarantine measures are effective against the virus. In countries with measures in place since the beginning of March, such as Italy and Spain, the number of new fatalities per day is flattening out. True new infected cases per day in these countries has likely already fallen by 80% to 90%.

Still, the total number of true infected people globally has grown rapidly and is likely now around 13 million, driven by quicker then expected growth in North America, as well as South America, the Middle East and other European countries. If all quarantine measures are maintained through April, about 25 million people will be infected by 1 May. In a scenario where quarantine measures are loosened, the number of infected people will grow to 65 million.

Our perspective is that all countries will aim to manage the pandemic by throttling between more or less strict social distancing measures. This will last for 12 to 18 months if no medical or technological solution is found. In many countries, especially low income countries, the resulting decrease in economic activity might lead to severe societal or public health related issues. Thus, a balance between virus mitigation and economic activity must be found.

We estimate that road traffic and aviation will be down 50% in April, and the impact on the global oil market will be unprecedented. Demand destruction could amount to over 22 million barrels per day. The world will run out of oil storage and production will need to be shut-in many places. The gas markets will be less severely hit, as associated gas will decline and gas demand is more robust. Demand for oil service will drop below any level seen the last few decades. However, as soon as the coronavirus situation is over, which will likely be sometime in 2021, oil and oil service markets are set to rebound to extreme levels.



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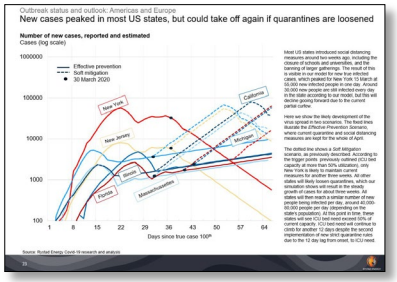

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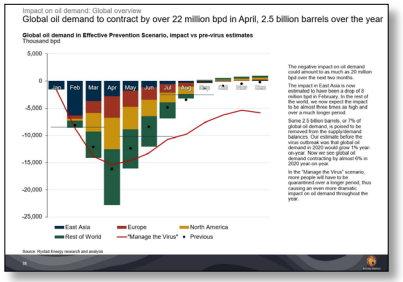

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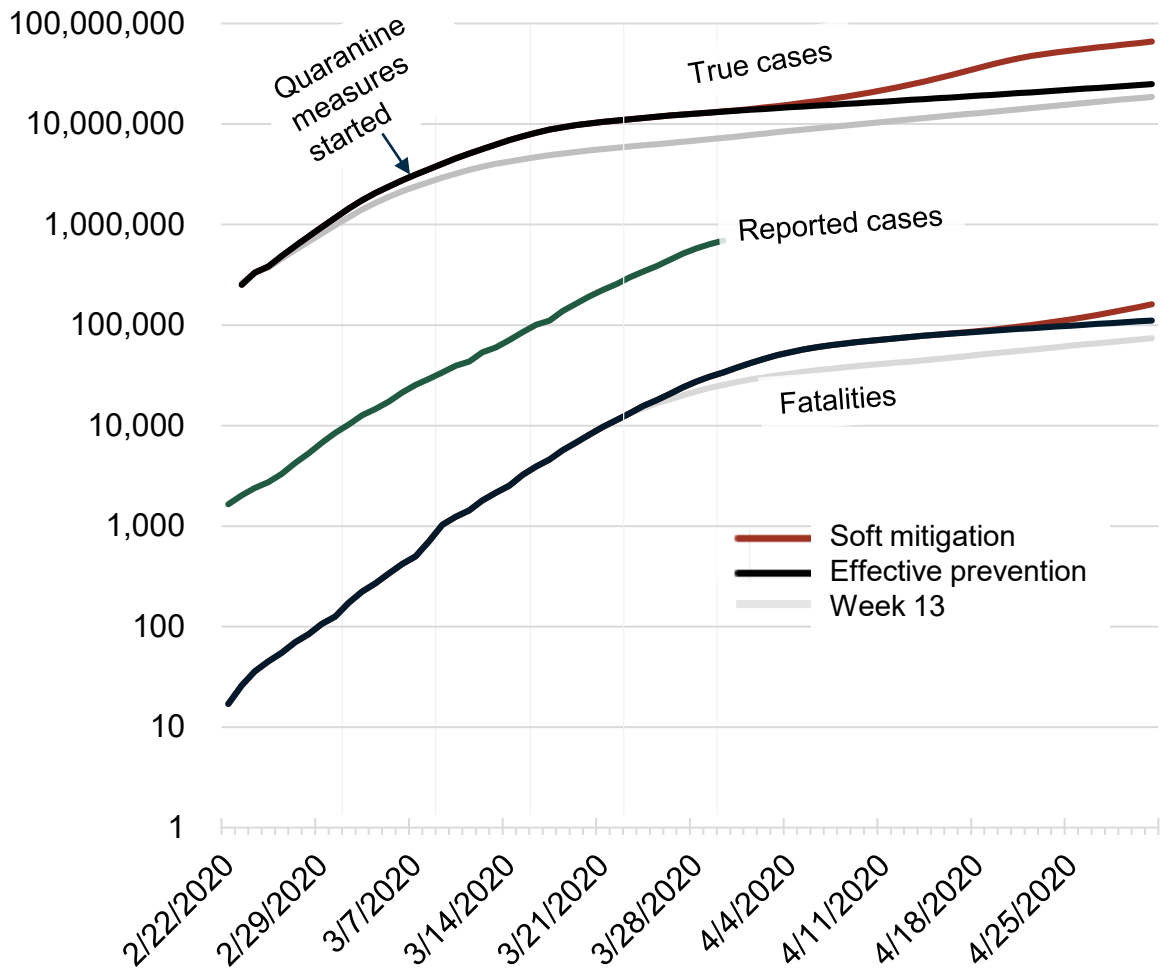
The true number of infected people is likely 13 million (outside of China)

Number of true and reported cases outside China
Cases (log scale)



* Reason for 0.5% given in the methodology chapter "Calibrating ICU bed capacity"
Source: Rystad Energy Covid-19 research and analysis

As of 30 March, 13.3 million people outside of China have been infected, according to our model.

Reported cases were 695,000 as of 30 March, a number we estimate is just 5% of true cases. The number of reported cases grew last week by 13% per day, with a doubling time of 5.7 days. Similar figures a week ago were 17% and 4.5 days, indicating that quarantine measures seem to have had an effect as growth in reported cases is slowing.

Registered fatalities outside of China were 33,800 as of 30 March, a number which grew by 14.4% per day over the last week versus the 18.9% growth seen a week ago. Thus, growth in fatalities is also slowing. However, growth is lagging behind true cases by 18 days and therefore we expect growth in fatalities to slow further over the next two weeks. Nevertheless, growth in fatalities was higher than expected last week, resulting in an upward revision of our historical estimates for *true cases.*

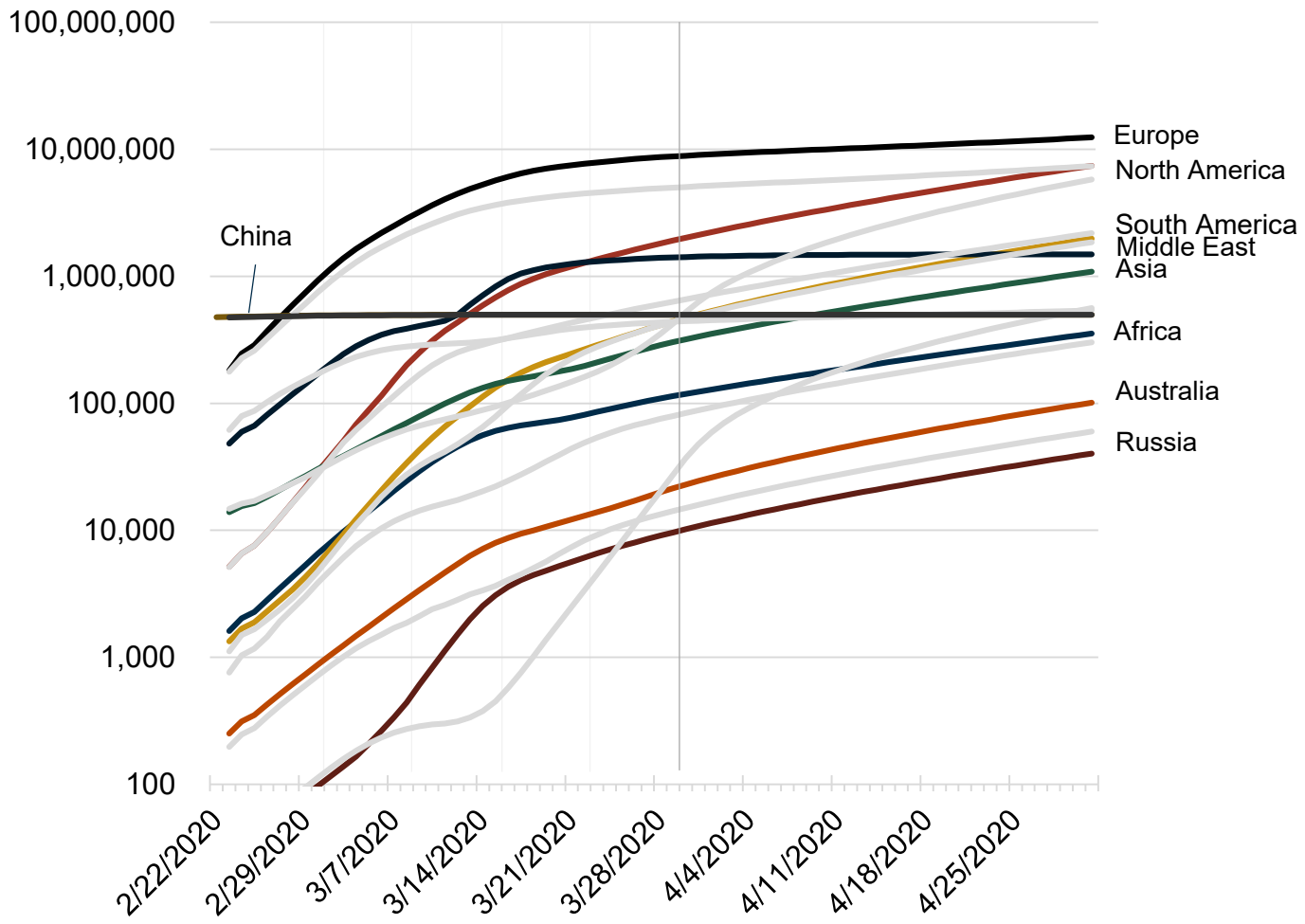
For the next month, we are presenting two scenarios; In the *Effective Prevention* scenario we assume that strict quarantine measures are maintained throughout April, keeping the Contact Rate (CR) at 2 interactions per person per day. In this scenario there will be 25 million infected people by end of April.

In the *Soft Mitigation* scenario, we assume a trigger point wherein 0.5% of true cases* exceeds 50% of the country's ICU capacity. If less than 50% of ICU capacity is utilized, quarantine measures within this scenario will be loosened, resulting in a CR of 6. In this scenario, true cases will again rise and there will be 66 million true cases of infection by the end of April.

Europe still has the most active cases, but revisions to North America show huge growth

Number of cases by region

Cases (log scale); assumes Effective Prevention Scenario



As of 30 March, an estimated 8.9 million people were infected in Europe.

North America has seen the largest revision since last week, up from 600,000 to 2 million estimated true infected cases as of 30 March.

Forecasted figures have been adjusted significantly down for Asia and Russia, as countries (India, Russia, others) have announced strict quarantine measures.

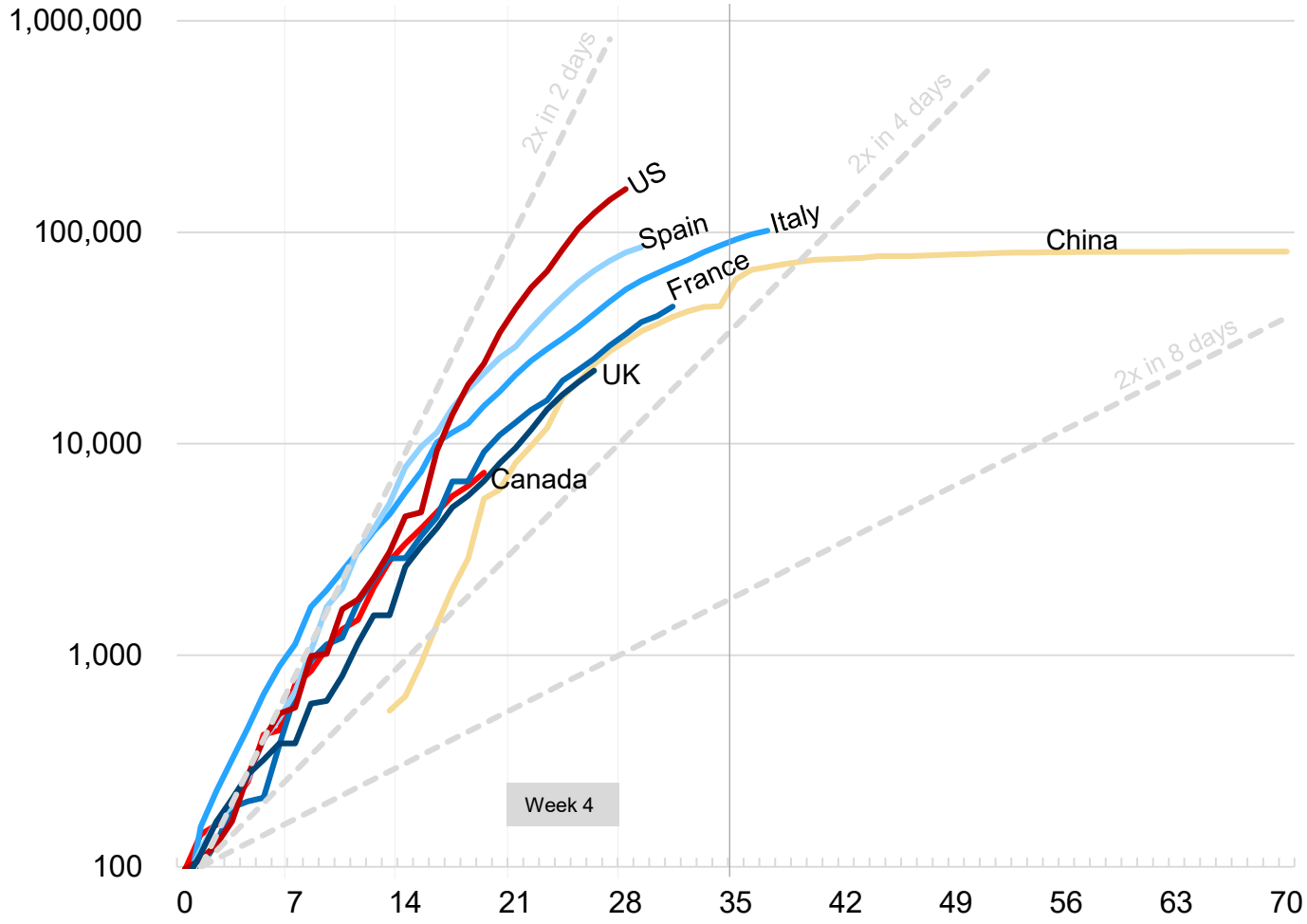
Australia and Africa have been adjusted upwards due to the observed increase in fatalities and reported cases

Continent	True cases 30 March	Reported cases 30 March	Share reported
Europe	8 907 010	410 139	4.60 %
North America	2 013 816	167 989	8.30 %
Middle East	1 419 758	62 078	4.40 %
China	498 048	81 470	16.40 %
South America	472 307	15 323	3.20 %
Asia	319 087	26 497	8.30 %
Africa	118 717	5 283	4.50 %
Australia	22 942	4 889	21.30 %
Russia	10 203	1 836	18.00 %

Source: Rystad Energy Covid-19 research and analysis

North American countries currently see the fastest growth of Covid-19 cases

Number of reported cases
Cases (log scale)



Source: Rystad Energy Covid-19 research and analysis

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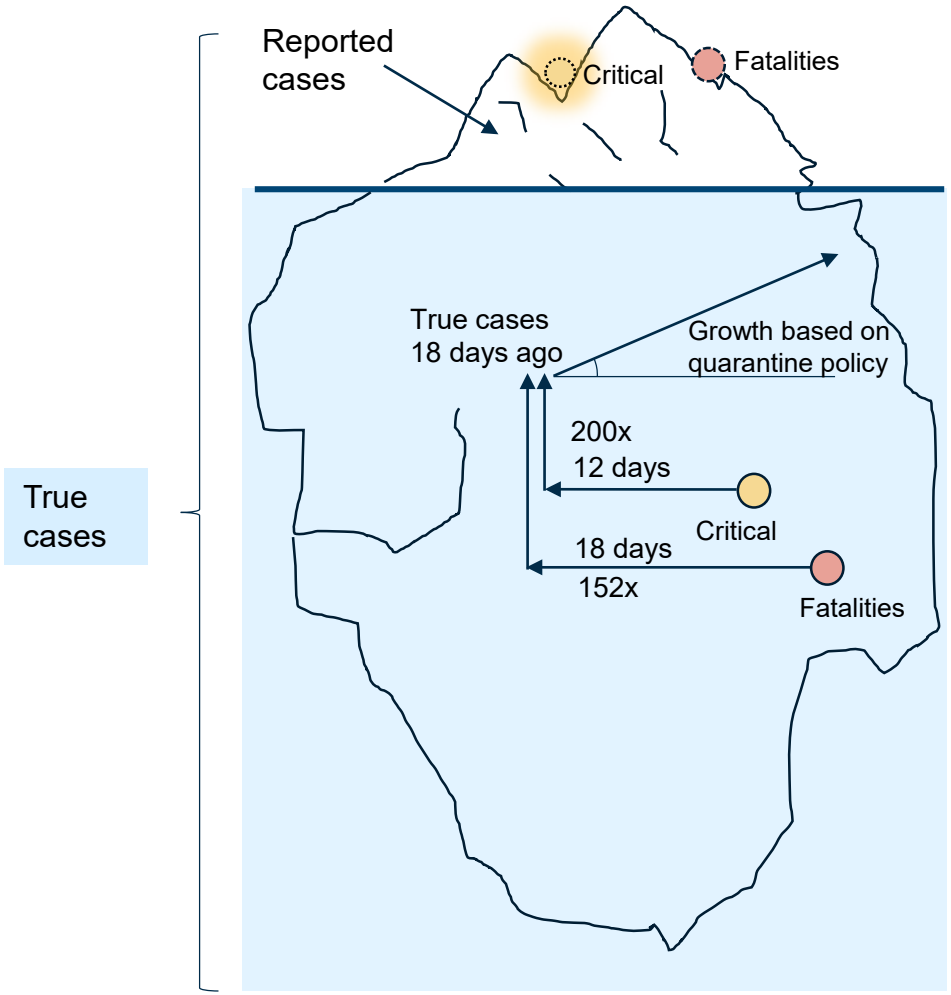
Reported cases are only the tip of the iceberg



Reported cases are only a fraction of the number of actual infected people:

- Many infected people are asymptomatic. They are unaware of being infected and are never tested or registered.
- Most sick people stay at home, and given the limited testing capacity in most countries, they are not registered as having been sick.

In populations where large groups have been tested, the following figures have been registered:

- Infection mortality rates (IFR) of 0.3%-1.0%, averaging 0.66%
- IFR appears stable across regions when adjusted for age.
- Thus, IFR is a better indicator of actual infected people, rather than reported cases. However, as the time from onset to fatality is, on average, 18 days, number of fatalities is giving a rather precise figure for «true infected» 18 days earlier.

The number of critical cases could potentially be another indicator of true cases because:

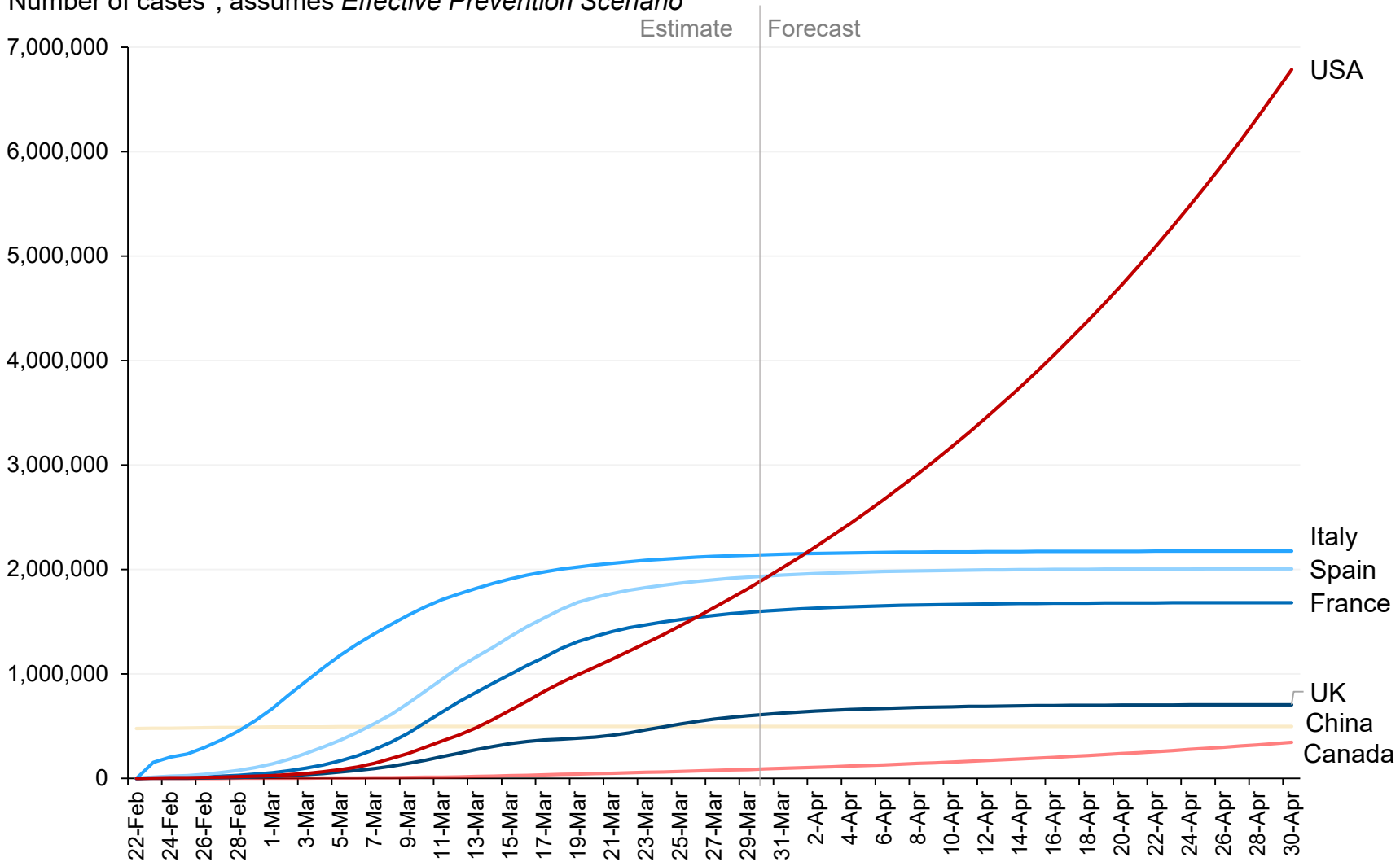
- 0.5% of all cases will need intensive care, according to our analysis as published earlier.
- However, critical case reporting practices vary from country to country, and cannot be trusted in all countries.
- Also, limited ICU capacity could lead to lower figures because people with a real need for ICU beds still do not get it.
- The time from onset to the critical phase is typically 12 days
- Still, the number of critical cases will also be used as an indicator to find the true number of Covid-19 cases.

Thus in our report, reported fatalities and critical cases are used to estimate the actual number of infected cases 12 to 18 days ago. Then we study observed quarantine measures and traffic patterns in order to produce a best possible estimate of the current true number of Covid-19 cases.

Source: Rystad Energy Covid-19 research and analysis

Most key countries have curbed the virus spread, but the US and Canada are still growing

Estimated total true cases, key relevant countries
Number of cases*; assumes *Effective Prevention Scenario*

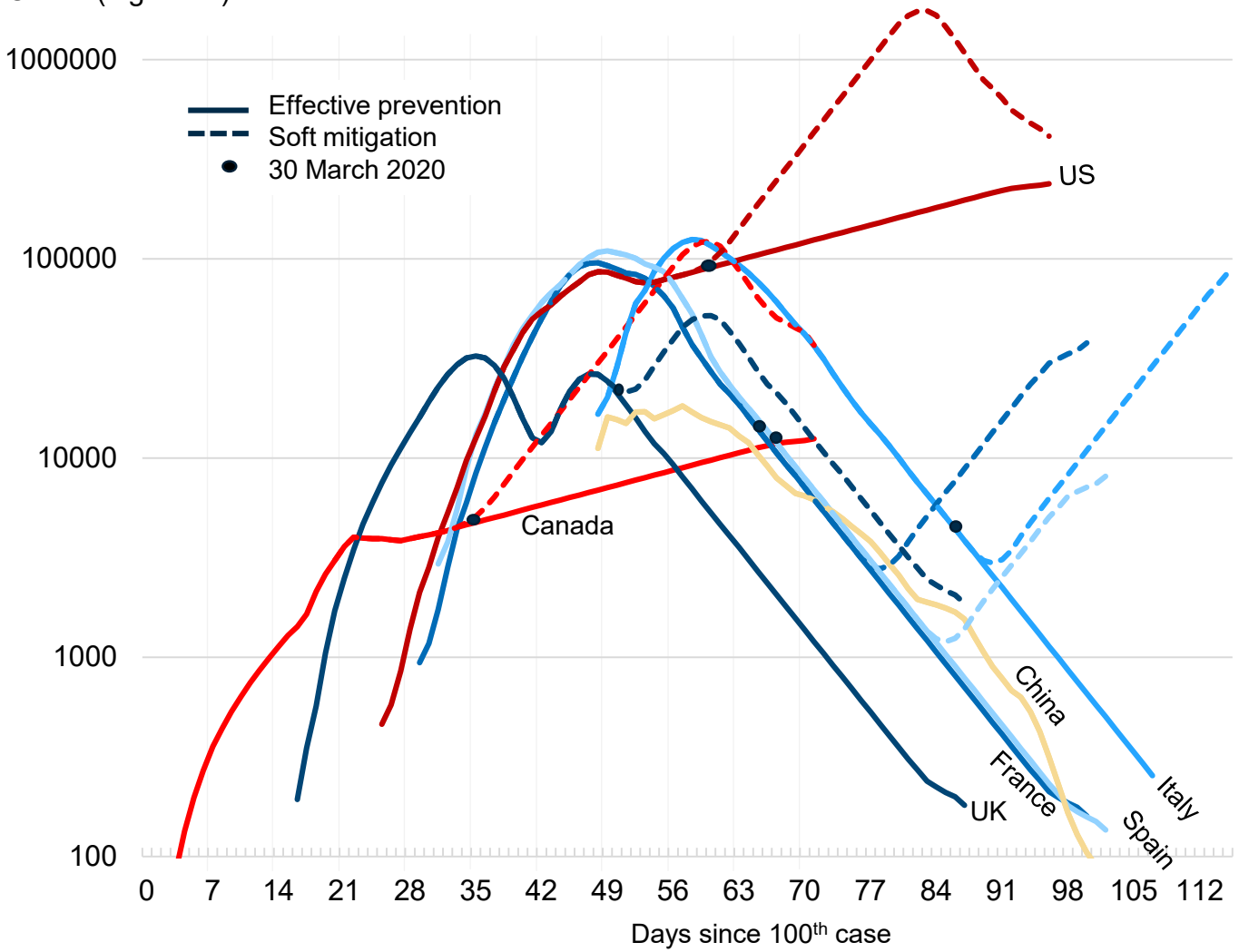


Source: Rystad Energy research and analyses; Worldometer; *Assumes current measures in place during forecasting interval

True *new cases* have peaked in Europe, while US and Canada will see growth

Number of true new cases, reported and estimated

Cases (log scale)



According to our data, *true new cases per day* peaked in France and Spain 18 days ago, and in Italy 26 days ago. At peak about 100,000 new people were infected every day in each of these three countries. Strict quarantine measures were then introduced. These measures have worked well, and true number of new infected people has declined significantly. In France and Spain the model indicates that true new cases each day are now at about 11,000, and about 5,000 in Italy.

In the US, about 100,000 new people are now infected every day, while in Canada about 5,000 are infected, and in the UK about 20,000 are infected each day.

Here we show the likely development going forward in two scenarios: The solid lines shows the *Effective Prevention Scenario*, wherein countries maintain current quarantines and social distance regimes. The dotted line shows a *Soft Mitigation Scenario*, wherein social distancing measures are loosened prematurely or see weak compliance.

Within the *Soft Mitigation Scenario*, France, Spain and Italy will as described loosen quarantines in 5 to 18 days. The US, Canada and the UK will loosen quarantines immediately as Intensive Care Unit (ICU) capacity is still only 50% utilized. These countries will then all see increases in the number of new infected cases each day. In the US, new cases per day will grow to 1.8 million per day in 21 days, when stricter quarantines will again be implemented.

Source: Rystad Energy Covid-19 research and analysis

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Three possible outcomes for the virus in a nation

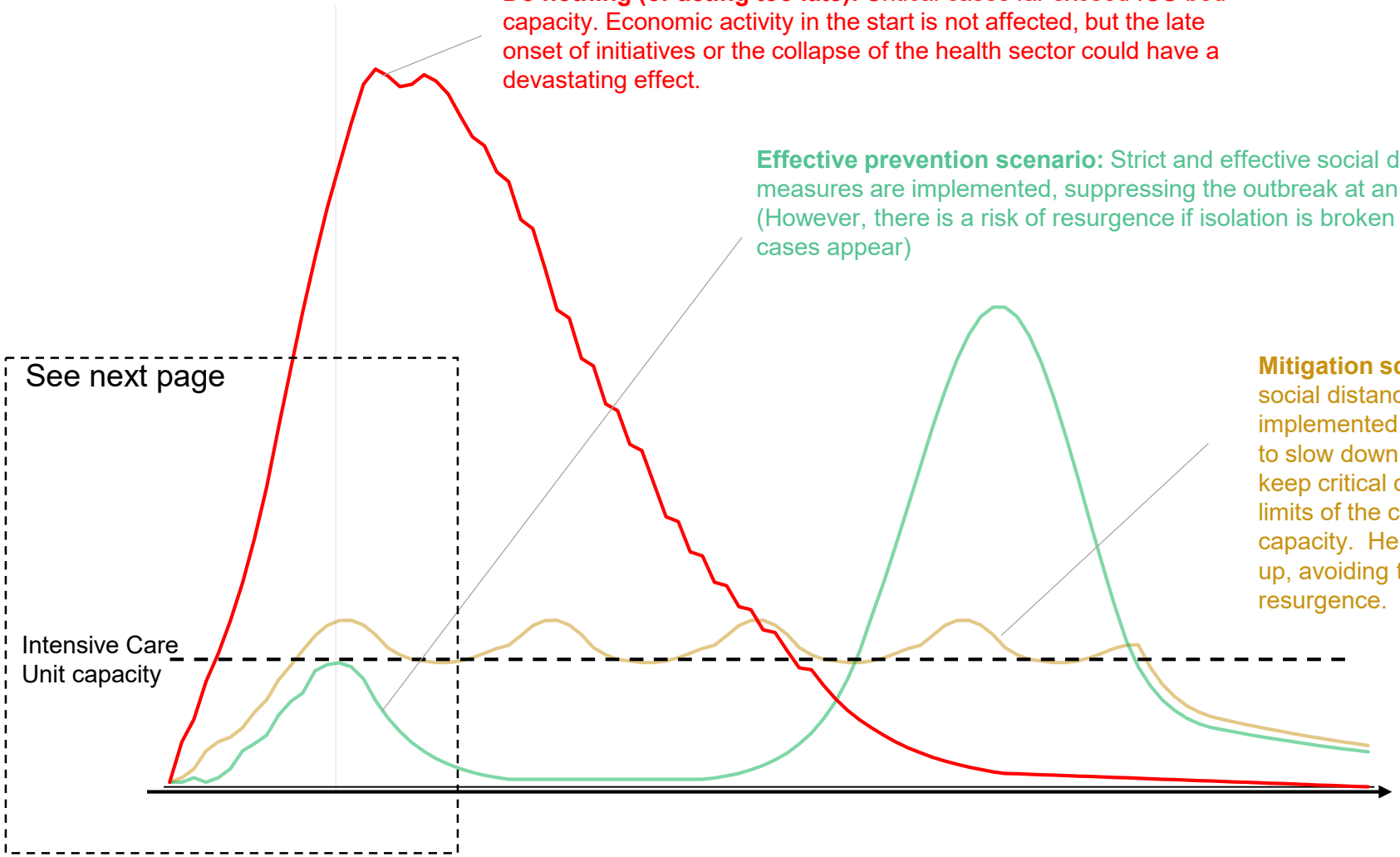
Conceptual

Scenarios for managing the outbreak

Do nothing (or acting too late): Critical cases far exceed ICU bed capacity. Economic activity in the start is not affected, but the late onset of initiatives or the collapse of the health sector could have a devastating effect.

Effective prevention scenario: Strict and effective social distancing measures are implemented, suppressing the outbreak at an early stage. (However, there is a risk of resurgence if isolation is broken and new cases appear)

Mitigation scenario: Looser social distancing measures are implemented. This is still enough to slow down the infection and keep critical cases within the limits of the country's ICU capacity. Herd immunity is built up, avoiding the risk of resurgence.

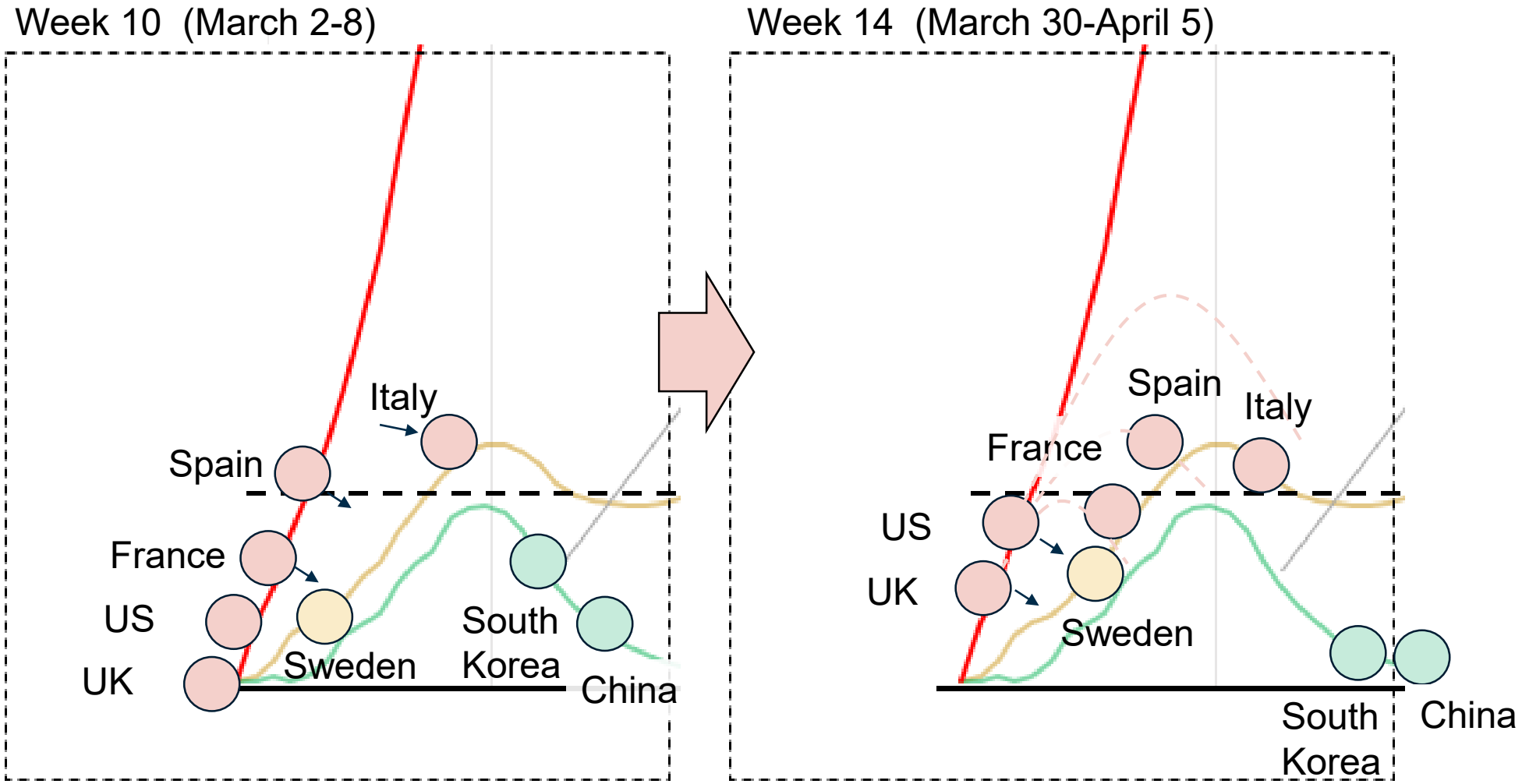


Source: Rystad Energy research and analyses

Countries that start too late could struggle to get off “the red route”

Conceptual

Scenarios for managing the outbreak



Source: Rystad Energy research and analyses

Global quarantine measures, spectrum of severity

Decrease in personal freedom →

	Social distancing	Light lockdown	Full lockdown	Curfew
Social gatherings	Limited e.g. to 50 people	Banned (but 5 could be accepted)	Banned	Banned
Educational establishments	Most schools shut	Shut	Shut	Shut
Non-essential businesses	Open	Work from home	Work from home	Closed
Essential businesses	Open	Open	Open	Open, but documentation required
Shopping	Allowed, with reduced social interaction	Allowed, with reduced social interaction	Allowed, but many shops closed	Not allowed, except from planned/ permitted hours
Leaving the house to walk and exercise	Allowed, with reduced social interaction	Allowed, with reduced social interaction	Not allowed, except maybe 1 hour or less	Not allowed

When no measures are enacted, we assume each person has contact with 10 other people daily.

When social gatherings are prohibited and schools are closed, contact levels decrease to 4.

The closure of non-essential businesses decreases contact further to 2.

A full lockdown brings the contact rate down to 1.

A **"lockdown"** refers to emergency protocol that preventing individuals from leaving an area and moving freely. During the Covid-19 pandemic, this indicates a mass quarantine. People are required to stay home and are allowed to go out for essential needs.

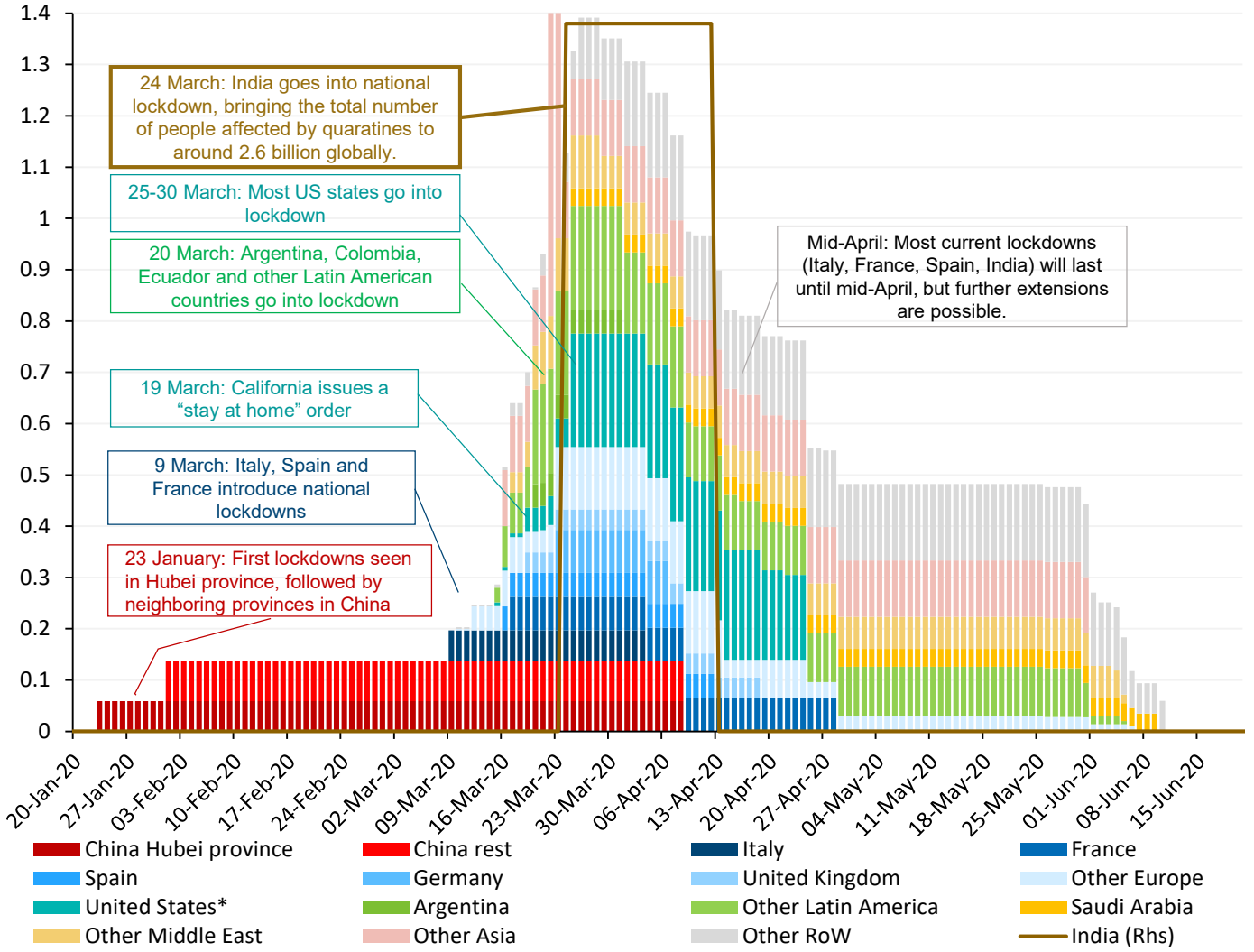
Lockdowns can be implemented at varying levels of severity. In Italy, people are required to bring a form of self-declaration when leaving their homes, while in the UK people are allowed to exercise outside without any formal notice.

In the US, more than two thirds of states have imposed a "**shelter-in-place**" order, which is similar to a lockdown.

Sources: Rystad Energy research and analysis

50 countries are currently in quarantine with nearly 3.0 billion people affected globally

Countries and geographic entities that have introduced lockdown measures; population affected
Billion people



Source: UN Population Prospects, Rystad Energy research and analysis

To date, 50 counties are in full lockdown in addition to almost two thirds of US states. This means that all non-essential business is closed, remote working is enforced, and only essential transportation is allowed. We expect such lockdowns to have a significant impact on oil demand, especially on road fuels, as people do not commute to work, or use cars or public transport on weekends.

In the US, major metropolitan areas instituted lockdowns first, and we are now seeing sweeping state-mandated shelter-in-place orders. Nearly half of US states have now adopted strict measures.

On 24 March, India went into a three-week lockdown and a curfew regime was imposed, essentially prohibiting 1.3 billion people from venturing out of their homes. The government has indicated that these measures will last until mid-April, but extensions will almost certainly occur. Italy, the European epicenter, is still miles away from having the pandemic under control despite being the first European country to enact similarly strict nationwide lockdowns.

Global quarantine measures visible in traffic data

Traffic data from 20 March to 30 March, by continent
Observed traffic versus normal traffic levels

Date	Africa	America N	America S	Asia	Australia	Europe	Middle East	Russia	Grand Total
20.mar.20	-27 %	-34 %	-37 %	-19 %	-16 %	-28 %	-31 %	-10 %	-25 %
21.mar.20	-28 %	-25 %	-42 %	-20 %	-13 %	-23 %	-35 %	-11 %	-25 %
22.mar.20	-35 %	-16 %	-47 %	-40 %	-11 %	-26 %	-41 %	-4 %	-27 %
23.mar.20	-36 %	-35 %	-48 %	-33 %	-16 %	-29 %	-45 %	-10 %	-31 %
24.mar.20	-36 %	-38 %	-48 %	-37 %	-25 %	-32 %	-44 %	-12 %	-34 %
25.mar.20	-35 %	-38 %	-46 %	-43 %	-27 %	-33 %	-43 %	-13 %	-35 %
30.mar.20	-50 %	-34 %	-45 %	-48 %	-33 %	-32 %	-42 %	-44 %	-41 %
Grand Total	**-35 %**	**-32 %**	**-45 %**	**-34 %**	**-20 %**	**-29 %**	**-40 %**	**-15 %**	**-31 %**

As seen here, global traffic fell from 25% below the normal level at the end of week 12, to 35% in week 13 and 41% in week 14.

Russia, Africa and Australia have recently seen the most significantly reduced traffic.

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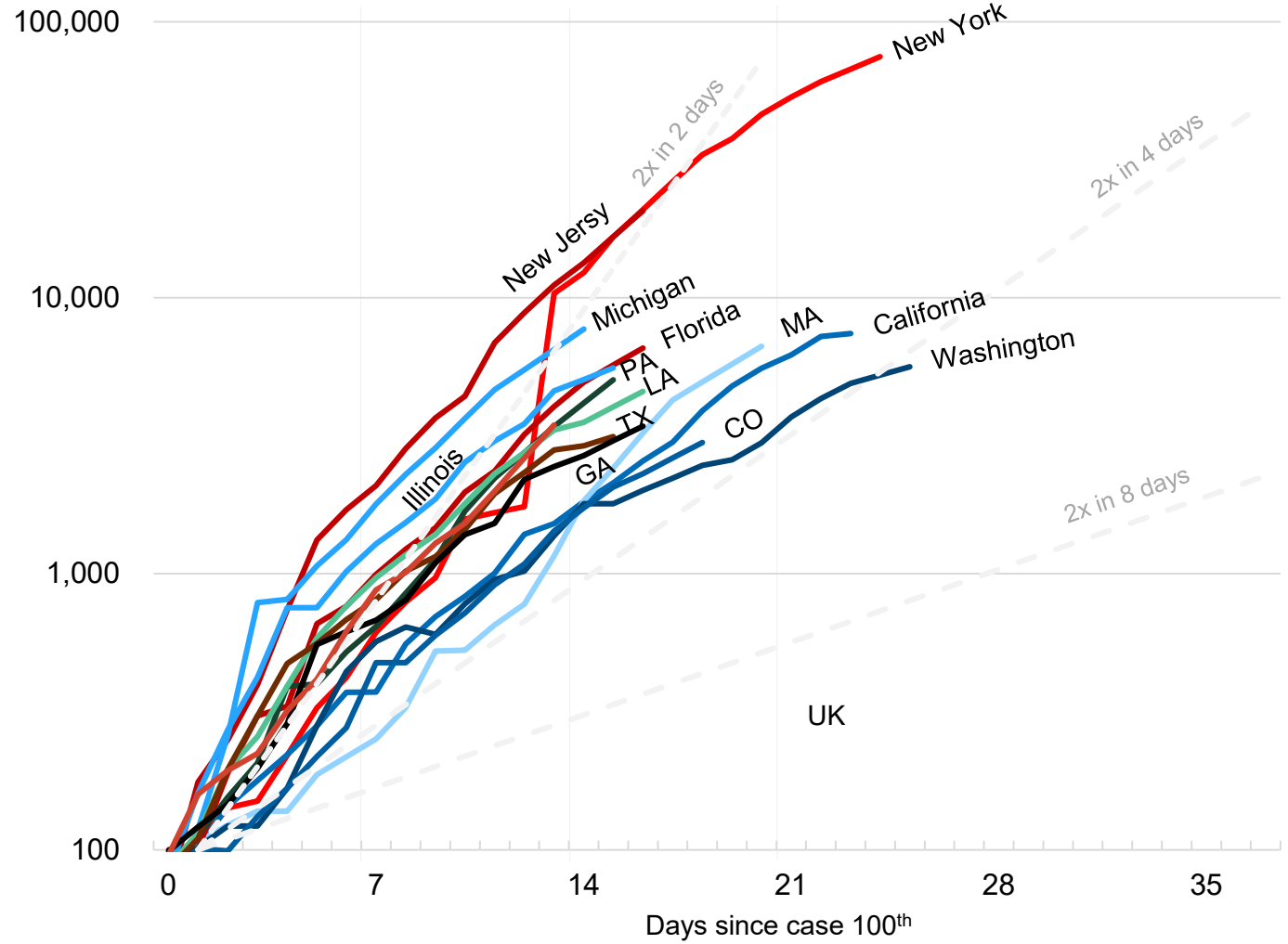
Growth of new cases slowing in New York state, MA and FL saw faster growth last week

Number of reported cases by State
Cases (log scale)



Within US, Covid-19 cases have so far grown the fastest in New York state, with 50% growth per day until a week ago. Last week, this growth slowed to a 16% increase in new cases per day. Currently reported cases are now around 75,000

Neighboring state New Jersey has seen 28% growth per day over the last 7 days, with 21,000 reported cases.

Five states follow, each with about 7,500 reported infected cases. Reported cases in Massachusettes grew the fastes last week (28% per day), followed by Florida (24%), Michigan (23%), California (16%) and Washington (13%).

Other states have around 55,000 reported cases combined, bringing the US total of reported cases to around 187,000 in total.

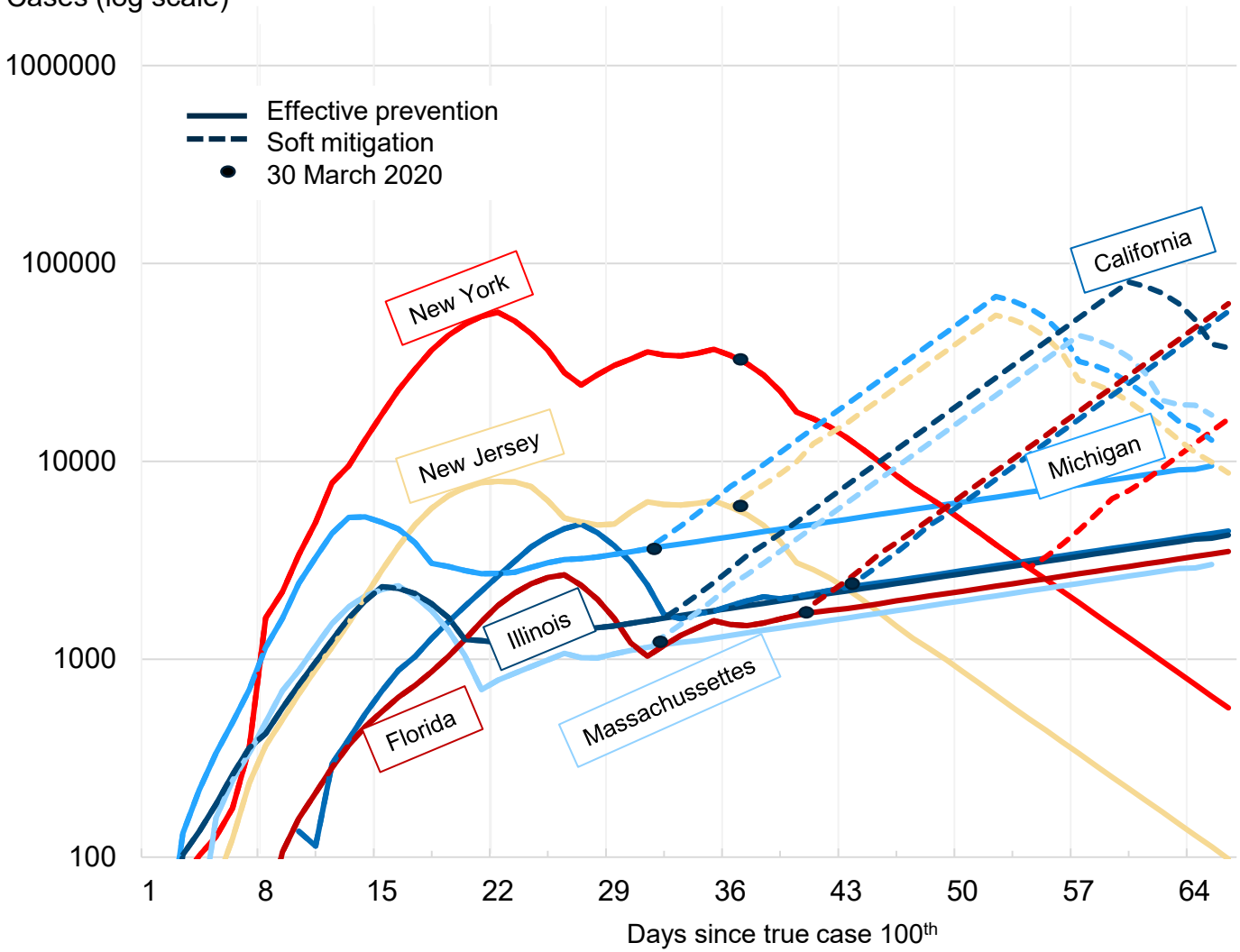
This number pales in comparison to our estimates. Accroding to our model, estiamted true infected cases are likely around 2 million, meaning that approximately 9% of infected people are actually reported as infected.

Source: Rystad Energy Covid-19 research and analysis

New cases peaked in most US states, but could take off again if quarantines are loosened

Number of new cases, reported and estimated

Cases (log scale)



Most US states introduced social distancing measures around two weeks ago, including the closure of schools and universities, and the banning of larger gatherings. The result of this is visible in our model for new true infected cases, which peaked for New York 15 March at 55,000 new infected people in one day. Around 30,000 new people are still infected every day in the state according to our model, but this will decline gooing forward due to the current partial curfew.

Here we show the likely development of the virus spread in two scenarios. The fixed lines illusrate the *Effective Prevention Scenario*, where current quarantine and social distancing measures are kept for the whole of April.

The dotted line shows a *Soft Mitigation* scenario, as previously described. According to the trigger points previously outlined (ICU bed capacity at more than 50% utilization), only New York is likely to maintain current measures for another three weeks. All other states will likely loosen quarantines, which our simulation shows will result in the steady growth of cases for about three weeks. All states will then reach a similar number of new people being infected per day, around 40,000-80,000 people per day (depending on the state's population). At this point in time, these states will see ICU bed need exceed 50% of current capacity. ICU bed need will continue to climb for another 12 days despite the second implementation of new strict quarantine rules due to the 12 day lag from onset, to ICU need.

Source: Rystad Energy Covid-19 research and analysis

Are quarantine measures working in the US? Yes, overall traffic is down 34%

Reduced traffic in US cities, summarized by country

Share reduction versus regular traffic

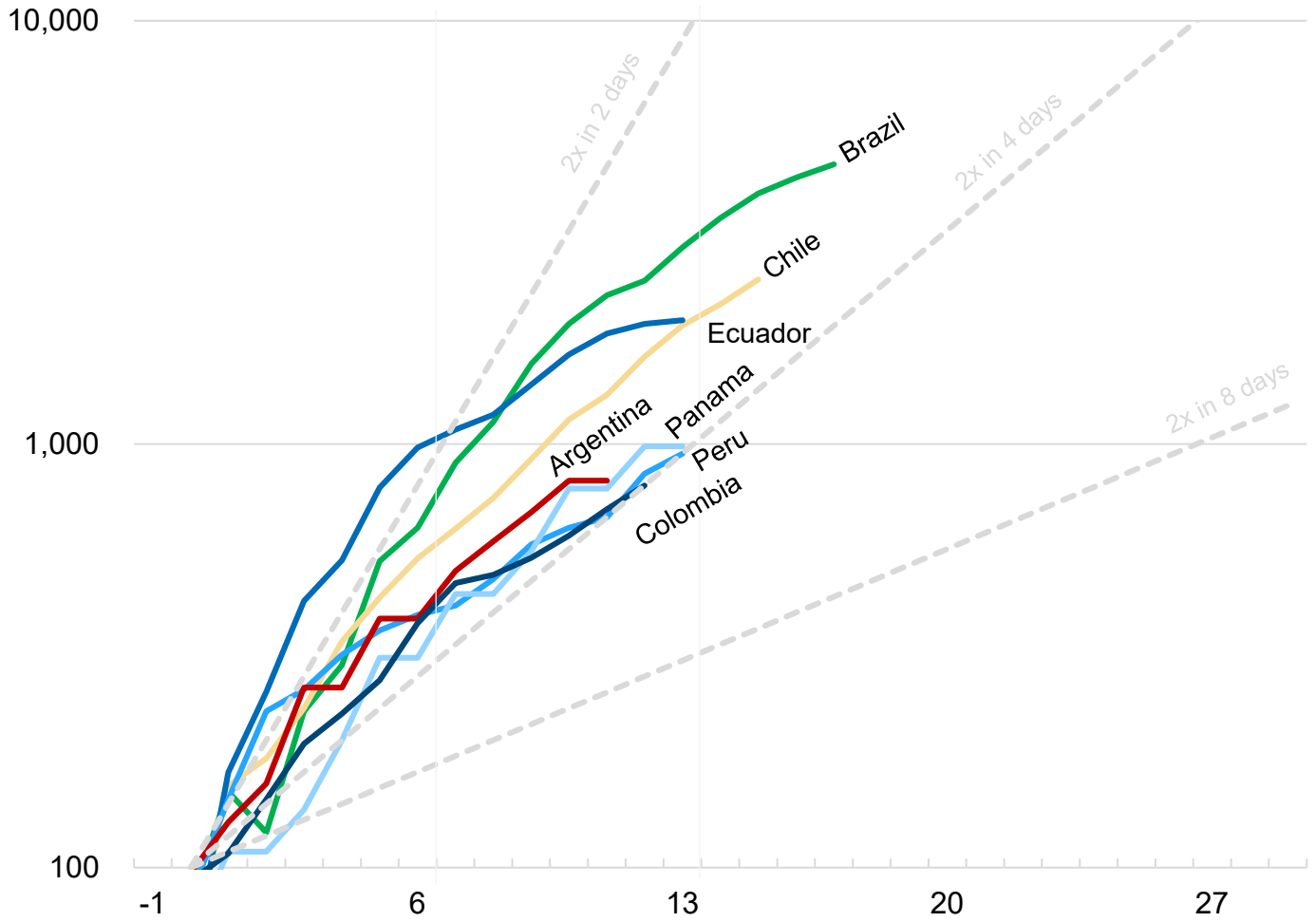
State in US	20.03.2020	21.03.2020	22.03.2020	23.03.2020	24.03.2020	25.03.2020	30.03.2020
New York	-50 %	-49 %	-53 %	-56 %	-59 %	-63 %	-63 %
District of Colum	-47 %	-39 %	-39 %	-54 %	-56 %	-57 %	-55 %
Washington	-50 %	-40 %	-33 %	-51 %	-55 %	-57 %	-60 %
Illinois	-43 %	-43 %	-37 %	-52 %	-51 %	-54 %	-53 %
California	-50 %	-41 %	-32 %	-50 %	-52 %	-52 %	-45 %
Florida	-47 %	-39 %	-32 %	-49 %	-52 %	-52 %	-46 %
Massachusetts	-44 %	-35 %	-31 %	-38 %	-54 %	-57 %	-53 %
Pennsylvania	-43 %	-40 %	-28 %	-42 %	-50 %	-51 %	-50 %
Georgia	-41 %	-29 %	-15 %	-39 %	-44 %	-44 %	-42 %
Maryland	-39 %	-25 %	-10 %	-38 %	-47 %	-48 %	-46 %
New Jersey				-58 %	-61 %	-64 %	-66 %
Connecticut	-40 %	-33 %	-20 %	-40 %	-44 %	-47 %	-14 %
Minnesota	-39 %	-22 %	-2 %	-40 %	-41 %	-40 %	-43 %
Kentucky	-35 %	-28 %	-17 %	-33 %	-35 %	-35 %	-32 %
Texas	-31 %	-19 %	-6 %	-35 %	-37 %	-42 %	-39 %
Rhode Island	-32 %	-23 %	-15 %	-28 %	-34 %	-40 %	-33 %
Nevada	-37 %	-24 %	-6 %	-32 %	-36 %	-35 %	-33 %
New Hampshire	-29 %	-20 %	-14 %	-32 %	-34 %	-33 %	-37 %
Hawaii	-37 %	-18 %	-12 %	-36 %	-44 %	-45 %	
North Carolina	-29 %	-16 %	-6 %	-32 %	-32 %	-32 %	-36 %
Louisiana	-28 %	-18 %	-2 %	-26 %	-31 %	-32 %	-34 %
Arizona	-39 %	2 %	26 %	-36 %	-44 %	-40 %	-28 %
Virginia	-25 %	-17 %	0 %	-27 %	-30 %	-31 %	-19 %
South Carolina	-25 %	-13 %	-7 %	-25 %	-27 %	-30 %	-20 %
Colorado	-26 %	-18 %	14 %	-27 %	-32 %	-33 %	-19 %
Tennessee	-22 %	-8 %	-1 %	-25 %	-27 %	-29 %	-26 %
Alaska	-21 %	-1 %	18 %	-24 %	-28 %	-33 %	-41 %
Missouri	-18 %	-10 %	1 %	-25 %	-26 %	-25 %	-17 %
New Mexico	-22 %	-16 %	0 %	-19 %	-25 %	-27 %	-10 %
Mississippi	-19 %	-7 %	7 %	-19 %	-26 %	-25 %	-21 %
Arkansas	-16 %	-8 %	-2 %	-16 %	-17 %	-18 %	-23 %
Alabama	-19 %	-5 %	2 %	-15 %	-18 %	-21 %	-23 %
Michigan	-16 %	-1 %	17 %	-15 %	-20 %	-20 %	-16 %
Idaho	-27 %	-12 %	29 %	-23 %	-35 %	-35 %	40 %
Utah	-18 %	-2 %	23 %	-18 %	-21 %	-18 %	-7 %
Indiana	-13 %	-7 %	9 %	-11 %	-15 %	-18 %	-5 %
Ohio	-10 %	-4 %	3 %	-8 %	-13 %	-12 %	-11 %
Wisconsin	-16 %	4 %	36 %	-12 %	-13 %	-14 %	-30 %
Nebraska	-12 %	5 %	18 %	-1 %	-5 %	-1 %	-11 %
Kansas	2 %	2 %	13 %	0 %	-5 %	-2 %	-4 %
Iowa	0 %	8 %	9 %	10 %	12 %	21 %	3 %
Oklahoma	5 %	26 %	36 %	11 %	8 %	9 %	-4 %

Source: Rystad Energy global city traffic database

- This overview shows the reduction in traffic in major US cities over the last 10 days.
- Overall traffic is down 34% on average.
- The largest reduction (a result of the strictest quarantine measures) can be seen in New York, New Jersey, Washington DC, Washington state, Illinois and California
- The least traffic reduction is observed in mid continent states like Oklahoma, Kansas, Iowa and Nebraska.
- State figures are weighted by population in each city.

South American countries have, so far, seen less reported cases

Number of reported cases
Cases (log scale)



In South America, 15,500 people are reported infected, of which the seven largest nations are shown here to the left. This number has grown from 6,000 only a week ago, or a 14% increase per day.

The number of fatalities has been 381, growing by 23% per day over the last week. 42% of these were in Brazil.

According to our simulations, there are currently around 500,000 infected people in South America, of which only 5% are reported as infected.

Still, South American countries are learning from other countries and have swiftly implemented strict quarantine measures.

Source: Rystad Energy Covid-19 research and analysis

Are quarantine measures working in the Americas? Yes, overall traffic is 38% down

Reduced traffic in American cities, summarized by country
Share reduction versus regular traffic

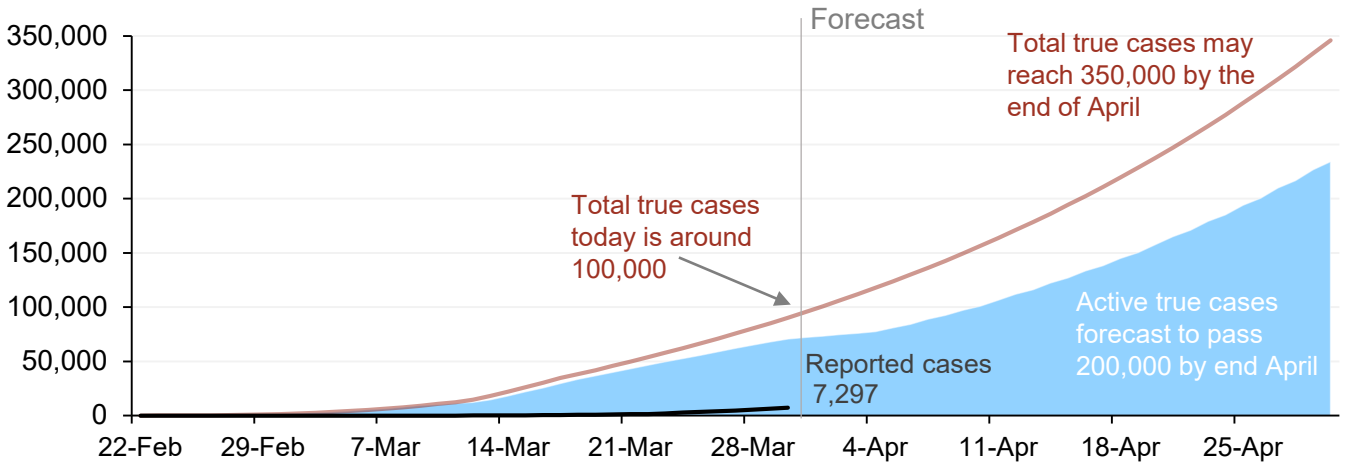
Continent	Country Standard	20.03.2020 Friday	21.03.2020 Saturday	22.03.2020 Sunday	23.03.2020 Monday	24.03.2020 Tuesday	25.03.2020 Wednesday	30.03.2020 Monday
America N	United States	-38 %	-28 %	-18 %	-39 %	-43 %	-44 %	-40 %
	Mexico	-14 %	-11 %	-9 %	-18 %	-20 %	-18 %	-13 %
	Canada	-42 %	-33 %	-20 %	-39 %	-43 %	-44 %	-38 %
America S	Brazil	-28 %	-34 %	-39 %	-39 %	-43 %	-43 %	-40 %
	Argentina	-44 %	-36 %	-32 %	-52 %	-51 %	-37 %	-23 %
	Colombia	-45 %	-70 %	-76 %	-73 %	-55 %	-65 %	-65 %
	Venezuela	-54 %	-53 %	-59 %	-52 %	-54 %	-51 %	-44 %
	Chile	-29 %	-31 %	-30 %	-34 %	-32 %	-31 %	-34 %
	Peru	-54 %	-54 %	-49 %	-53 %	-54 %	-51 %	-57 %
	Dominican Republi	-51 %	-59 %	-68 %	-52 %	-63 %	-61 %	-69 %
	Ecuador	-61 %	-65 %	-65 %	-67 %	-64 %	-62 %	-71 %
	Bolivia	-35 %	-28 %	-85 %	-80 %	-82 %	-80 %	-71 %
	Honduras	-49 %	-49 %	-47 %	-41 %	-43 %	-25 %	-60 %
	Guatemala	-47 %	-59 %	-71 %	-55 %	-58 %	-45 %	-44 %
	Puerto Rico	-51 %	-41 %	-37 %	-52 %	-55 %	-56 %	-57 %
	Haiti	-33 %	-43 %	-68 %	-49 %	-56 %	-57 %	-74 %
	Paraguay	-37 %	-56 %	-61 %	-63 %	-64 %	-62 %	-58 %
	Guinea	-29 %	-68 %	-92 %	-68 %	-45 %	-37 %	-42 %
	Uruguay	-13 %	5 %	-9 %	-12 %	-16 %	-12 %	-4 %
	Panama	-31 %	-38 %	-41 %	-38 %	-45 %	-49 %	-62 %
	Costa Rica	-39 %	-55 %	-68 %	-46 %	-46 %	-46 %	-51 %
	El Salvador	-34 %	-38 %	-48 %	-52 %	-51 %	-50 %	-61 %
	Nicaragua	-15 %	-21 %	-20 %	-21 %	-24 %	-29 %	-58 %
	Jamaica	-24 %	-22 %	-14 %	-30 %	-33 %	-28 %	-45 %
	Bahamas	-25 %	-33 %	-28 %	-38 %	-66 %	-61 %	-72 %

- This overview shows the reduction in traffic in major cities in the Americas over the last 10 days.
- Overall traffic is down 38% on average.
- The largest reduction (a result of the strictest quarantine measures) can be seen in South America, in particular in Colombia, Peru, Dominican Republic, Ecuador and Bolivia with around a 70% decrease in traffic.
- The least traffic reduction is observed in Mexico, Chile and Uruguay.
- Country figures are weighted by population in each city.

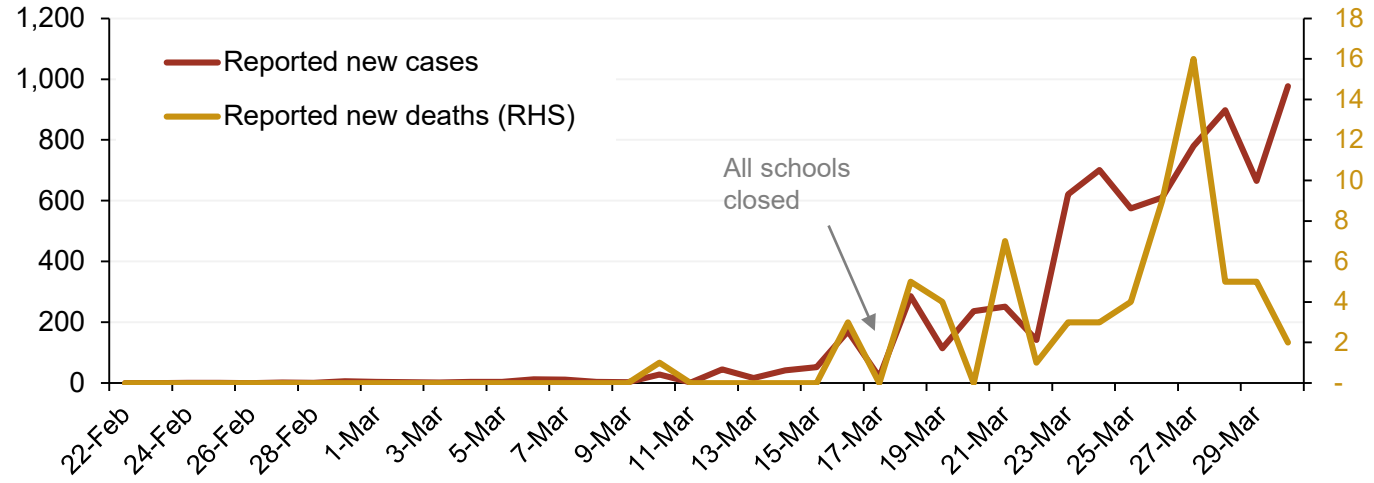
Source: Rystad Energy global city traffic database

Number of cases in Canada expected to grow as measures are not yet strict enough

Canada, estimated total and active true cases
Number of cases*; Effective Prevention Scenario



Daily new cases and deaths



Canada has yet to enforce very strict quarantine measures, however all schools closed nationwide on 17 March.

We estimate the current true number of total cases is likely around 100,000, more than fourteen times the 7,000 reported cases. In our Effective Prevention Scenario we expect the total true number of cases will grow to 200,000 by the end of April. We expect this number will continue to grow as measures continue to be insufficient to stop the spread.

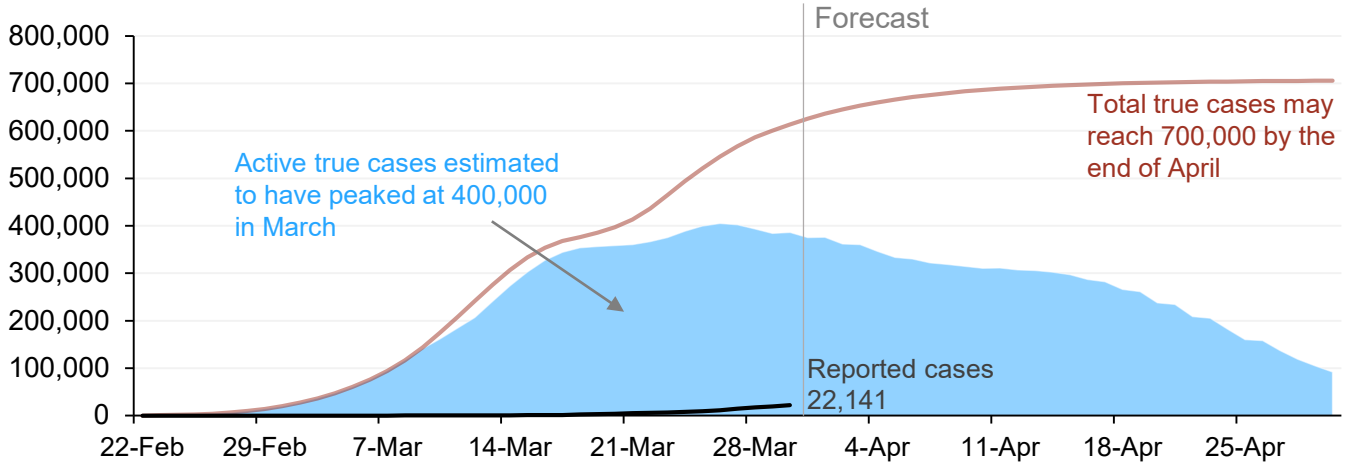
The lower chart shows the daily number of new cases. We note that the number of reported new cases is still on an upwards trend.

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

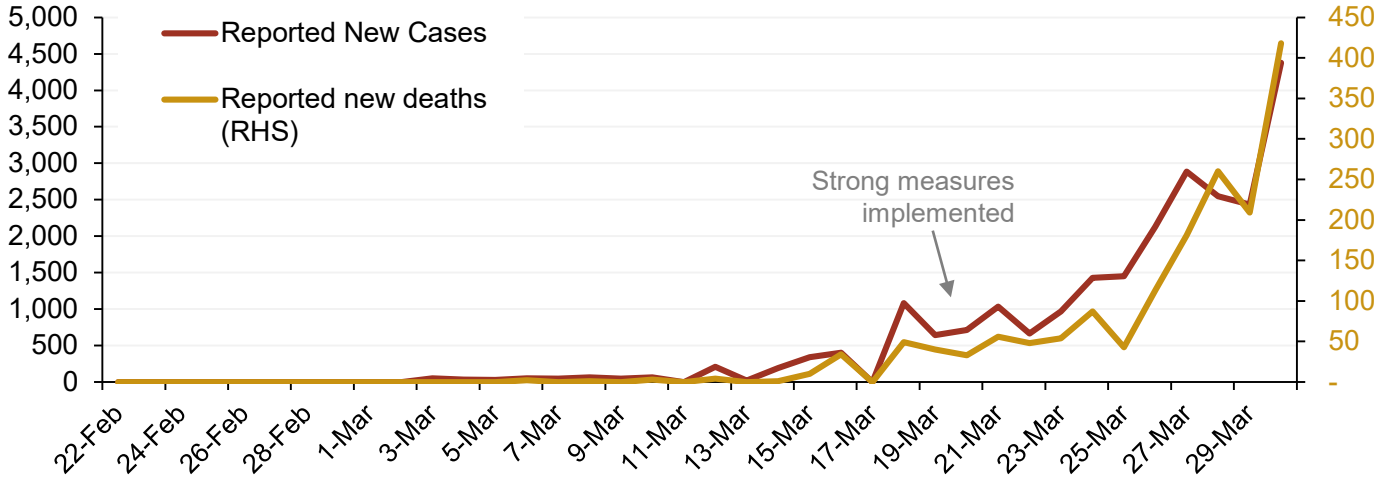
Source: Rystad Energy research and analyses; Worldometer; *Assumes current measures in place during forecasting interval

The UK may have passed peak active cases after a very strict lockdown was implemented

UK, estimated total and active true cases
Number of cases*; Effective Prevention Scenario



Daily new cases and deaths



The UK implemented a very strict nationwide lockdown on 20 March – a complete turnaround from the former strategy of only slowing the spread and protecting people in risk groups.

We estimate the current true number of total cases 600,000 which is almost thirty times the 22,000 of reported cases. However, we estimate about 400,000 are currently affected, which we expect is the peak.

The lower chart shows the daily reported new cases and deaths. We note that the number of new cases and deaths is still climbing. This is as expected, as the reported numbers have a delay compared to the true numbers. (For example, reported cases keep climbing as more and more people feel symptoms.) We expect to see the number of new cases begin to decline in early April – around two weeks after the very strict lockdown was implemented.

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

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

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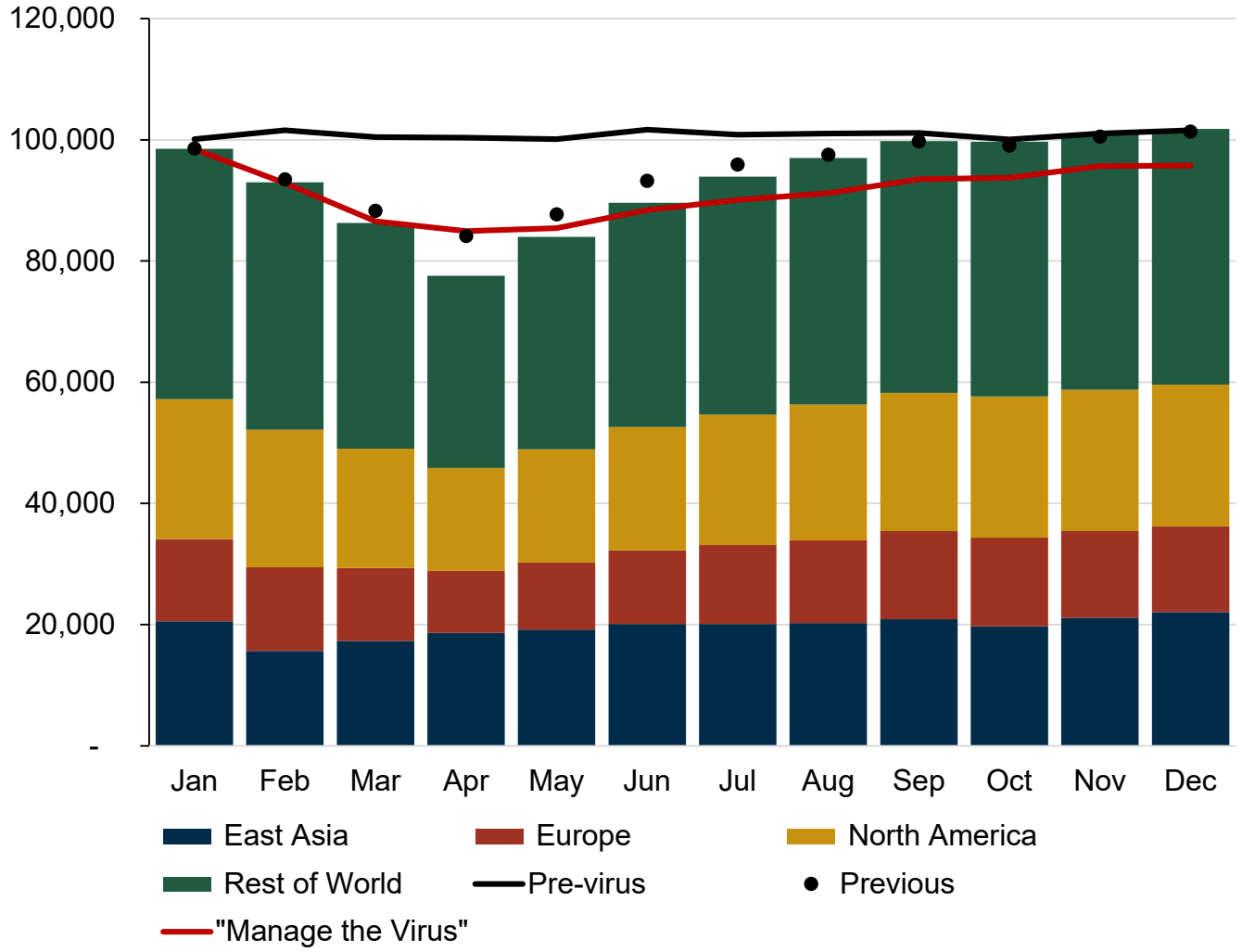
We now see global oil demand in 2020 contracting by 6.4% from 2019

Global oil demand impact analysis Covid-19 – Effective Prevention Scenario
Thousand bpd



We now estimate 2.5 billion barrels lower oil demand in 2020 due to the virus outbreak, with average daily demand of 93.5 million bpd for the year, i.e. a 6.4% contraction vs the 2019 level of 100 million bpd.

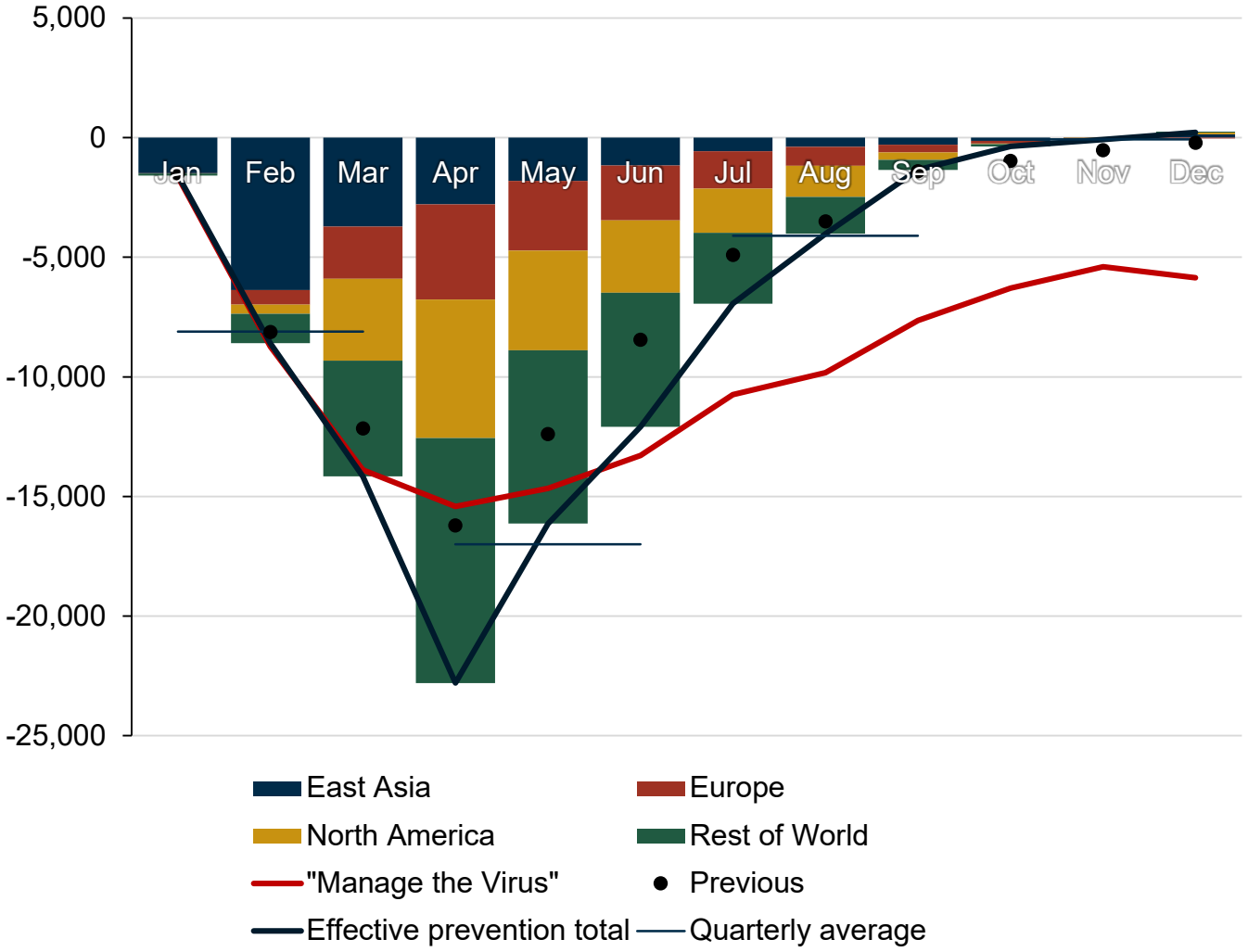
In the alternative “Manage the Virus” scenario we see a more prolonged impact through the year with average demand of only 91.4 million bpd.

A large part of the global population is currently working from home, drastically reducing fuel demand for road transport. Jet fuel use is also dropping sharply as 80% of international long-haul flights are cancelled.

Source: Rystad Energy Research and Analysis

Global oil demand to contract by over 22 million bpd in April, 2.2 billion barrels over the year

Global oil demand in the Effective Prevention Scenario, impact vs pre-virus estimates
Thousand bpd



The negative impact on oil demand could amount to as much as 20 million bpd over the next two months.

The impact in East Asia is now estimated to have been a drop of 6.3 million bpd in February. In the rest of the world, we now expect the impact to be three times as high and over a longer period.

Some 2.2 billion barrels, or 7.3% of global oil demand, is poised to be removed from the supply/demand balances. Our estimate before the virus outbreak was that global oil demand in 2020 would grow 1% year-on-year. Now we see global oil demand contracting by 6.4% in 2020 year-on-year.

In the “Manage the Virus” scenario, more people will have to be quarantined over a longer period, thus causing an even more dramatic impact on oil demand throughout the year.

Source: Rystad Energy research and analysis

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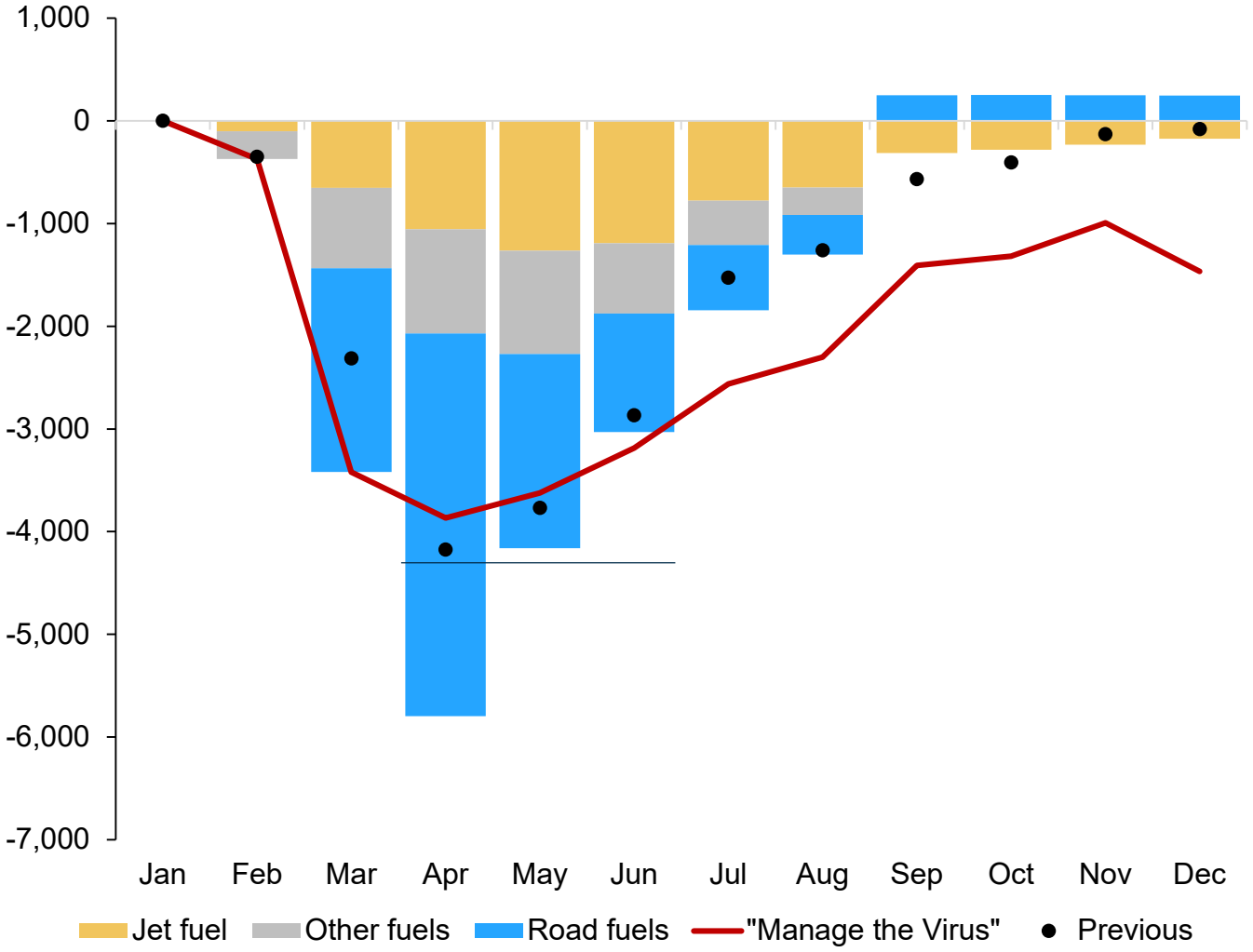
We see a drop of 5-6 million bpd in April and a drop of 600 million barrels before September

North American oil demand in the Effective Prevention Scenario, impact vs pre-virus estimates
Thousand bpd



We see state-level and city-level quarantine measures being implemented across the US, although still no federal quarantine measures have been taken.

Existing and future quarantine measures and travel restrictions in the northern states and Canada are likely to peak in April 2020.

We expect future travel restrictions and quarantine measures to peak in the southern states in May 2020.

As a result, we expect North American oil demand to hit bottom at 17 million bpd in April and 19 million bpd in May 2020, compared to our pre-virus estimate of close to 23 million bpd.

As more cities and states introduce quarantine measures, we expect a more significant road fuel impact than in our previous report last week.

We now forecast road fuel demand to be reduced by 3.7 million bpd in April and 1.9 million bpd in May 2020.

Overall, oil demand will be cut by almost 6 million bpd in April and about 4.3 million bpd in the second quarter of 2020 on average.

In the alternative “Manage the Virus” scenario, we see restrictions lasting longer and affecting demand in the fourth quarter of 2020 as well.

Source: Rystad Energy research and analysis

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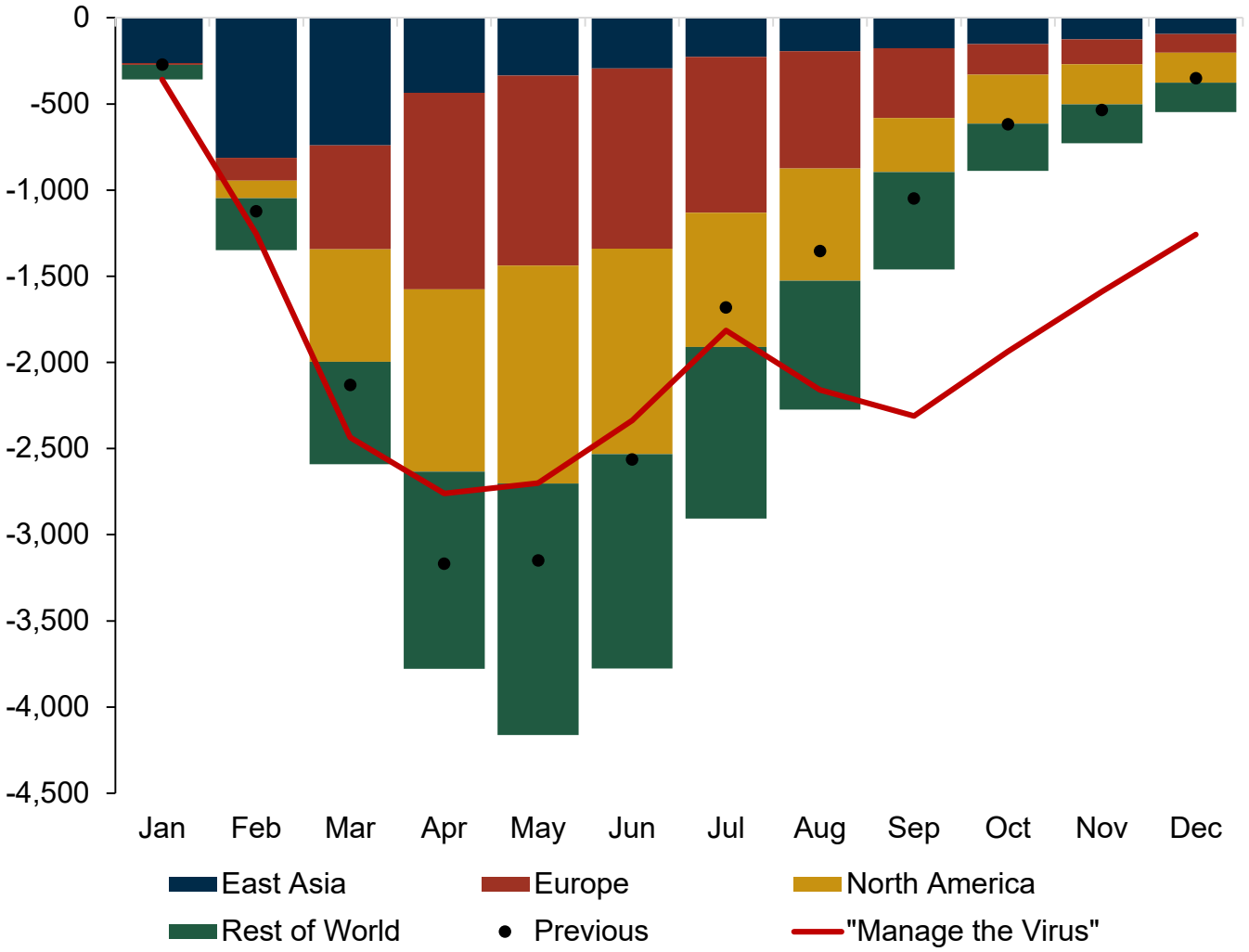
Dramatic impact on jet fuel: -4 million bpd in May; down 750 million barrels or 28% in 2020

Global jet fuel consumption growth year-on-year
Thousand bpd



The bottom for jet fuel will be seen in late April or early May, as the entire world fights against further spread of the virus.

Above and beyond the restrictions being imposed, travelers themselves are voluntarily suspending journeys.

We expect fewer cancellations in June as flights come back gradually ahead of the summer.

The summer peak will be lower than usual due to fewer long-haul flights, as many travelers are likely to prefer domestic vacations.

Source: Rystad Energy research and analysis

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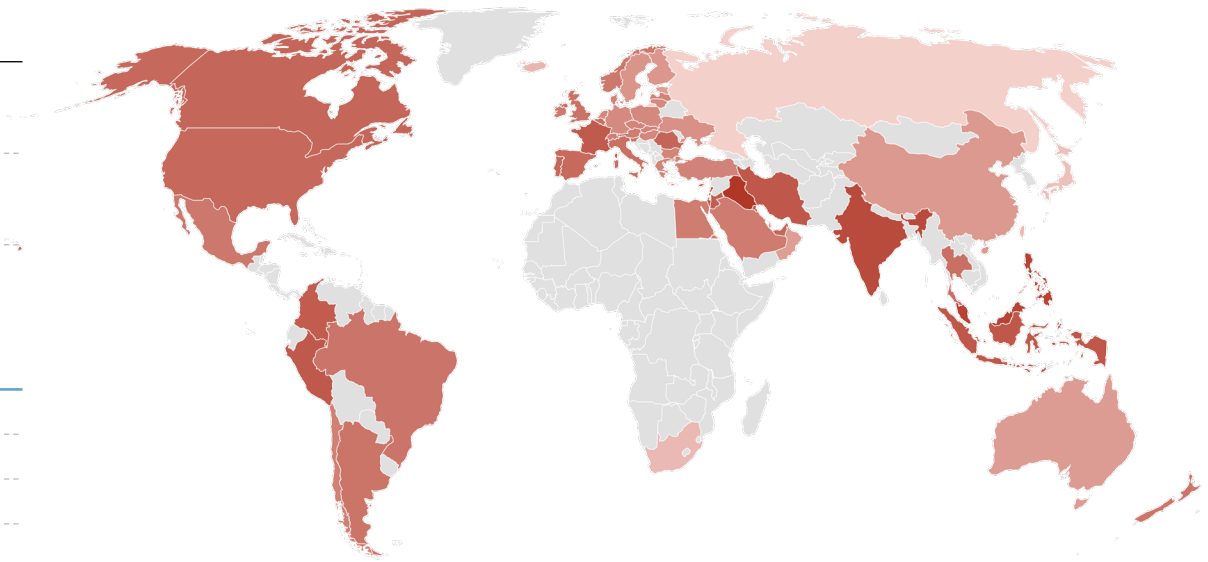
Global traffic down 36% as movement restrictions sweep India and Southeast Asia

Reduction in traffic* versus normal levels
Percent difference year-on-year, three-day moving average

Average**

This week	-36%
Last week	-28%

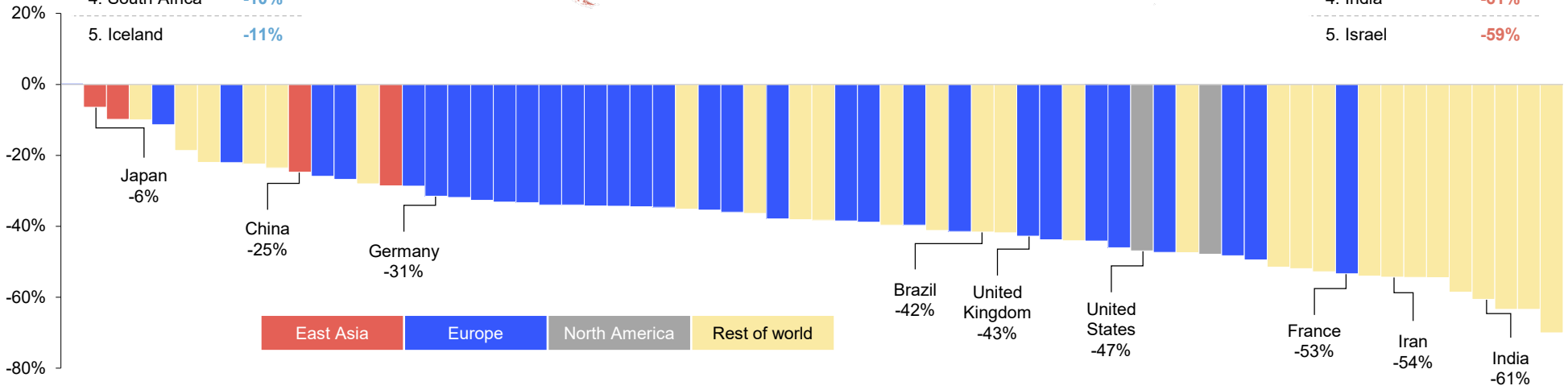


Smallest drops in traffic

1. Russia	0%
2. Japan	-6%
3. Taiwan	-10%
4. South Africa	-10%
5. Iceland	-11%

Largest drops in traffic

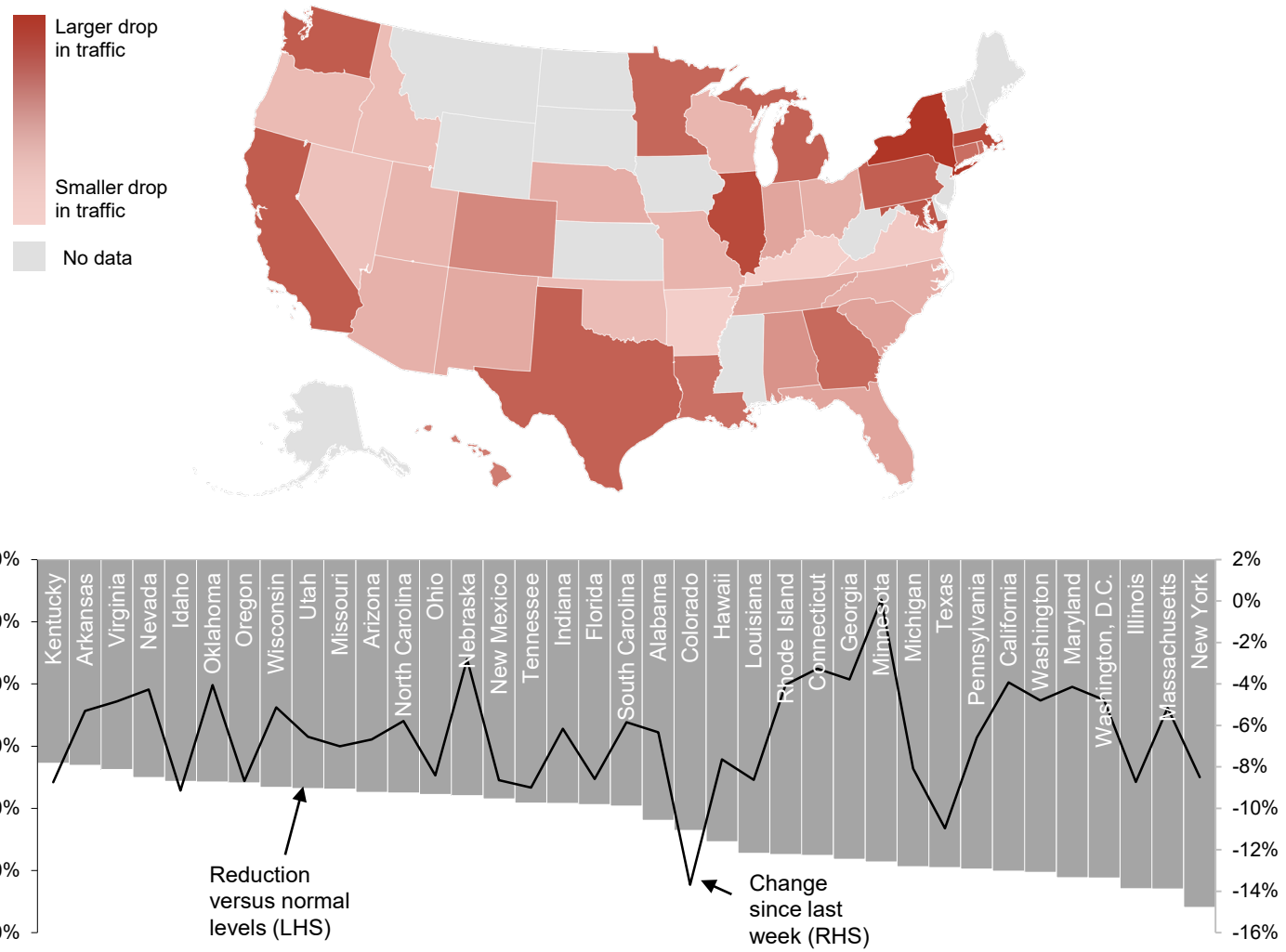
1. Iraq	-70%
2. Philippines	-63%
3. Malaysia	-63%
4. India	-61%
5. Israel	-59%



*Traffic refers to light-duty vehicle traffic.
**Average is population-weighted, and numbers for both weeks are using a three-day moving average.
Source: TomTom Traffic Index; Google Maps; Rystad Energy research and analysis

Road traffic in New York down 56% with traffic nationally likely to follow suit

Average state-by-state reduction in traffic versus last year
Percent difference year-on-year, three-day moving average

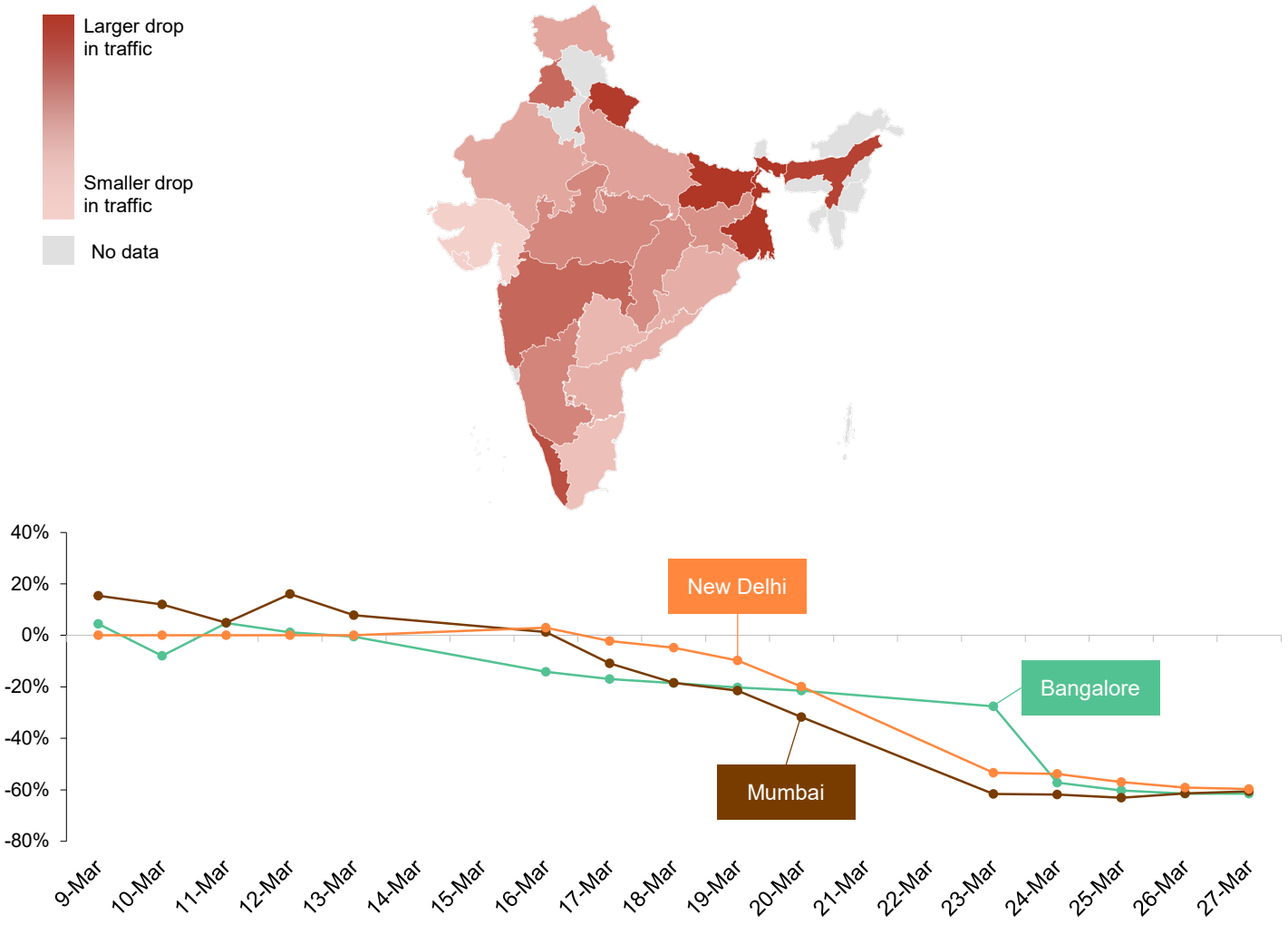


- Last week we presented historical declines in US road traffic.
- As the situation in many states has become more severe, we have seen further decreases in road traffic this week in all states in our dataset.
- An exception was Minnesota, which stayed flat at last week's levels.
- Among the three most populous states, California and Texas both experienced 50% traffic reductions, while Florida was down 39% from average 2019 levels.
- Unsurprisingly, New York experiences the most severe drawdown at 56%, a level we currently only see in five other countries.

Source: TomTom Traffic Index; Rystad Energy research and analysis

Road traffic in India down 60% as the country prepares for a month in lockdown

Average state-by-state reduction for traffic in India versus normal levels
Percent difference, year-on-year



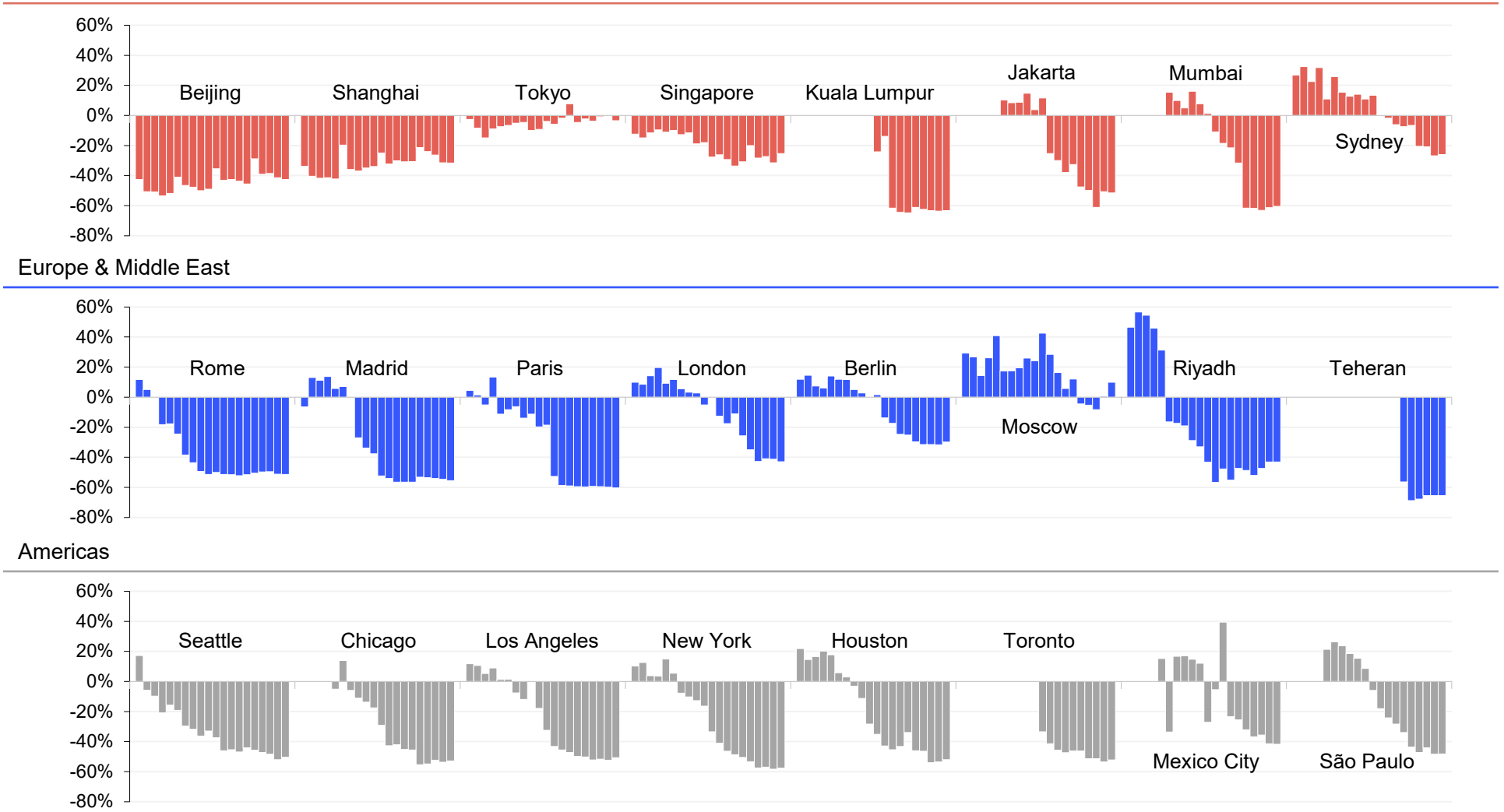
- Real-time traffic data started showing declines for traffic in Indian cities around mid-March, indicating that some companies already had enforced a work-from-home policy among employees.
- Traffic dropped significantly in the days following Prime Minister Narendra Modi's speech on 19 March urging everyone to stay at home in a Janata Curfew.
- After enforcing a 21-day national lockdown on 24 March, traffic levels in India have declined by around 60% from normal levels. India is the world's third-largest consumer of road fuel, and the demand effect from this is therefore expected to be huge.

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

Road traffic in most major global hubs is down over 30% from normal levels

Traffic levels for last 20 working days compared to average 2019 levels

Percent difference, year-on-year



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

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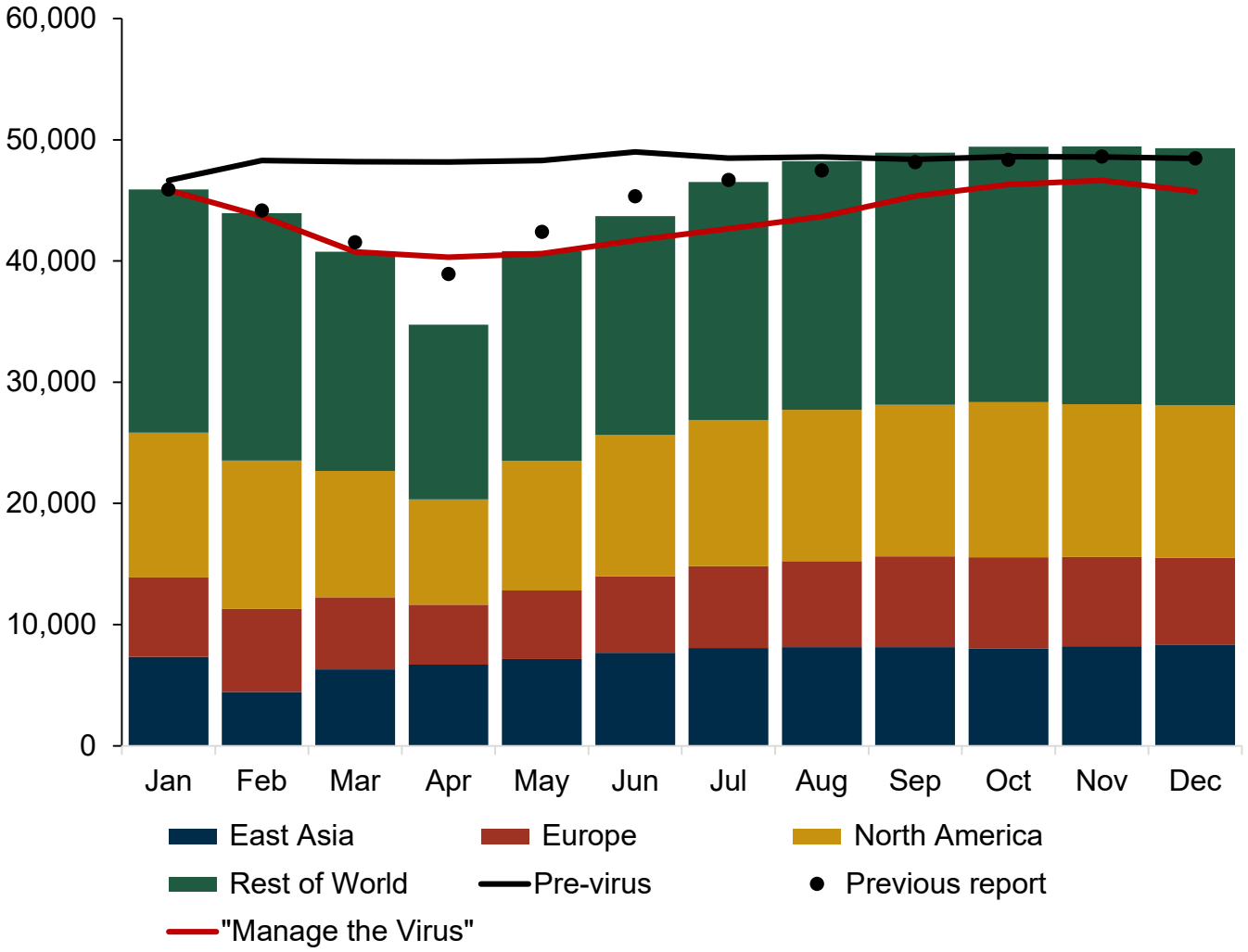
Road fuel consumption will fall from 48 million to 35 million bpd in April, down 6.6% for 2020

Global gasoline and road diesel consumption
Thousand bpd



A large part of the global population – from East Asia to Europe and North America – is currently working from home.

Over the last week, these restrictions have extended to Africa and Latin America.

France now observes a full curfew in large cities. Such war-like restrictions have over the last week also been introduced in Germany, Spain and the rest of Europe, even in the UK.

TomTom data indicates that commuting rush-hour traffic dropped from more than 50% congestion levels to less than 10% across Europe last week.

The following weeks will see very little commuting traffic in the largest cities in almost all parts of the world.

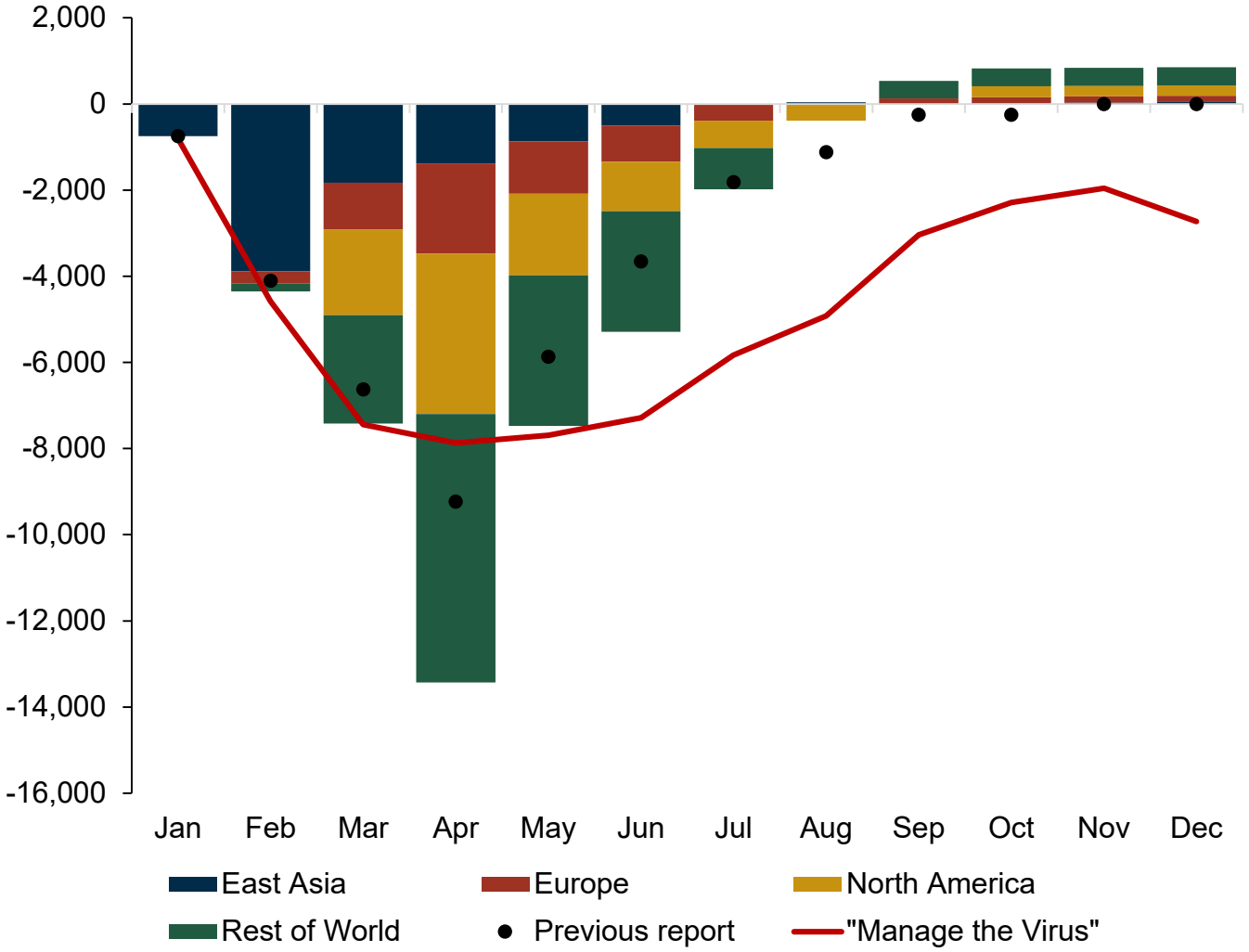
On all continents, leisure activities have come to a halt as most people now prefer isolation, even during the weekends.

The impact on heavy-duty transport, which represents 22% of total road fuel demand, will be much less pronounced.

Source: Rystad Energy research and analysis

Global road fuel consumption drops 13.4 million bpd in April, down 1.2 billion barrels in 2020

Global gasoline and road diesel consumption growth year-on-year
Thousand bpd



The maximum impact outside China is expected to be three times as large as what was observed in China in February.

Assuming effective containment of Covid-19, Europe and North America will gradually come back to normal levels before the summer.

In the alternative “Manage the Virus” scenario, we see a dramatic impact on road fuel throughout the year.

Source: Rystad Energy research and analysis

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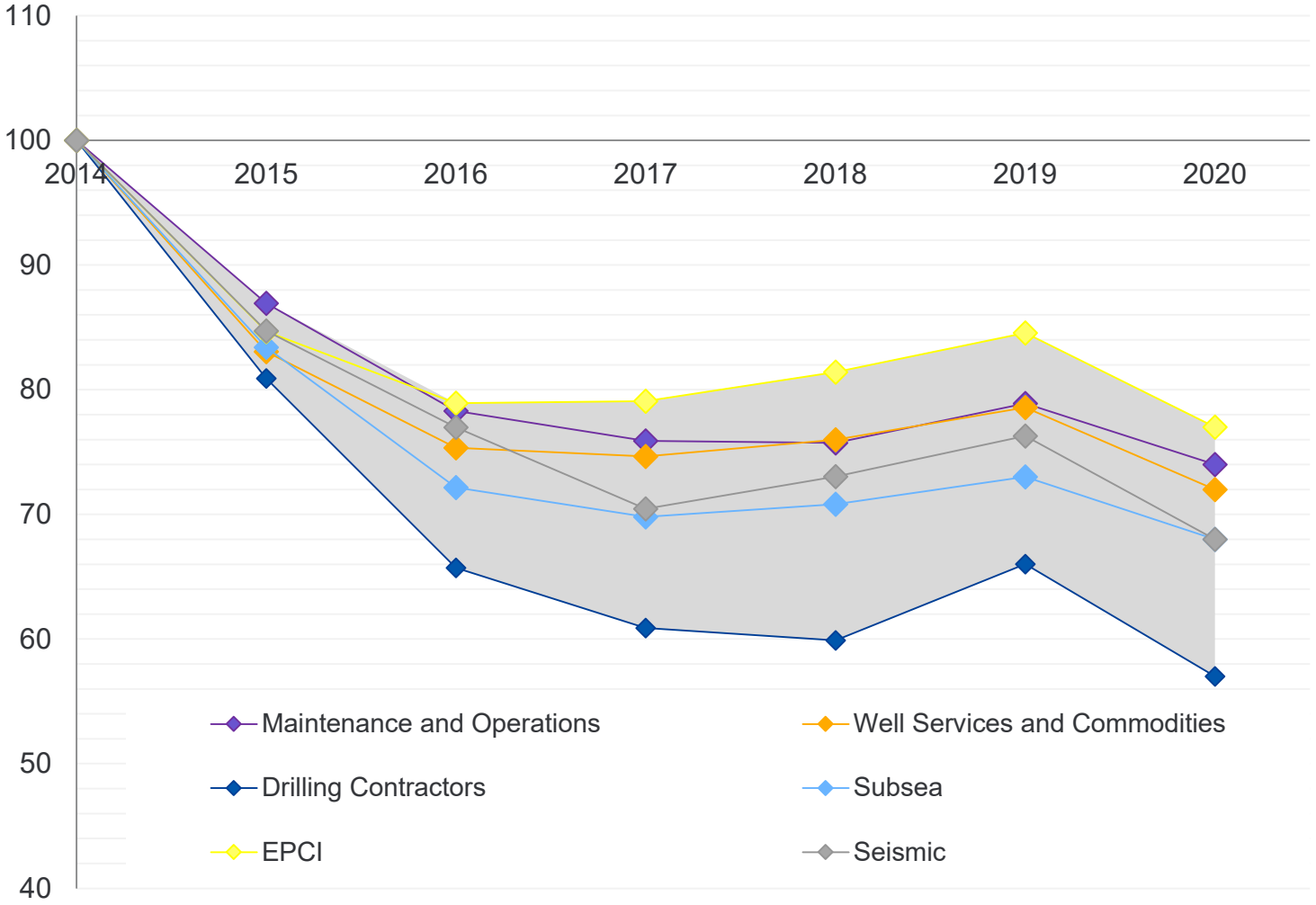
Expect service prices down 8% in 2020 – drilling contractors hit the hardest

Service price index from 2014 to 2020
Normalized to 2014=100 for each segment



- During the previous downturn, service prices fell by about 20% on average from 2014 to 2017.
- This time we expect service prices to come down by about 8% on average, although the impact is likely to be more severe for drilling contractors, given that the market experienced a substantial increase in service prices last year.

Source: Rystad Energy Cost Analytics

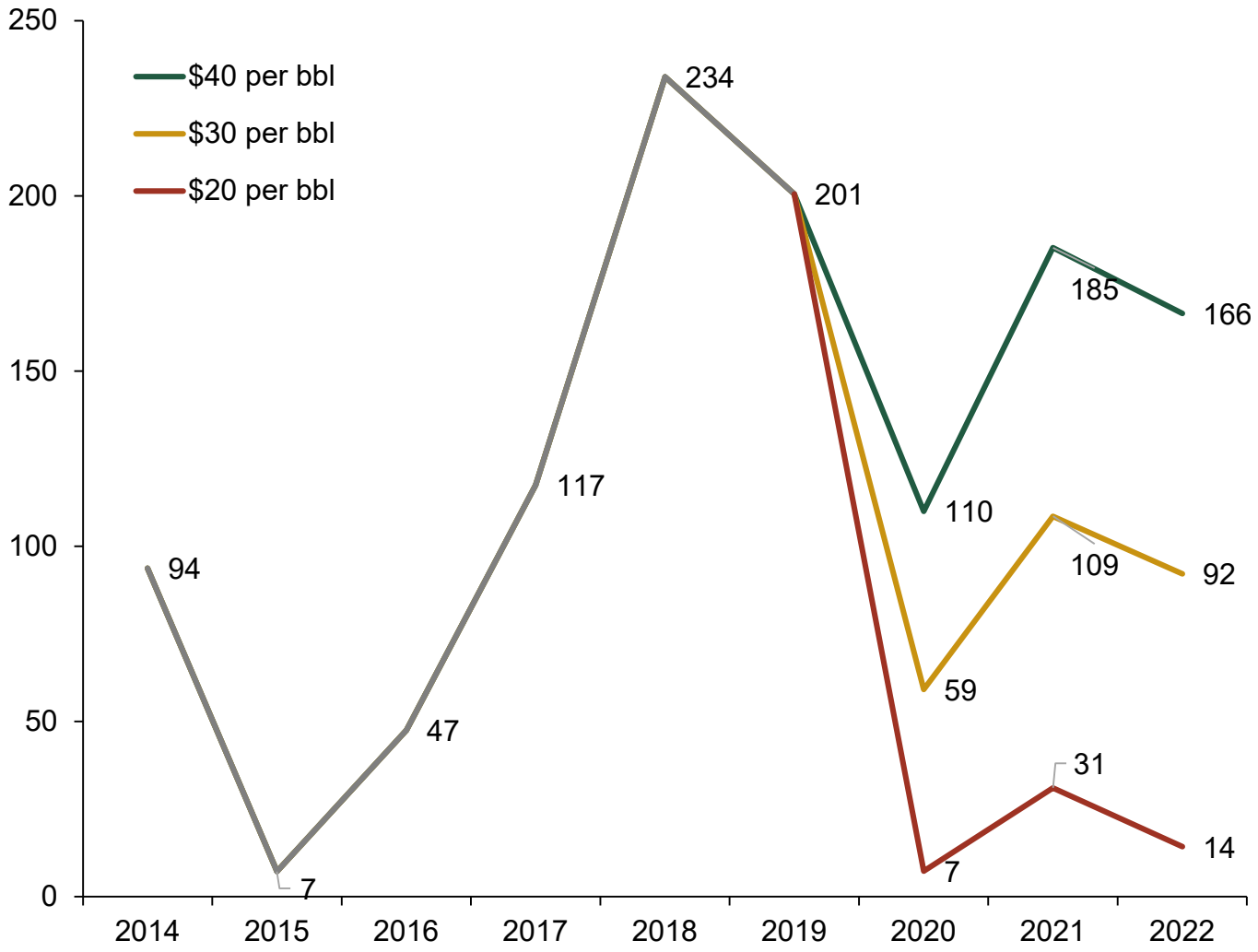
With oil at $30, FCF from public E&Ps will drop 70% YOY – better be prepared this time

With the new oil price outlook, upstream free cash flow (FCF) for E&P companies is poised for a significant fall in 2020. Assuming an average Brent oil price of $30 per barrel this year, the sector's FCF is expected to drop to about $59 billion. But if the average Brent oil price ends up at $20 per bbl in 2020, FCF will plummet to nearly zero.

The $30 per bbl scenario, while representing a huge drop in FCF versus 2018 and 2019, would in fact be considerably better than the cash flow generated by the industry as recently as 2015 and 2016.

This shows that the E&P companies are in a much better position now than they were during the previous oil price collapse.

Total upstream free cash flow from public E&P companies by Brent oil price scenario*
Billion USD



* Excludes China Source: Rystad Energy UCube March 2020

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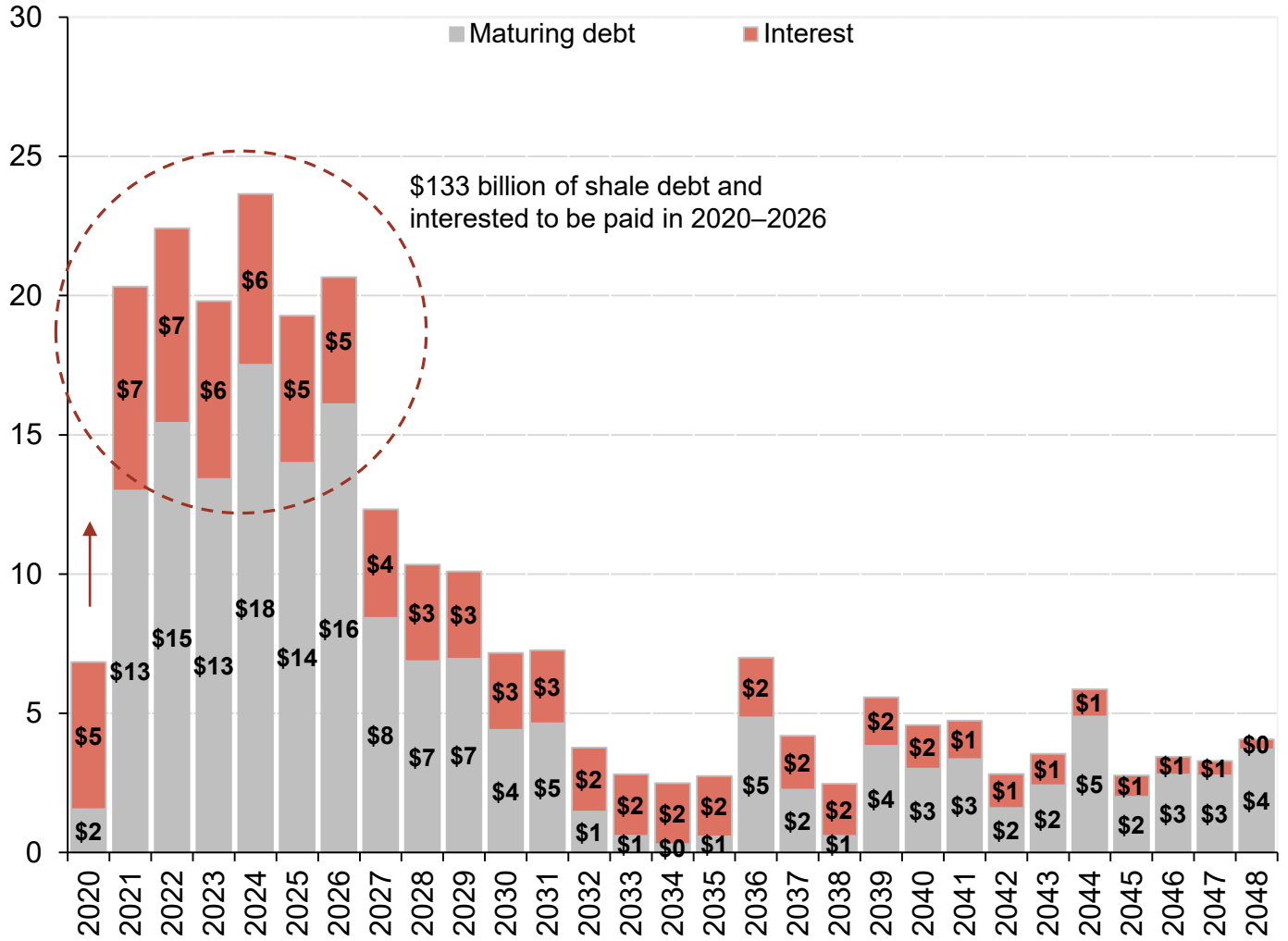
Debt burden means US shale activity must drop faster this time around

With billions in debt payments approaching, shale E&P companies are likely to put the brakes on activity much faster than what was seen during the previous downturn five years ago.

The chart shows the amount of maturing debt and interest expenses scheduled for the top 29 US light tight oil public producers, which collectively accounted for about half of last year's US light tight oil production. During the next seven years, these operators are expected to spend about $133 billion on debt instalments and interest unless further debt refinancing is applied. Interest payments for the group vary between $5 billion and $8 billion annually, while the maturities and interest schedule totals roughly $27.2 billion for the remainder of 2020 and 2021. In 2019 the same peer group generated $51.1 billion in cash flow from operations (CFO) while spending $45.9 billion in capex.

Although operators made a concerted effort in 2019 to balance spending and to deleverage, the prevailing low commodity prices and continuous equity investor pressure point towards a persistent lack of financing to deal with the obligations burden as fewer companies will be able to break even. The benchmark is also highly impacted by Occidental Petroleum's debt burden after its acquisition of Anadarko. Other companies that have more than $0.5 billion in scheduled debt payments in 2020-2021 include EOG, Noble Energy, Pioneer Natural Resources, Whiting Petroleum and WPX Energy.

US shale E&P debt and interest by maturity, 29 companies
Billion USD



*Peer group of 29 operators: APA, CPE, CHK, XEC, CXO, COP, CLR, DVN, FANG, ESTE, EOG, HES, HPR, LPI, MRO, MTDR, MUR, NBL, OAS, OVV, OXY, PE, PDCE, PXD, QEP, ROSE, SM, WLL, WPX
Source: Company reporting, Rystad Energy research and analysis

US lockdown could cause a drop in demand of up to 4.4% in 2020

As the number of Covid-19 cases in the US continues to grow exponentially (now totalling more than 185,000), a lot of uncertainty remains on how the country will react to stop the pandemic. So far 18 states have announced a full lockdown and 12 only a partial one. But the duration of the quarantine still remains to be seen and it is still uncertain if other states will also be forcing people to stay at home.

We have defined five scenarios to try to estimate the potential impact of a lockdown, where in Scenario 1 only the states that have announced a lockdown continue with reduced activities for one month. In the most extreme case (Scenario 5) all states apply a full lockdown for a period of two months. We also apply reduced demand ratios to the various sectors based on the effect we have seen in other countries so far. The commercial sector is the one most affected, with a drop of around 31% as a result of a full lockdown, while power demand has dropped between 7% and 19% in various countries. Given that around 37% of total gas demand in the US is from the power sector, this is where a major drop in demand could be expected. Finally we assume a drop of 2% in total demand as a result of slower economic growth during the rest of the year.

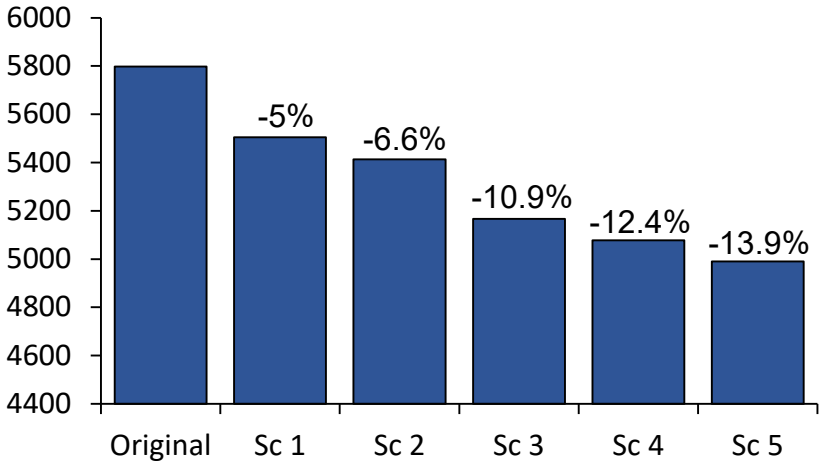
Based on the different scenarios, demand could drop between 5% and 14% during 2Q 2020, which would represent a major blow for gas producers that are already struggling in the low price environment. In yearly terms, demand could drop between 2.7% and 4.4%f rom our original 2020 forecast, depending on the final measures taken. The drop in demand could be less accentuated if more coal-to-gas switching takes place within the power sector. So far coal prices have not dropped to the same extent, incentivising more gas power generation.

Scenarios

Scenario	Description	Duration
1	18 states apply full lockdown and 12 states apply a partial.	1 month + 2 weeks to restart
2	30 states apply full lockdown	1 month + 2 weeks to restart
3	30 states apply full lockdown	2 month + 2 weeks to restart
4	30 states apply a full lockdown and 21 states a partial.	2 month + 2 weeks to restart
5	All states apply a full lockdown	2 month + 2 weeks to restart

US natural gas demand in 2Q 2020

Billion cubic feet



Expected effect of full lockdown on demand

Sector	Effect
Residential	-2%
Commercial	-31%
Industrial	-16%
Transport	-15%
Power	-19%

US natural gas demand in 2020

Trillion cubic feet

Scenario	Demand	Effect
Original	28.3	
1	27.5	-2.7%
2	27.4	-3.0%
3	27.2	-3.8%
4	27.1	-4.1%
5	27.0	-4.4%

Source: Rystad Energy research and analysis, GasMarketCube, EIA

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Governments face a balancing act between public health and economic impact

Public health impact

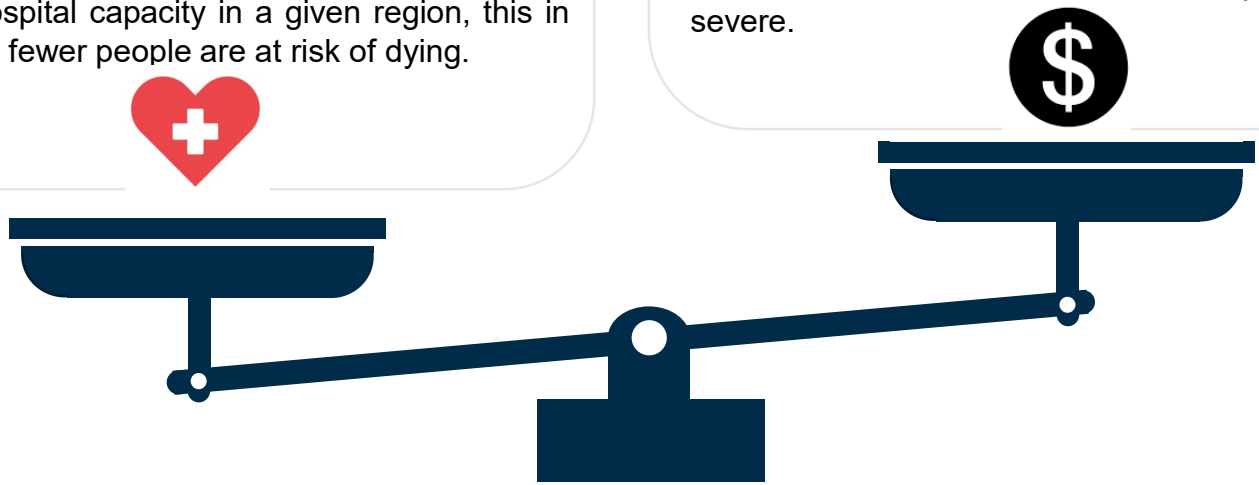
Strict preventative measures reduce the spread of the virus and “flatten the curve” of infection. This implies that the number of people infected at any point in time is reduced, and fewer patients are in need of intensive care.

If the number of people in intensive care is lower than the hospital capacity in a given region, this in turn implies fewer people are at risk of dying.

Economic impact

Strict preventative measures such as school closures, home quarantine and travel bans imply reduced revenues for many companies and massive layoffs.

The economic impact will increase relative to the severity of quarantine measures implemented and the time period the measures are in place. At a certain point, governments will consider easing measures either because they have control of the virus or because the economic impact is too severe.



Source: Rystad Energy research and analyses

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Scenarios for the Covid-19 pandemic

Scenario	Government policy	Benefits	Issues	Impact
Do nothing (let outbreak occur)	• Do nothing	• Economy as usual • Life as usual (if not sick) • "Finished" in 4 months	• 90% of intensive care patients get no help • Higher fatality rates • Health sector collapse • Economy hurt anyway if global recession	• Limited negative market impact • Negative moral impact – unnecessary loss of loved ones
Manage the virus (mitigate or slow outbreak)	• No cultural activity • Case isolation, home quarantine, social distancing • Travel down by ~90%	• Plan for health system capacity to handle intensive care cases (although this has uncertainty) • Immunity for future similar epidemics • Vital functions still working	• Takes a long time – 6 to 22 months • Hurts economy • Weakest groups in dire straits • Quarantines challenge free movement, liberal values	• Severe and long-lasting economic impact • Oil market collapse
Effective prevention (suppress or stop outbreak)	• As above, plus… • Curfew for all non-essential workers and penalties for non compliance • Complete isolation between regions and countries	• Mission accomplished in 8 weeks, then back to normal • Complete city/country isolation • Avoid fatalities - hope vaccination will occur before virus comeback	• Too late to stop the virus many places • May challenge human rights and liberal values • When "finished", we could see virus resurgence	• Very sudden market collapse, but for a short period of time • Ethically the right decision, but concerns the infection will comeback

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Can we trust reported ICU cases?

Since the beginning of March, Worldometer has reported serious/critical cases. These figures are taken from national health authorities or public sources.

Can we trust these figures?

Yes and no!

For some countries, figures are flat or 0 for many days, and then suddenly we see a big jump. E.g. for US (reported flat at 64 up to March 21th, then reported at 795), Germany (reported flat at 23 up to March 26th, then reported at 1581) and Iran (reported at 0 until March 26th, and then reported at 2746)

For other countries, figures are almost perfectly correlated between reported actual or active cases, indicating that one of the figures is calculated based on the other (China, Spain, France, ..)

We have checked the correlation between *active cases* and *serious/critical* cases with 0,1,2,….9 day delays. We have found that the best correlation was after an average of 5.6 days. Thus, we will use a 6 day delay for countries where data is incomplete.

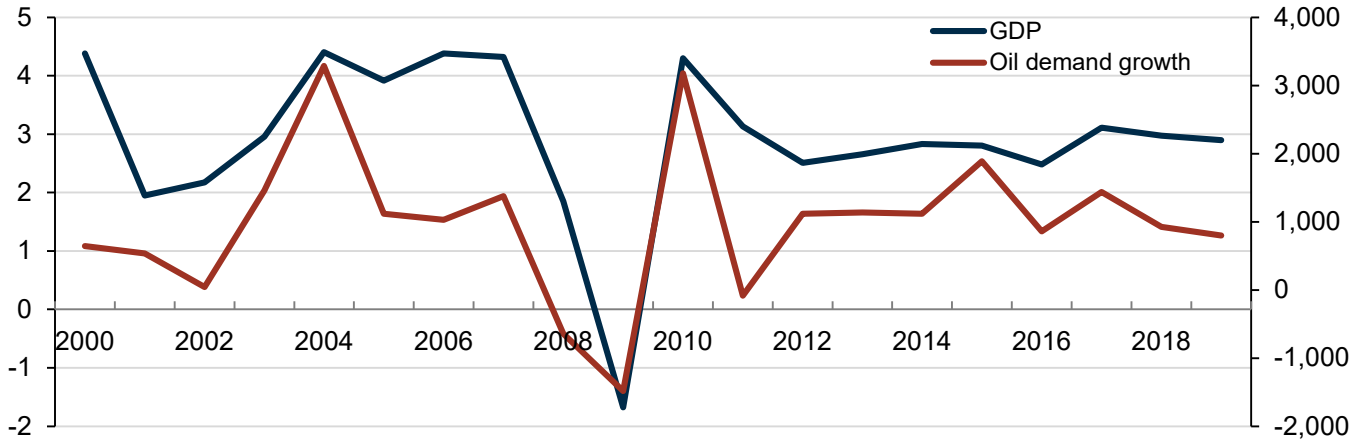
South Korea, Iceland and Norway have done the most testing. For these countries the number of *seriouse/critical cases* is between 0.7% and 3.2% of *active reported cases.* The Norwegian Institute of Public Health (FHI) expects that 0.25% of those infected will need an ICU bed, while our own calibration concludes that 0.5% infected will require ICU treatment.

Country	Max correlation	Date (D) for best correlation	Days delay giving highest correlation (x)	Reported active cases day D	Reported critical cases day D+x	Active reported cases per ICU (Day D+x versus D)	Share ICU of all active cases N days before
Spain	0.9951	23.mar.20	4.0	29 470	4 165	7	14.1 %
France	0.9968	24.mar.20	3.0	17 923	3 787	5	21.1 %
China	0.9958	11.mar.20	6.0	16 051	3 226	5	20.1 %
Iran	0.7726	23.mar.20	6.0	12 861	3 206	4	24.9 %
USA	0.9887	23.mar.20	6.0	42 609	2 948	14	6.9 %
Italy	0.9950	19.mar.20	-	33 190	2 498	13	7.5 %
Germany	0.9583	23.mar.20	6.0	28 480	1 979	14	6.9 %
Netherlands	0.9894	23.mar.20	5.0	4 534	914	5	20.2 %
Belgium	0.9967	24.mar.20	5.0	3 686	867	4	23.5 %
Turkey	0.9957	23.mar.20	6.0	1 492	568	3	38.1 %
Switzerland	0.9471	22.mar.20	7.0	7 245	301	24	4.2 %
Brazil	0.9729	23.mar.20	6.0	1 888	296	6	15.7 %
Czechia	0.9734	23.mar.20	6.0	1 228	45	27	3.7 %
Sweden	0.9887	23.mar.20	6.0	2 005	255	8	12.7 %
Austria	0.9398	20.mar.20	9.0	2 634	187	14	7.1 %
UK	0.9133	21.mar.20	7.0	4 692	163	29	3.5 %
Canada	0.9114	21.mar.20	8.0	1 295	120	11	9.3 %
Denmark	0.9898	23.mar.20	6.0	1 425	113	13	7.9 %
Portugal	0.9678	24.mar.20	4.0	2 307	89	26	3.9 %
Norway	0.9393	24.mar.20	2.0	2 848	70	41	2.5 %
Greece	0.9894	19.mar.20	9.0	439	66	7	15.0 %
Ireland	0.9807	24.mar.20	4.0	1 317	59	22	4.5 %
Ecuador	0.9481	19.mar.20	8.0	256	58	4	22.7 %
Japan	0.9683	23.mar.20	4.0	851	56	15	6.6 %
S. Korea	0.9347	09.mar.20	2.0	7 259	54	134	0.7 %
Malaysia	0.9858	23.mar.20	6.0	1 345	73	18	5.4 %
Israel	0.9953	22.mar.20	4.0	1 033	46	22	4.5 %
Moldova	1.0000	23.mar.20	6.0	106	33	3	31.1 %
Peru	1.0000	23.mar.20	6.0	389	40	10	10.3 %
Finland	0.9753	20.mar.20	9.0	440	32	14	7.3 %
Serbia	1.0000	23.mar.20	6.0	243	25	10	10.3 %
Australia	0.9602	23.mar.20	5.0	1 762	23	77	1.3 %
Azerbaijan	0.9525	23.mar.20	6.0	61	23	3	37.7 %
Panama	1.0000	23.mar.20	6.0	309	32	10	10.4 %
Singapore	0.9463	22.mar.20	7.0	309	19	16	6.1 %
Iceland	0.9261	24.mar.20	5.0	595	19	31	3.2 %
San Marino	0.9761	23.mar.20	6.0	163	16	10	9.8 %
Diamond Princess	0.9352	21.mar.20	-	137	15	9	10.9 %
Romania	0.9939	13.mar.20	8.0	63	14	5	22.2 %
Slovenia	0.9780	22.mar.20	4.0	412	14	29	3.4 %
Croatia	0.9674	22.mar.20	5.0	248	14	18	5.6 %
Thailand	0.9497	19.mar.20	6.0	229	11	21	4.8 %
Pakistan	0.9779	21.mar.20	8.0	629	11	57	1.7 %
Luxembourg	0.9738	13.mar.20	4.0	26	10	3	38.5 %

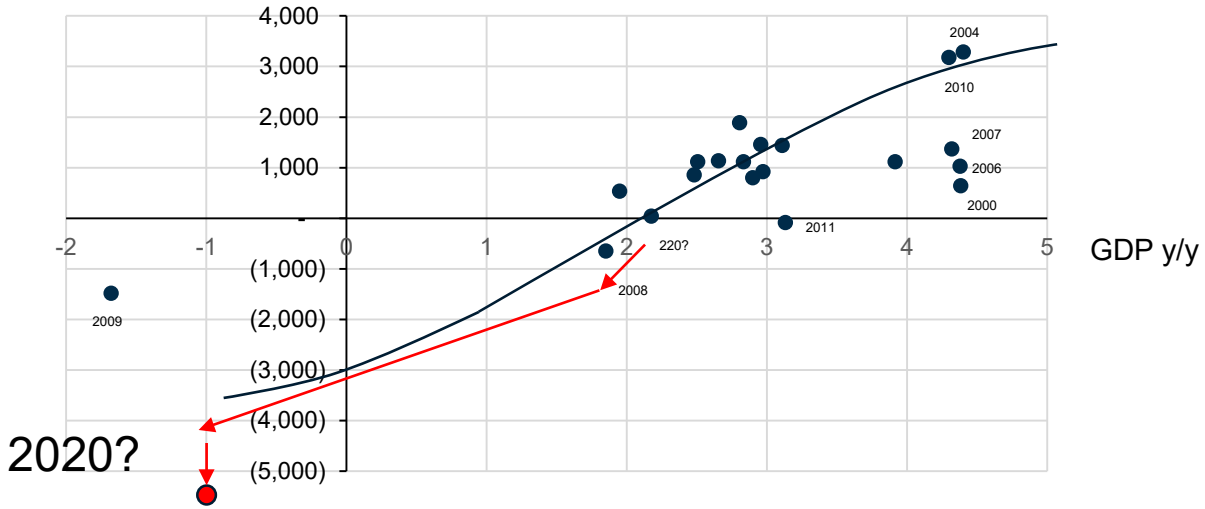
Source: Worldometer; Rystad Energy Covid-19 research team

Global GDP growth possibly contracting by 1%, global oil demand contracting by 5.7%

GDP growth (percent, LHS) versus oil demand growth (thousand bpd, RHS) per year



GDP growth (x-axis, percent) versus oil demand growth (y-axis, thousand bpd) per year 2000–2019



Source: Rystad Energy research and analysis

Global oil demand growth is strongly related to GDP growth. The relationship is given by oil demand intensity, which gradually decreases with improved fuel efficiency and – going forward – electric vehicle market penetration. The correlation is not fully linear due to demand elasticities.

Our research indicates that pre-virus global oil demand in 2020 would be flat if GDP growth was to slow down to 2% (IMF: “global recession”), while oil demand growth would be 1 million bpd if global GDP was to expand by 3%.

However, based on the latest reporting on the spread of Covid-19 and the state of the stock markets, some macro analysts now see global GDP contracting.

Our latest estimate for a global oil demand contraction of 4 million barrels per day is in line with this empiric model of correlation between oil demand and GDP.

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