# The Economist

Iran's dangerous game

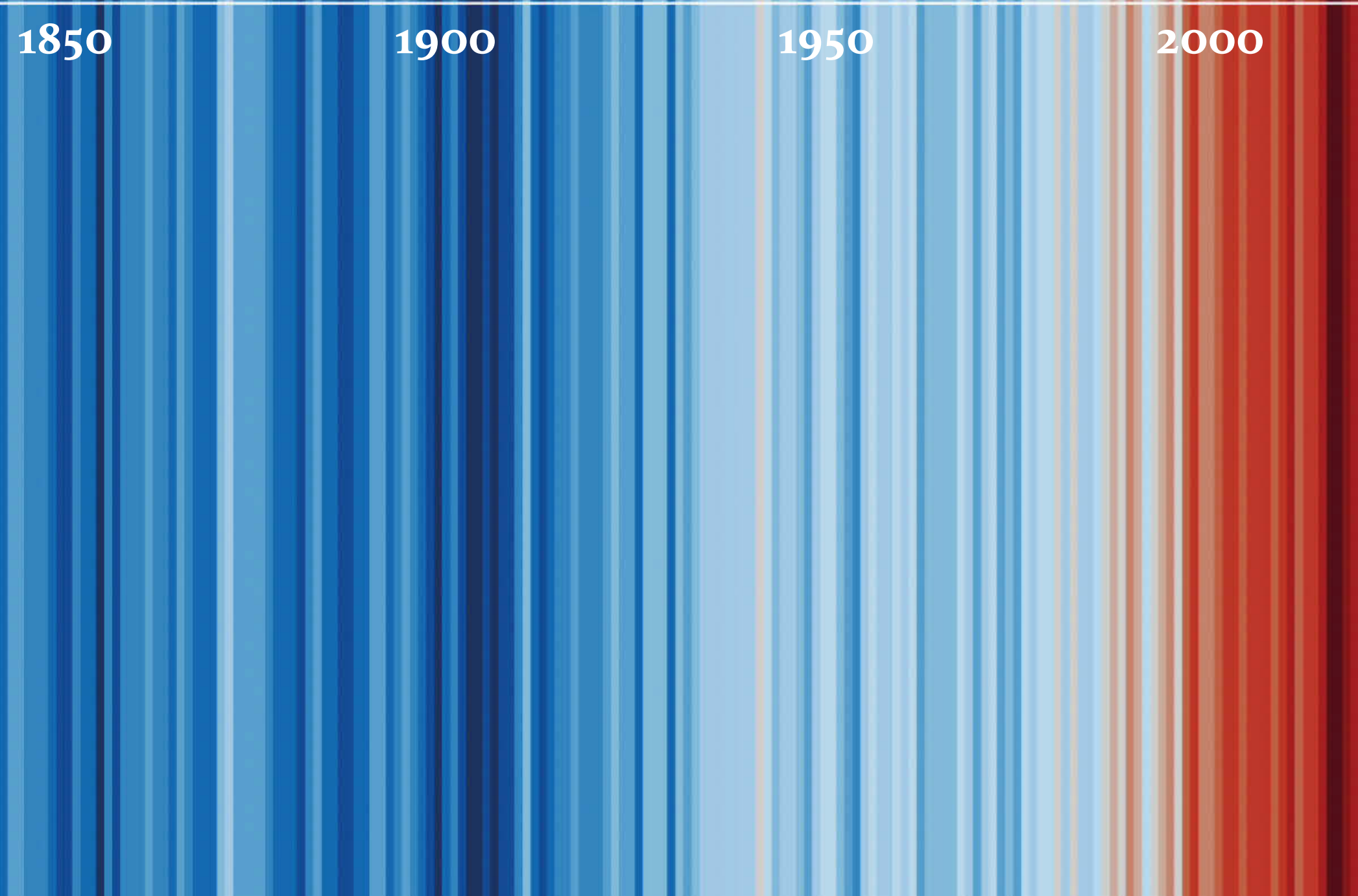
Lessons from a Wall Street titan

Why rent controls are wrong-headed

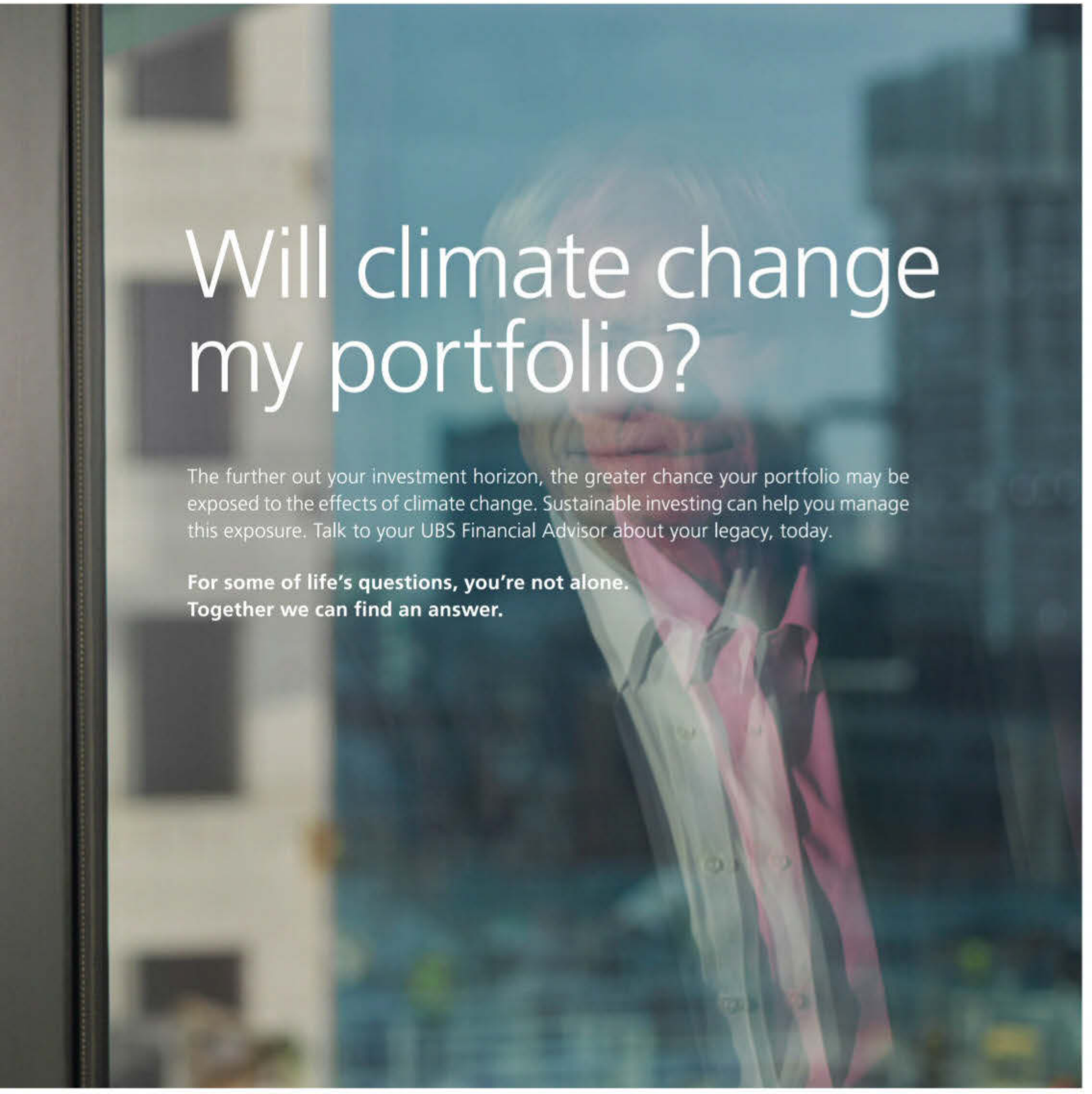
Goddess of the Taiwan Strait

SEPTEMBER 21ST–27TH 2019

# The climate issue



**Michael Spence.** Nobel Laureate in Economic Sciences.

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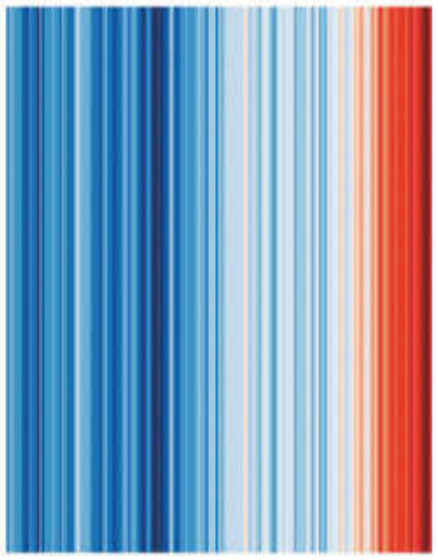

## On the cover

**Global warming touches on everything *The Economist* writes about. In this issue we feature a series of articles that look at climate change and how to cope with it. The stripes on our cover were developed by Ed Hawkins of the University of Reading. They represent the years from 1850 to 2018 and the colour marks each year's temperature, compared with the average in 1971-2000**

- **Iran's dangerous game** Nobody wants a war in the Middle East. That is why aggression by Iran and its proxies needs a tough response: leader, *page 14*. A strike on Saudi Arabia moves a shadowy conflict closer to open war, *page 51*. Saudi Aramco tries asserting control amid chaos, *page 53*

- **Lessons from a Wall Street titan** How Stephen Schwarzman built a legacy: Schumpeter, *page 76*

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- **Goddess of the Taiwan Strait** Communist Party bosses love Mazu, a folk goddess of the sea: Chaguan, *page 49*














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The Economist

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to take part in *"a severe contest between intelligence, which presses forward, and an unworthy, timid ignorance obstructing our progress."*

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Donald Trump said he would impose fresh sanctions on **Iran** following an audacious missile and drone attack on two oil facilities in **Saudi Arabia**: the Abqaiq crude-processing plant, the biggest of its kind in the world, and the Khurais oilfield. Claims by Houthi rebels in Yemen that they staged the attack were dismissed by American and Saudi officials. The Houthis are backed by Iran in a proxy war fighting a Saudi-led coalition. Iran insists it was not responsible for the strike.

**Israel's** general election, the second this year, produced no clear result. Binyamin Netanyahu's Likud coalition lost seats, so he will struggle to remain prime minister. The centrist Blue and White party, led by Benny Gantz, a former general, is now the largest in the Knesset but will need the support of other parties to form a government, which could take months.

The first round of **Tunisia's** presidential election narrowed the field to two contenders: Kais Saied, a conservative law professor, and Nabil Karoui, a wealthy populist who is in jail on tax-evasion charges and has been described as the Tunisian Berlusconi. Turnout was a mere 45%. Disappointed liberals lament that the run-off later this month will be a race between the Godfather and the Terminator.

Prosecutors at the International Criminal Court have appealed against the acquittal of Laurent Gbagbo, a former president of **Ivory Coast**, on charges of crimes against humanity. The charges are related to a disputed election in 2010 in which Mr Gbagbo refused to accept he had lost. About 3,000 people died in the subsequent violence.

A fire at a boarding school near Monrovia, the capital of **Liberia**, killed at least 27 people.

### The fourth man

Donald Trump named Robert O'Brien as his fourth **national security adviser**, replacing John Bolton. Mr O'Brien is the State Department's hostage negotiator, working to free American captives in countries such as North Korea and Yemen. He is the author of "While America Slept: Restoring American Leadership to a World in Crisis".

Mr Trump said that his administration would abrogate **California's** laws on car emissions, which set higher standards than federal rules, "in order to produce far less expensive cars for the consumer". Regulators have often griped that the state dictates rules for the country as a whole. California vowed to fight the administration all the way to the Supreme Court.

### The big smoke

Fires raging in the forests of Borneo and Sumatra blanketed **South-East Asia** in a thick haze. Indonesia deployed more than 9,000 people to fight them, but the unusually dry conditions hampered their efforts.

**African swine fever**, a disease that is harmless to humans but fatal to pigs, was detected in South Korea. Since first being reported in China in August 2018, the disease has spread through much of East Asia.

Rodrigo Duterte, the president of the **Philippines**, appeared to admit that he was behind an assassination attempt on a local official whom he had accused of being involved in the drugs trade. His aides later claimed the president had misspoken because of his poor grasp of Tagalog, the country's main language.

The **Solomon Islands** switched its diplomatic allegiance from **Taiwan** to **China**, leaving Taiwan with diplomatic relations with just 16 countries. Taiwan's president, Tsai Ing-wen, who is running for re-election, described the move as an attempt by China to intimidate Taiwanese voters.

The government of **Hong Kong** announced the cancellation of a large fireworks display that had been due to take place on October 1st, China's national day. It said it made the decision because of "public safety", a clear reference to recent pro-democracy unrest. Violence erupted again, with protesters throwing petrol bombs. Hundreds of people gathered outside the British consulate to ask for Britain's support.

### Letting go

**Venezuela's** dictatorial government, led by Nicolás Maduro, freed from prison Edgar Zambrano, a congressman who is a senior adviser to Juan Guaidó, the president of the opposition-controlled national assembly. Mr Guaidó is recognised by the assembly and by more than 50 countries as Venezuela's interim president. Mr Maduro said that 55 lawmakers from his United Socialist Party would take their seats in the national assembly after boycotting it for three years.

A **Spanish court** released from prison Hugo Carvajal, a former chief of Venezuela's military intelligence service who had turned against the regime. The court turned down an extradition request by the United States, which accuses him of arranging to ship 5,600kg of cocaine from Venezuela to Mexico in 2006. Mr Carvajal, also known as El Pollo (The Chicken) was arrested in Spain in April.

A photo emerged taken in 2001 showing Justin Trudeau, **Canada's** prime minister, wearing "brownface" make-up at a party at a private school where he taught. Mr Trudeau, who is running for re-election, explained that he had dressed up as Aladdin for a party with an Arabian Nights theme. He said he was "deeply sorry".

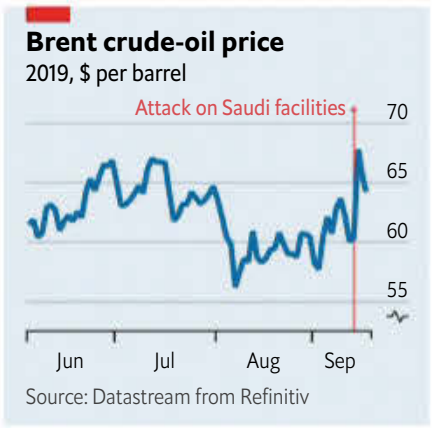
### An empty gesture

While **Britain's** Supreme Court reviewed the legality of his suspension of Parliament, Boris Johnson met European leaders in Luxembourg, where he found little respite from the turmoil at home. The British prime minister's Luxembourger counterpart mocked him for skipping a press conference because anti-Brexit protesters were too rowdy. Other EU leaders said trying to humiliate Mr Johnson was a mistake; a close aide of Angela Merkel, the German chancellor, said the episode "did not serve the European cause".

Matteo Renzi, a former prime minister of **Italy**, caused consternation when he said he was splitting from the Democratic Party (PD) he used to lead. He insists, though, that he still supports the new coalition between the PD and the Five Star Movement, which was created to prevent Matteo Salvini, the populist leader of the Northern League, from triggering an early election.

A fresh election looked probable in **Spain**, after talks between the caretaker Socialist government and the left-wing Podemos party broke down. It would be the fourth general election in four years.

A huge strike paralysed much of Paris, particularly its Metro, in protest at plans by the president, Emmanuel Macron, to rationalise **France's** excessively generous pension system.




Saudi Arabia sought to assure markets that **oil production** levels would return to normal within weeks following the attack on two oil facilities, which cut around 5.7m barrels of oil a day from output. Analysts are sceptical that production can recover in such a short timespan. The attack had caused a huge spike in the price of Brent crude.

The **Federal Reserve** sliced its benchmark interest rate for the second time within two months, by another quarter of a percentage point to a range of between 1.75% and 2%. There has been mounting evidence that uncertainty over trade is starting to drag on the economy, especially manufacturing. But with services flourishing and consumer spending buoyant, two of the Fed's rate-setters voted against a cut.

Earlier the Fed injected billions of dollars into the financial system because of an unexpected shortfall of cash available to banks, leading to a surge in the **"repo rate"** for overnight loans. It was the Fed's first such surprise intervention in money markets since the financial crisis.

The chief economist of the **European Central Bank** defended its decision to cut interest rates and restart its quantitative-easing scheme amid fierce criticism from Germany and the Netherlands. The ECB reduced its main rate to -0.5%, taking it further into negative territory. Jens Weidmann, the head of Germany's Bundesbank, said the ECB had overreacted to the euro zone's slowdown. *Bild*, a German newspaper, lampooned Mario Draghi, the ECB's soon-to-retire president, as Count Draghila, lamenting the "horror" for prudent savers who are being sucked dry. Mr Draghi steps down on Halloween.

**Purdue Pharma** filed for bankruptcy protection, part of a tentative settlement it has reached with 24 states and thousands of local governments to resolve claims that the aggressive marketing of its OxyContin painkiller contributed to America's opioid crisis. Under its bankruptcy plan the drugmaker will become a public trust and the Sackler family will relinquish ownership. Purdue says the settlement is worth $10bn, but that is not enough for the two dozen states, including California and New York, that are contesting the agreement.

## Won't work

**WeWork** postponed its IPO amid tepid interest from investors and a drop in its expected stockmarket value. The office-rental firm has never made a profit and was trying to go public amid market doubts about the prospects for other loss-making startups that have floated shares this year. Adam Neumann, WeWork's hipsterish CEO, said he was "humbled" by the experience.

Another blockbuster IPO that was shelved earlier this year was back on track, but in a much slimmer form. **Anheuser-Busch InBev** started taking orders for an offering of shares in its Asian division minus its Australian business, which it sold after pulling the IPO two months ago. The brewer will float the shares on the Hong Kong stock exchange at the end of the month.

Under pressure from an activist investor, **AT&T** was reportedly considering whether to divest its **DirecTV** business, a satellite-media provider that the telecoms giant acquired in 2015 as part of its diversification strategy. Elliott, an activist hedge fund, revealed recently that it has bought a stake in AT&T and criticised its management's approach to acquisitions, which has saddled the company with around $160bn in net debt.

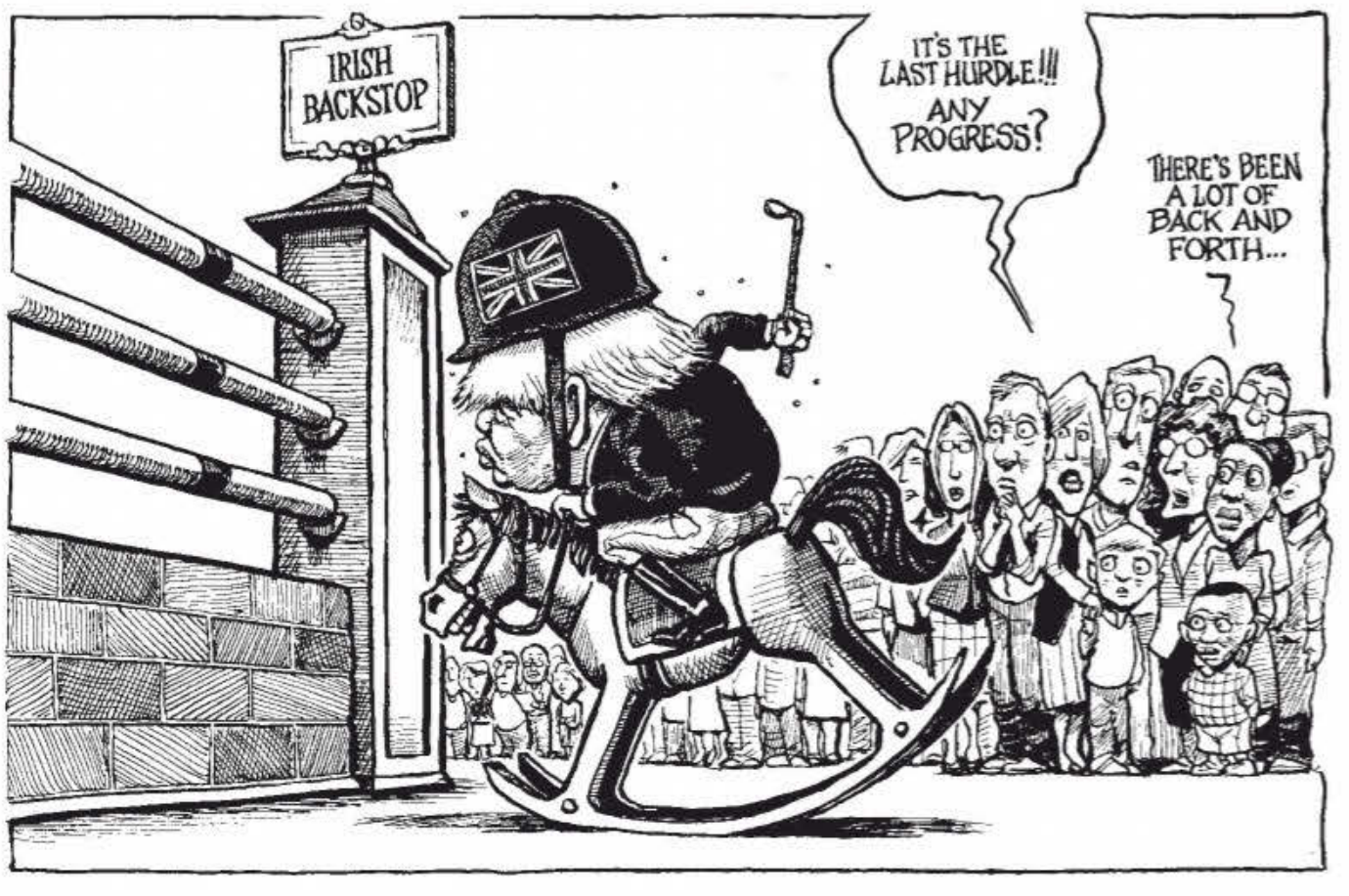
The United Automobile Workers union held its first strike at **General Motors** since 2007. Around 48,000 employees downed tools, disrupting more than 50 factories and car-parts warehouses. A collective-bargaining deal agreed to in 2015 has expired, but the company says the pay rises and other terms in a new contract are generous. The union argues that it made sacrifices when GM faced bankruptcy in 2009, and that its workers should be rewarded for creating "a healthy, profitable industry".

## The "Supreme Court"

**Facebook** announced its plans for an independent "oversight board" to regulate decisions it makes about censorship on the social network. The board will hear its first cases in 2020, and will eventually have 40 members.

Sandoz stopped distributing its Zantac **heartburn medicine** while regulators investigate the presence of an impurity called NDMA, which is classified as a probable human carcinogen. The Swiss drugmaker said that this was a precautionary measure.

The move towards **autonomous cars** stepped up a gear when Shanghai became the first city in China to allow test vehicles to carry passengers. The riders will be volunteers and a driver will sit in the car, but if there are no accidents on Shanghai's complex and busy road system the three car firms that have been granted the permits will get the green light to increase their fleets.



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The United Nations Development Programme uses that money to address the crisis we're facing in nature, save species from extinction and preserve habitats. Thus far, we've helped to safeguard the world's last Sumatran Tigers and stop elephant poaching in Niassa, Mozambique. So it's working. We just need more big brands to get on board. You can help us help wildlife. Next time you see an animal in an ad, ask the brand if they're part of **@LionsShareFund**

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# The climate issue

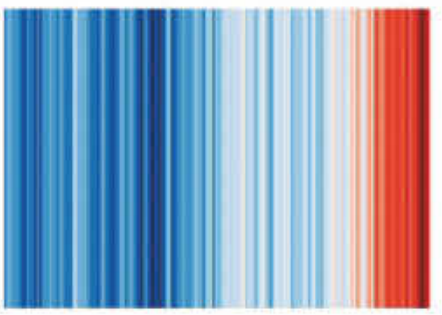
**Climate change touches everything this newspaper reports on. It must be tackled urgently and clear-headedly**

FROM ONE year to the next, you cannot feel the difference. As the decades stack up, though, the story becomes clear. The stripes on our cover represent the world's average temperature in every year since the mid-19th century. Dark blue years are cooler and red ones warmer than the average in 1971-2000. The cumulative change jumps out. The world is about 1°C hotter than when this newspaper was young.

To represent this span of human history as a set of simple stripes may seem reductive. These are years which saw world wars, technological innovation, trade on an unprecedented scale and a staggering creation of wealth. But those complex histories and the simplifying stripes share a common cause. The changing climate of the planet and the remarkable growth in human numbers and riches both stem from the combustion of billions of tonnes of fossil fuel to produce industrial power, electricity, transport, heating and, more recently, computation.

## All around us

That the changing climate touches everything and everyone should be obvious—as it should be that the poor and marginalised have most to lose when the weather turns against them. What is less obvious, but just as important, is that, because the processes that force climate change are built into the foundations of the world economy and of geopolitics, measures to check climate change have to be similarly wide-ranging and all-encompassing. To decarbonise an economy is not a simple subtraction; it requires a near-complete overhaul.



To some—including many of the millions of young idealists who, as *The Economist* went to press, were preparing for a global climate strike, and many of those who will throng the streets of New York during next week's UN General Assembly—this overhaul requires nothing less than the gelding or uprooting of capitalism. After all, the system grew up through the use of fossil fuels in ever-greater quantities. And the market economy has so far done very little to help. Almost half the atmosphere's extra, human-made carbon dioxide was put there after the turn of the 1990s, when scientists sounded the alarm and governments said they would act.

In fact, to conclude that climate change should mean shackling capitalism would be wrong-headed and damaging. There is an immense value in the vigour, innovation and adaptability that free markets bring to the economies that took shape over that striped century. Market economies are the wells that produce the response climate change requires. Competitive markets properly incentivised, and politicians serving a genuine popular thirst for action, can do more than any other system to limit the warming that can be forestalled and cope with that which cannot.

This special issue of *The Economist* is not all about the carbon-climate crisis. But articles on the crisis and what can be done about it are to be found across all this week's sections. In this, our reporting mirrors the world. Whether it is in ensuring a future for the Panama Canal or weaning petrol-head presidents off their refinery habit, climate is never the whole story. Other things matter to Manhattan stockholders and Malawian smallholders. But climate change is an increasingly dangerous context for all their worlds.

To understand that context, it is important to understand all the things that climate change is not. It is not the end of the world. Humankind is not poised teetering on the edge of extinction. The planet itself is not in peril. Earth is a tough old thing and will survive. And though much may be lost, most of the wondrous life that makes Earth unique, as far as astronomers can yet tell, will persist.

Climate change is, though, a dire threat to countless people—one that is planetary in scope if not in its absolute stakes. It will displace tens of millions, at the very least; it will disrupt farms on which billions rely; it will dry up wells and water mains; it will flood low-lying places—and, as time goes by, higher-standing ones, too. True, it will also provide some opportunities, at least in the near term. But the longer humanity takes to curb emissions, the greater the dangers and sparser the benefits—and the larger the risk of some truly catastrophic surprises.

The scale of the implications underlines another thing that climate change is not. It is not just an environmental problem alongside all the others—and absolutely not one that can be solved by hair-shirt self-abnegation. Change by the people who are most alarmed will not be enough. What is also needed is change in the lives of those who do not yet much care. Climate is a matter for the whole of government. It cannot be shunted off to the minister for the environment whom nobody can name.

And that leads to a third thing that climate change is not. It is not a problem that can be put off for a few decades. It is here and now. It is already making extreme events like Hurricane Dorian more likely. Its losses are already there and often mourned—on drab landscapes where the glaciers have died and on reefs bleached of their coral colours. Delay means that mankind will suffer more harm and face a vastly more costly scramble to make up for lost time.

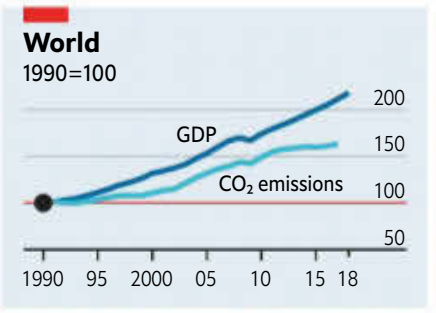
## Hanging together

What to do is already well understood. And one vital task is capitalism's speciality: making people better off. Adaptation, including sea defences, desalination plants, drought-resistant crops, will cost a lot of money. That is a particular problem for poor countries, which risk a vicious cycle where the impacts of climate change continuously rob them of the hope for development. International agreements stress the need to support the poorest countries in their efforts to adapt to climate change and to grow wealthy enough to need less help. Here the rich world is shirking its duties.

Yet, even if it were to fulfil them, by no means all the effects of climate change can be adapted away. The further change goes, the less adaptation will be able to offset it. That leads to the other need for capital: the reduction of emissions. With plausible technological improvements and lots of investment, it is possi- ▸▸

ble to produce electricity grids that need no carbon-dioxide-emitting power stations. Road transport can be electrified, though long-haul shipping and air travel are harder. Industrial processes can be retooled; those that must emit greenhouse gases can capture them.

It is foolish to think all this can be done in ten years or so, as demanded by many activists and some American presidential hopefuls. But today's efforts, which are too lax to keep the world from two or even three degrees of warming, can be vastly improved. Forcing firms to reveal their climate vulnerabilities will help increasingly worried investors allocate capital appropriately. A robust price on carbon could stimulate new forms of emission-cutting innovations that planners cannot yet imagine. Powerful as that tool is, though, the decarbonisation it brings will need to be accelerated through well-targeted regulations. Electorates should vote for both.




The problem with such policies is that the climate responds to the overall level of carbon dioxide in the atmosphere, not to a single country's contribution to it. If one government drastically reduces its own emissions but others do not, the gallant reducer will in general see no reduced harm. This is not always entirely true: Germany's over-generous renewable-energy subsidies spurred a worldwide boom in solar-panel production that made them cheaper for everyone, thus reducing emissions abroad; Britain's thriving offshore wind farms may achieve something similar. But it is true enough in most cases to be a huge obstacle.

The obvious fix will be unpalatable to many. The UN's climate talks treat 193 countries as equals, providing a forum in which all are heard. But three-quarters of emissions come from just 12 economies. In some of those, including the United States, it is possible to imagine younger voters in liberal democracies demanding a political realignment on climate issues—and a new interest in getting others to join in. For a club composed of a dozen great and middling-but-mucky powers to thrash out a "minilateral" deal would leave billions excluded from questions that could shape their destiny; the participants would need new systems of trade preference and other threats and bribes to keep each other in line. But they might break the impasse, pushing enough of the world onto a steeper mitigation trajectory to benefit all—and be widely emulated.

The damage that climate change will end up doing depends on the human response over the next few decades. Many activists on the left cannot imagine today's liberal democracies responding to the challenge on an adequate scale. They call for new limits to the pursuit of individual prosperity and sweeping government control over investment—strictures some of them would welcome under any circumstances. Meanwhile, on the right, some look away from the incipient disaster in an I'm-alright-Jack way and so ignore their duties to the bulk of humanity.

If the spirit of enterprise that first tapped the power of fossil fuels in the Industrial Revolution is to survive, the states in which it has most prospered must prove those attitudes wrong. They must be willing to transform the machinery of the world economy without giving up on the values out of which that economy was born. Some claim that capitalism's love of growth inevitably pits it against a stable climate. This newspaper believes them wrong. But climate change could nonetheless be the death knell for economic freedom, along with much else. If capitalism is to hold its place, it must up its game. ■

The Saudi attacks

# Abqaiq the powder keg

**Nobody wants a war in the Middle East. That is why Iranian aggression needs a tough response**

TO REDUCE ITS climate risks, the world needs to curtail its production of oil. But there was nothing risk-reducing about the strike on Saudi Arabian oil facilities on September 14th. The drones and missiles that pummelled Abqaiq and Khurais cut the kingdom's output by 5.7m barrels a day (see Middle East & Africa section). It was a bigger loss to world markets than that brought about by Saddam Hussein's invasion of Kuwait in 1991. That aggression led to a march on Baghdad by 35 countries. The strike last weekend was not an invasion; but an attack that reduces global oil supply by 6% is everybody's business. Even if Saudi Arabia fulfils its pledge to restore output by the end of September, supplies from the world's largest oil exporter are now vulnerable.

Houthi rebels fighting Saudi Arabia in Yemen claimed responsibility for the attack. They are backed by Iran and used Iranian weapons. America may have evidence the strike came from inside Iran itself. Mike Pompeo, the secretary of state, has called it "an act of war". The details matter, but do not change the question: how to curb the aggression of Iran and its proxies?

Among the causes of this crisis lie two terrible mistakes. The first is Saudi Arabia's four-year war in Yemen—not just a moral disaster but a strategic one, too. Over 90,000 people have died in the fighting and almost as many children under five from famine and disease. Far from defeating the Houthis, it has turned them into dangerous foes; far from severing their loose links with Saudi Arabia's sworn enemy, Iran, it has strengthened them.

The second blunder was the Trump administration's withdrawal last year from the deal to limit Iran's nuclear programme. America switched to a policy of "maximum pressure": sanctions designed to cause Iranians to rebel against the mullahs or to force Iran meekly back to the negotiating table. Predictably, however, maximum pressure has strengthened the hardliners, who reject talks with America. One reason President Donald Trump ditched the nuclear accord was because it failed to restrain Iran's regional aggression, yet if Iran was behind Saturday's attack, it shows that the regime is more belligerent than ever.

Over everything hangs the spectre of yet another Middle Eastern conflict. That poses a dilemma. With its back to the wall, Iran may meet any retaliation by striking even harder. But unless Iran sees that aggression carries a cost, it will be emboldened to use force again. That, sooner or later, also leads towards war.

Consider the cost of recent Western restraint. In May Iran hit four tankers in the United Arab Emirates; in June it struck two ▸▸

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*Source: Moody's, Green Bonds: Key Numbers and Trends, January 2018.

more tankers in the Strait of Hormuz; later it took down an American drone. Mr Trump was prepared to retaliate only after that last aggression—and even then he pulled back at the last minute. The attack on September 14th was vastly more consequential. The president has said that America is "locked and loaded". In Tehran they are watching to see whether he is all talk, as they are in Beijing, Moscow, Pyongyang, and in countries whose security depends on the idea that America will turn up.

If any nuclear negotiations are to succeed, Iran must pay a price for Abqaiq. America wants a more sweeping agreement than the original one, but only the pragmatic faction in Tehran, weakened by America's approach, will make such a deal. While Iran can hit out again, the hardliners will have a veto over any talks. If America is seen as a paper tiger, they will be able to argue that Iran need not give much ground. On the contrary, they will say that their country should pile pressure on America by accelerating its nuclear programme. America and its allies therefore need to convince Iran that it cannot use violence to get its way.

The first stage of a response is to establish precisely where Saturday's attack originated and who planned it. America must share this publicly, partly because Mr Trump's word alone does not carry weight, but also to build a coalition and help stifle the objections of Iran's apologists. Evidence against Iran could pave the way for new sanctions. Mr Trump has promised more—though America is already doing pretty much all it can. He should be backed by the Europeans, who need to understand that peace depends on deterring Iran, and China, which imports over 9m b/d of oil, much of it from the Middle East.

That is not all. If the Abqaiq attack is the work of Iran's revolutionary guards, they should face direct consequences. That involves covert operations, by cyber-units that can disrupt their communications and finances; and air strikes on guard units outside Iran in Syria. Ideally, these would be carried out by a coalition, but if need be, America and Saudi Arabia should act alone. The risk of escalation should not be ignored, but Iran does not want all-out war any more than Saudi Arabia and America do. Israel frequently launches air strikes against Iranian targets in Syria and Iraq without provoking an Iranian escalation.

A show of force is part of the way back to nuclear talks—and to repairing those two terrible mistakes. Saudi Arabia's allies must press it to sue for peace in Yemen. And America needs to signal to Iran that it will be reasonable in re-establishing the bargain embodied in the nuclear deal. If it demands that Iran surrenders everything, the Middle East will get nothing but more misery. ■

Israel

# King Bibi's reign is ending

**Israel's prime minister has lost his majority, hope of immunity and aura of invincibility**

His devotees call him King Bibi, but the crown is slipping. Twice this year Binyamin Netanyahu, Israel's prime minister, has gone to the country to ask voters for a clear majority. Twice they have denied him one. With almost all the votes counted from the ballot on September 17th, Mr Netanyahu's Likud party was two seats behind Blue and White, a centrist alliance led by Benny Gantz, a former military chief. Mr Netanyahu's coalition of right-wing and religious parties fell six short of a majority, a larger shortfall than at the previous election in April.

Mr Netanyahu (pictured, left) still hopes to cling to power as Mr Gantz (right), too, has no clear path to a governing coalition. Yet the era of King Bibi is surely coming to a close. Having lost his majority, Mr Netanyahu has lost almost all hope of obtaining immunity from prosecution on three counts of alleged corruption. And he has lost the aura of invincibility given by four terms and 13 years in power.

Liberals in Israel and around the world may dare to believe that, at last, Mr Netanyahu's brand of ethno-nationalist politics can be defeated. Israel now has a chance to return to a more sane democratic politics. But only a chance.

Much will depend on how the coalition horse-trading plays out. By nosing ahead, Mr Gantz has the better claim to try to form a cabinet. But Mr Netanyahu remains caretaker prime minister until another government is formed. Even if he somehow stays in office, he will be much diminished. He will have to share power with his enemies—whether Mr Gantz or, worse, Avigdor Lieberman, an ex-aide who split with him and thwarted him. The best Mr Netanyahu can hope for is a government of national unity in which he and Mr Gantz take turns as leader. Even so, he will be vulnerable to prosecution and abandonment by allies.

In March this newspaper described Mr Netanyahu's tenure as a parable of modern populism. He embraced muscular nationalism and elite-bashing long before these became a global force (though he adopted more sensible economic policies). During the campaign he reverted to type: although after 13 years in power he can hardly claim to be the underdog, he cast himself as the champion of the people against the elite. He claimed that policemen and prosecutors dogging him were leftists, even though he appointed many of them. The journalists who questioned him were denounced for purveying false news, though *Israel Hayom*, the biggest freesheet, is so loyal that Israelis call it *bibiton* (*iton* is Hebrew for newspaper).

Mr Netanyahu sowed distrust of Arab citizens. He accused Arab parties of fraud; a chatbot message on his Facebook page, since withdrawn, accused them of trying "to destroy us all". As ever, he highlighted the threat of Iran and his friendship with President Donald Trump, who recognised Jerusalem as Israel's capital. Above all, Mr Netanyahu sought to mobilise his right-wing base, promising to annex part of the occupied West Bank if re-elected.

None of these tactics worked, and some backfired. The threat to place cameras in polling stations, supposedly to deter Arab voter fraud, instead provoked a large Arab turnout. What were once acts of bravura from the man known as "the magician" now look like tired old stunts.

His potential replacement, Mr Gantz, presents himself as a warrior who wants peace, but has been worryingly vague about his policies. Do not expect him to rush into a deal with the Palestinians. A two-state peace deal, with a Palestinian state alongside ▸▸

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Israel, may seem desirable to most of the world but appeals to only about half of Israelis. And many of them think it is unachievable right now: moderate Palestinians are too weak, and the radicals strong enough to spoil any accord. Most Israelis reckon the conflict can only be managed, not solved. At least under Mr Gantz some sort of dialogue with Palestinians might resume, and the threat of unilateral annexation will recede; perhaps there can be partial deals. If Mr Gantz makes a difference, it is more likely to be to the tenor of Israeli politics, whose drift towards intolerant ethno-nationalism he might arrest.

That said, what brought Mr Netanyahu down was not a victory of the peace camp, but a betrayal among nationalists. Mr Lieberman, formerly Mr Netanyahu's chief of staff, has become Israel's kingmaker. His breakaway party, Yisrael Beiteinu (Israel, Our Home), made bigger gains than any other by promising not to join any government unless it introduced secular reforms, which would in turn break Likud's alliance with ultra-religious parties. That is welcome, but Yisrael Beiteinu is hardly liberal. It is more rabidly nationalist than Likud, having often led efforts to delegitimise Arab parties, and Mr Lieberman has been fending off accusations of corruption for as long as Mr Netanyahu has.

It is tempting to conclude that the parable has a hopeful moral: populism has found its limits; the institutions of liberal democracy can stand up to it. But the weakening of one kind of populism may simply have strengthened another. The work of embattled liberals in Israel, and elsewhere, is far from done. ■

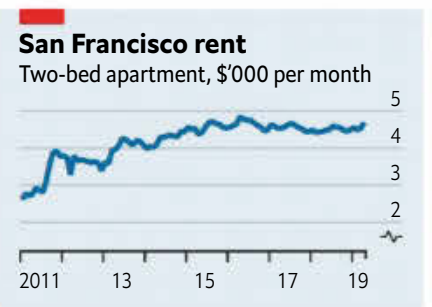
Regulating rent

# Control your instincts

**Capping how much landlords get paid is the wrong way to help Generation Rent**

THE OVER-REGULATION of homebuilding in and around thriving cities is one of the great economic-policy failures of recent times. In London the median full-time employee renting the median two-bedroom flat works nearly half the year just to pay the landlord. In San Francisco rent is so high that a four-person household with an income of $129,000 might still qualify for federal handouts. Housing shortages like these have helped suck wealth away from young renters, fuelling tension between the generations. Supply restrictions have a high economic cost—by one estimate, curbs in just three successful cities lower overall GDP in the United States by almost 4%. As more and more voters find themselves on the losing end of property markets, they have also generated a political backlash. In America and Europe politicians are thus under pressure to reduce housing costs.

A rethink of housing policy is certainly overdue. Many of the new ideas are welcome, for example more building and recognition of the harm wrought by NIMBYism (the attitude of homeowners campaigning against nearby developments). Britain has improved the regulation of rental contracts, a vital component of a functional housing market. Unfortunately, at the same time an old and rotten idea is being resurrected—rent controls. If these proliferate, they will, just like rules that stymie building, skewer property-market outsiders and protect favoured residents.




Across the West rent controls are back in fashion. On September 11th California's lawmakers passed a bill that would cap annual rent increases across the state at 5% plus inflation. The state is following in the footsteps of Oregon, which earlier this year limited most rent rises to 7% plus inflation. Some Democrats want rents managed nationally. On September 14th Bernie Sanders, a senator and presidential contender, said that the limit everywhere should be 3% or 1½ times inflation, whichever is higher (see United States section). Meanwhile London's mayor, Sadiq Khan, has called for rent controls in the capital. Berlin's legislators have voted to freeze rents for five years from 2020; some German politicians have called for national rent caps. Paris reintroduced rent controls in July, having scrapped them in 2017.

Rent controls are a textbook example of a well-intentioned policy that does not work. They deter the supply of good-quality rental housing. With rents capped, building new homes becomes less profitable. Even maintaining existing properties is discouraged because landlords see no return for their investment. Renters stay put in crumbling properties because controls often reset when tenants change. Who occupies housing ends up bearing little relation to who can make best use of it (ie, workers well-suited to local job opportunities). The mismatch reduces economy-wide productivity. The longer a tenant stays put, the bigger the disparity between the market rent and his payments, sharpening the incentive not to move.

The resulting damage is clear from the fate of two American cities. In the mid-1990s Cambridge, Massachusetts, scrapped its rent controls, while San Francisco made its regime even stricter. In Cambridge apartments freed from rent control saw a spurt of property improvements. San Francisco experienced its own residential investment boom, but one that was aimed at getting round the rules, for example by converting rental properties so that they could be sold. The subsequent 15% reduction in supply by affected landlords pushed up rents across the city by more than 5%.

It is unrealistic to expect politicians to ignore voters' demands. But the danger is that one abuse of power is replaced by another as renters, just like NIMBYs, campaign for regulations to lock newcomers out of the market. Although today's residents might benefit from capped rent increases, outsiders, faced with less supply and fewer opportunities, will suffer. Just ask the 636,000 people who were queuing at the end of 2018 for a diminishing stock of rental housing in rent-controlled Stockholm. There, the average waiting-time to find a long-term tenancy is ten years and black-market rentals have begun to thrive. Rent control harms almost everyone eventually because the housing stock deteriorates.

Falling home-ownership rates in countries like Britain and America mean that it is more important than ever for the rental market to function well. Yet rent controls will only make it worse. As a solution to housing shortages, they are snake oil. Voters and politicians everywhere should reject them. ■

**Repairing capitalism**

Your leader and briefing on "What companies are for" (August 24th) were among the most important I have read in *The Economist*. We live in strange times, when innovations are expanding potential GDP hugely, and, at the same time, fuelling conflict, disenchantment and the marginalisation of many. We saw similar changes during the Industrial Revolution. We came out of that era just fine, not just because of reformers like Robert Peel and Robert Owen, but also because of original thinkers who changed our very understanding of capitalism. The Industrial Revolution coincided with the biggest breakthroughs in economics, from Adam Smith's seminal book in 1776, through the works of Augustin Cournot, Karl Marx and John Stuart Mill, to Léon Walras.

The complexity of your cover story's prescriptions is a reminder that we are at a turning point in history, where we need novel reforms. The solution is not going to be easy. Economics needs creativity of the kind seen 200 years ago.

PROFESSOR KAUSHIK BASU
Former chief economist at the World Bank
*Ithaca, New York*

The stirring among some billionaire chief executives at the Business Roundtable who want to redefine the purpose of a company beyond maximising shareholder value is not unprecedented. In the mid-19th century it was a given that employers operated with a legal if not moral obligation to consider the well-being of their employees as well as their neighbours and customers. That idea faded almost entirely in America by the early 20th century, but was revived a bit in the 1960s. So the current thinking is rather a sad repeat of the attention given in the 1970s in the media and some business schools and think-tanks to what companies owe to the rest of American society beside their own profitability. Milton Friedman was inspired to protest against that thinking, arguing that companies have only one priority, namely to maximise the earnings of shareholders. The business-responsibility idea soon faded after it became amply clear that the whole thing was little more than a public-relations gesture at a time of considerable social and economic agitation.

The real problem is that so many public goods, such as education, the arts and philanthropy, are already dependent on private billionaires and their sometimes benign but sometimes sleazy foundations. But why should we invite corporate billionaires to control which social and economic problems deserve attention, to say nothing about how those problems might be treated? In fact, corporate boards and CEOs already exercise outsize influence on the political process, policymaking and government administration at every level.

Maybe Friedman was right: companies have only one legitimate priority. Maybe it is time to let others have a fair chance to influence policy.

RICHARD ABRAMS
Emeritus professor of history
University of California, Berkeley

John Maynard Keynes wrestled with these questions in the "The End of Laissez-Faire", published in 1926. He concluded then that: "Our problem is to work out a social organisation which shall be as efficient as possible without offending our notions of a satisfactory life."

ROBERT OBER
*Litchfield, Connecticut*

The Business Roundtable's commitment to other stakeholders as well as shareholders has long been fundamental to its policy. Its new statement is an affirmation of this de facto record rather than a response to an environmental and social governance fad. My own experience involved a bold initiative by the Roundtable with civil-rights and women's-rights leaders on some major legislation. The rationale for breaking away from the rest of the business community was both that its member companies were already committed to responsible policies on race and gender and that this was where the entire business community needed to be.

KATHERINE HAGEN
Former vice-president for government affairs at AT&T
*Grasse, France*

The dilemma for some companies about whether to pursue shareholder value alone is illustrated by Cathay Pacific. Should it kowtow to the demands of the Chinese government and sack staff who participate in the protests in Hong Kong, or should it meet its responsibilities to its employees and society? Cathay is in a tricky situation but ultimately must respect the rights of its workers. Companies do not need to become vanguards of democracy and do-goodery, but they should ensure that staff, communities and customers are not harmed as a result of their pursuit of profit.

KATRYN WRIGHT
*London*

A crucial argument against corporate do-gooding is conflict of interest. Should we allow companies, rather than governments, to set corporate behavioural norms? Firms have a strong incentive to avoid rules that go against the interests of shareholders or managers. For example, would a company benefiting from a monopoly promote strong competition? Democratic governments are accountable to their citizens and suffer no such conflict of interest. They are better placed to set rules on their people's behalf.

RICHARD WILLIAMSON
*Ely, Cambridgeshire*

You ignored the law. A company's directors and officers have a fiduciary duty to look out for the best interests of the corporation and its shareholders. Often, this fiduciary obligation is compatible with respecting other stakeholders' interests, because looking out for all stakeholders helps move everyone towards long-term business success. But if there ever is a conflict the interests of the company and its shareholders will override the interests of others.

DANA SHULTZ
*Piedmont, California*

The clearest arguments in support of shareholders' interests were handed down by the Michigan Supreme Court 100 years ago in *Dodge v Ford Motor Company*. In that case Henry Ford (who could hardly be accused of an agency problem) claimed that his company was organised "to do as much good as we can, everywhere, for everybody concerned" and only "incidentally to make money".

The court disagreed. Citing Ford's testimony, it ruled the corporation could make "an incidental humanitarian expenditure of corporate funds", but it could not commit to "a general purpose and plan to benefit mankind at the expense" of shareholders.

A.S. ILKSON
*Woodstock, New York*

Shareholder primacy is anti-scientific, wrong, immoral (not just amoral) and very damaging. Oh, and really bad business. Those who reproduce the propaganda of this parasitic variety of capitalism that has been dominant for the past 30 years are part of the problem, not the solution.

JOREN DE WACHTER
*Brussels*

The question of what the proper purpose of a company should be has bedevilled thinkers ever since its modern inception. Edward Thurlow, a British lord chancellor in the late 18th century, observed that: "Corporations have neither bodies to be punished, nor souls to be condemned; they therefore do as they like."

CHRISTINE SAYERS
*Rome*

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# Freedom in the World of Mobility

## Hyundai is changing the way we move for the better

We are constantly being told that the 21st century is going to be all about how technology will revolutionise the way we travel, communicate, do business and live our lives.

This is as true in the car industry as it is in retail or medicine. And yet, one of the biggest names in the business, Hyundai, has recently introduced a radical, purpose-driven way of thinking about technological and digital advancement—a new approach that will affect every dollar that the company invests in future tech.

Progress, Hyundai has decided, is nothing unless humanity benefits from it.

This is perhaps an acknowledgement that processing power and robotics are fast approaching the point where people may not be needed at all. But on a more basic level, it is a recognition that humans, not the technology itself, should be at the heart of everything the Korean brand strives to achieve. And this approach is supported, Hyundai believes, by three pillars that will steer its innovation in new directions:

- Freedom in mobility
- Connected mobility
- Clean mobility

Youngcho Chi, Hyundai Motor Group's President and Chief Innovation Officer, says, "The concept of mobility stretches beyond simply moving a person or an object from point A to point B." "Freedom in mobility" means giving people the freedom to choose how they move from place to place. But Hyundai is thinking about "freedom of mobility" as well: focusing on how being mobile benefits humans by giving people the freedom to move around and the permission to dream.

In practical terms, this means that when Hyundai views "freedom of mobility", it is looking way beyond a chassis, four wheels and a combustion engine, electric motor or hydrogen fuel cell. Indeed, the company is already looking at solutions for "the last mile" of your journey—that additional distance you have to cover to your final destination once you have parked, whether because of inaccessibility, restrictions on vehicles or insufficient parking in city centres.

For this, Hyundai has developed the IONIQ electric scooter, a lightweight, foldable device that can be stored in the boot of a vehicle, then used to make the final few minutes of the journey as easy as possible. This is, in fact, the first physical result of Hyundai's new "freedom of mobility" approach to reach the market, as customers in China will start taking delivery of IONIQ scooters by the end of 2019.

### TECHNOLOGY WITH A HUMAN HEART

Hyundai believes that everyone should have "freedom of mobility". But for some people, even this most basic concept is compromised because their physical movement is hampered through injury, accident or disability. Hyundai wants to give these people the freedom to move and accomplish their aspirations and dreams.

Driven by a desire to make mobility accessible to everyone, Hyundai is developing wearable H-MEX exoskeletons. Aimed at helping paraplegics and elderly people, this robotic medical device can support up to 40kg of the wearer's weight and potentially grant movement to those with spinal injuries or muscle issues.

This human-focused approach to mobility has also been adopted by CRADLE, Hyundai's hub for start-up collaboration. Its offices in Silicon Valley, Tel Aviv, Berlin and Beijing are a hotbed for innovators specialising in everything from artificial intuition and

image sensors to public transport apps and facial and speech recognition.

The CRADLE team asked themselves: "How might we go further to help people truly reach freedom through mobility?" To answer this question, they looked at scenarios where conventional vehicles would simply not be able to offer people the required mobility. This could be an extreme situation, such as a natural disaster where first responders are unable to reach disaster victims because traditional roads have been compromised, or more everyday challenges, like an elderly or infirm person who finds it difficult to walk up the steps to their home. Having identified these human needs, CRADLE then tried to use technology to overcome them.

> "Freedom can be experienced individually or collectively, but it is always embedded in our shared cultural experience."

The result was Elevate—the "walking car". Created in conjunction with industrial design firm Sundberg-Ferar, Elevate has complex multi-joint legs, inspired by those of a grasshopper. This gives it the ability to climb steps, lift itself above flowing water, or even jump over gaps in a disaster-hit area.

Elevate is a physical expression of "freedom of mobility" and it sits alongside H-MEX as proof of how a human-first approach to problem solving can yield solutions that would never exist if the focus were on technology alone. Chi says that focusing on the mobility of the human body allows Hyundai to consider a variety of life experiences and situations where mobility—or the lack of it—can have an impact. "For example, if an elderly woman has difficulty reaching the nearest bus stop, it may discourage her from visiting the doctor regularly until she becomes seriously ill," he says.

### THE FUTURE OF MOBILITY IS FREEDOM IN MOBILITY

It may seem counterintuitive that Hyundai, traditionally a car-making company, is experimenting with and developing these new solutions. However, Chi argues that it is better for Hyundai to start thinking in new ways about "freedom in mobility", because the market will not wait for it to do so. "In the future," he says, "people will prefer more diverse and practical mobility solutions than just buying a car, so we must actively develop transportation solutions for the future, not the past."

Freedom can be experienced individually or collectively, but it is always embedded in our shared cultural experience. Similarly, people will always need to travel, but how they do so is always evolving. A range of factors—climatic, environmental, social and financial—are affecting how humanity views mobility and Hyundai understands that it needs to anticipate and meet these demands. "The need for mobility is here to stay. What will change is vehicle ownership—from individuals to service providers," says Chi.

At the heart of all these technologies, devices and solutions is a very simple premise: How can Hyundai give people both "freedom of mobility" and "freedom in mobility"? The company has discovered that developing solutions—technological or otherwise—to human challenges must always involve taking a human-centric approach.

HYUNDAI

IONIQ is Hyundai's electric scooter that can be both stored in and charged by your vehicle.

H-MEX, a wearable robotic exoskeleton, helps support its user's weight and gives freedom of mobility to physically impaired people.

## Mobility is more than the car

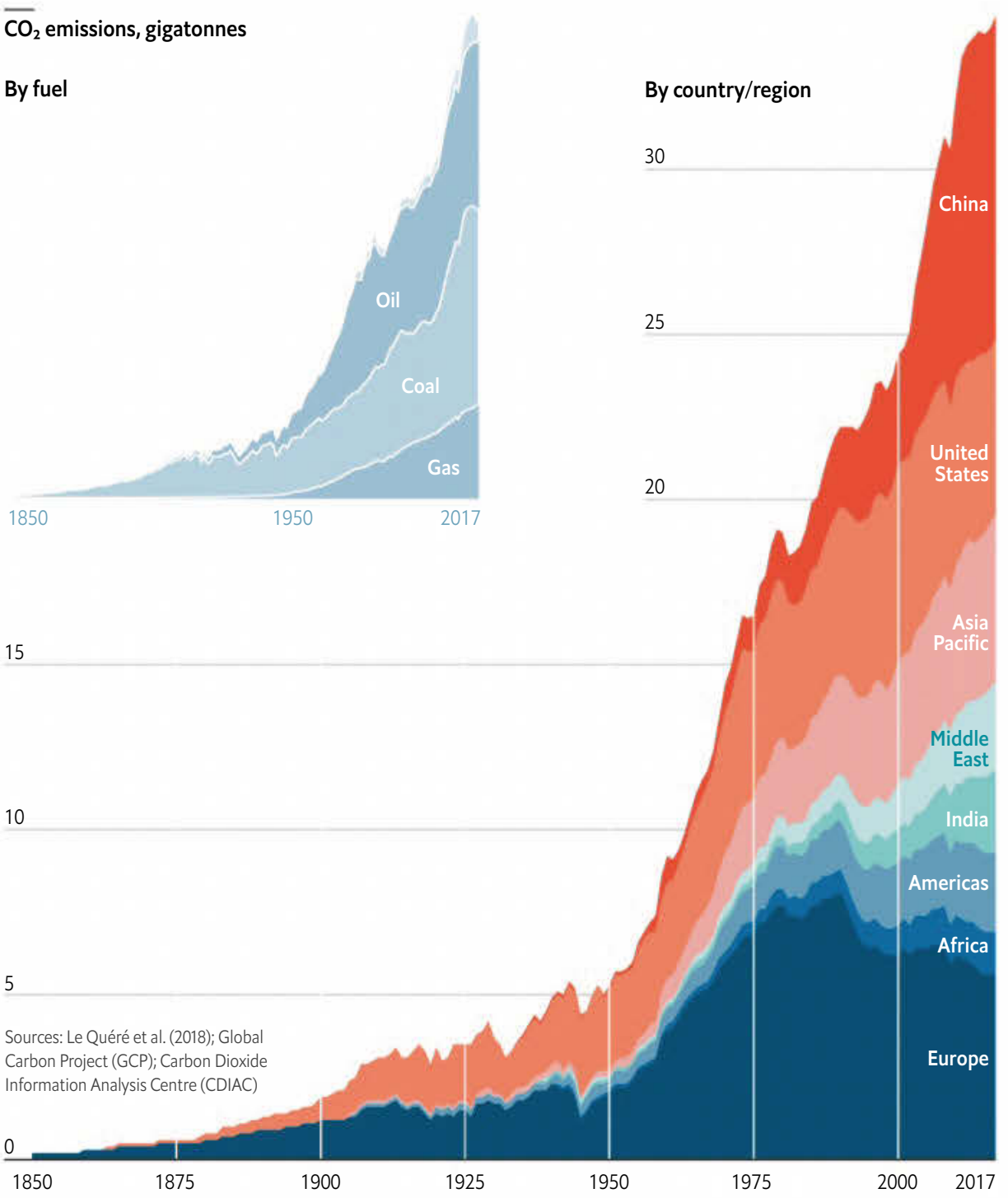
When thinking about mobility, people often take a car-centric approach. However, Hyundai believes this is not true to the concept of "freedom in mobility", and ignores the millions of people, especially in developing countries, who do not own a car. According to a 2015 report by the Pew Research Centre, the proportion of car owners was very low in South and Southeast Asian countries. For example, in both Bangladesh and Vietnam, only 2% reported having a car.

Another challenge is the lack of access to public transport. In the USA, for example, a combination of increasing urban-suburban sprawl and the relative absence of convenient and affordable public transportation makes getting around difficult and time consuming for low-income families. This can have a real socio-economic impact. A 2015 Harvard study identified commute times as the single biggest indicator of whether an American household can pull itself out of poverty.

**6%** car ownership rate in India

**US$300 million:**
Hyundai's investment in Ola, an Indian ridesharing service

To address "freedom in mobility" and allow people the freedom of choosing how to be mobile, Hyundai is exploring other solutions, such as car-sharing and ride-hailing. The teams at CRADLE have been working on how to develop and integrate these "mobility solution" technologies together—with buy-in from local authorities and city administrations. For example, Hyundai has taken direct action in India, a market where only 6% of the population are car owners. Recognising both the need and opportunity, Hyundai invested US$300 million in Ola, an Indian peer-to-peer ridesharing and ride-hailing service that already has more than 150 million users.




# What goes up

**Carbon dioxide emissions are rising. Reducing them is a monumental challenge**

In the early 19th century Joseph Fourier, a French pioneer in the study of heat, showed that the atmosphere kept the Earth warmer than it would be if exposed directly to outer space. By 1860 John Tyndall, an Irish physicist, had found that a key to this warming lay in an interesting property of some atmospheric gases, including carbon dioxide. They were transparent to visible light but absorbed infrared radiation, which meant they let sunlight in but impeded heat from getting out. By the turn of the 20th century Svante Arrhenius, a Swedish chemist, was speculating that low carbon-dioxide levels might have caused the ice ages, and that the industrial use of coal might warm the planet.

What none foresaw was how fast, and how far, the use of fossil fuels would grow (see chart above). In 1900 the deliberate burning of fossil fuels—almost entirely, at the time, coal—produced about 2bn tonnes of carbon dioxide. By 1950 industrial emissions were three times that much. Today they are close to 20 times that much.

That explosion of fossil-fuel use is inseparable from everything else which made the 20th century unique in human history. As well as providing unprecedented access to energy for manufacturing, heating and transport, fossil fuels also made almost all the Earth's other resources vastly more accessible. The nitrogen-based explosives and fertilisers which fossil fuels made cheap and plentiful transformed mining, warfare and farming. Oil refineries poured forth the raw materials for plastics. The forests met the chainsaw.

In no previous century had the human population doubled. In the 20th century it came within a whisker of doubling twice. In no previous century had world GDP doubled. In the 20th century it doubled four times and then some.

An appendix to a report prepared by America's Presidential Science Advisory Committee in 1965 marks the first time that politicians were made directly aware of the likely climate impact of all this. In the first half of the century scientists believed that almost all the carbon dioxide given off by industry would be soaked up by the oceans. But Roger Revelle, an oceanographer, had shown in the 1950s that this was not the case. He had also instituted efforts to measure year-on-year changes in the atmosphere's carbon-dioxide level. By 1965 it was clear that it was steadily rising.

The summary of what that rise meant, novel when sent to the president, is now familiar. Carbon stored up in the crust over hundreds of millions of years was being released in a few generations; if nothing were done, temperatures and sea levels would rise to an extent with no historic parallel. Its suggested response seems more bizarre: trillions of ping-pong balls on the ocean surface might reflect back more of the sun's rays, providing a cooling effect.

The big difference between 1965 and now, though, is what was then a peculiar prediction is now an acute predicament. In 1965 the carbon-dioxide level was 320 parts per million (ppm); unprecedented, but only 40ppm above what it had been two centuries earlier. The next 40ppm took just three decades. The 40ppm after that took just two. The carbon-dioxide level is now 408ppm, and still rising by 2ppm a year.

Records of ancient atmospheres provide an unnerving context for this precipitous rise. Arrhenius was right in his hypothesis that a large part of the difference in temperature between the ice ages and the warm "interglacials" that separated them was down to carbon dioxide. Evidence from Antarctic ice cores shows the two going up and down together over hundreds of thousands of years. In interglacials the carbon-dioxide level is 1.45 times higher than it is in the depths of an ice age. Today's level is 1.45 times higher than that of a typical interglacial. In terms of carbon dioxide's greenhouse effect, today's world is already as far from that of the 18th century as the 18th century was from the ice age (see "like an ice age" chart on next page).

Not all the difference in temperature between interglacials and ice ages was because of carbon dioxide. The reflection of sunlight by the expanded ice caps added to the cooling, as did the dryness of the atmosphere. But the ice cores make it clear that what the world is seeing is a sudden and dramatic shift in fundamental parameter of the planet's climate. The last time the Earth had a carbon-dioxide level similar to today's, it was on average about 3°C warmer. Greenland's hills were green. Parts of Antarctica were fringed with forest. The water now frozen over those landscapes was in the oceans, providing sea levels 20 metres higher than today's.

### Ping-pong ding-dong

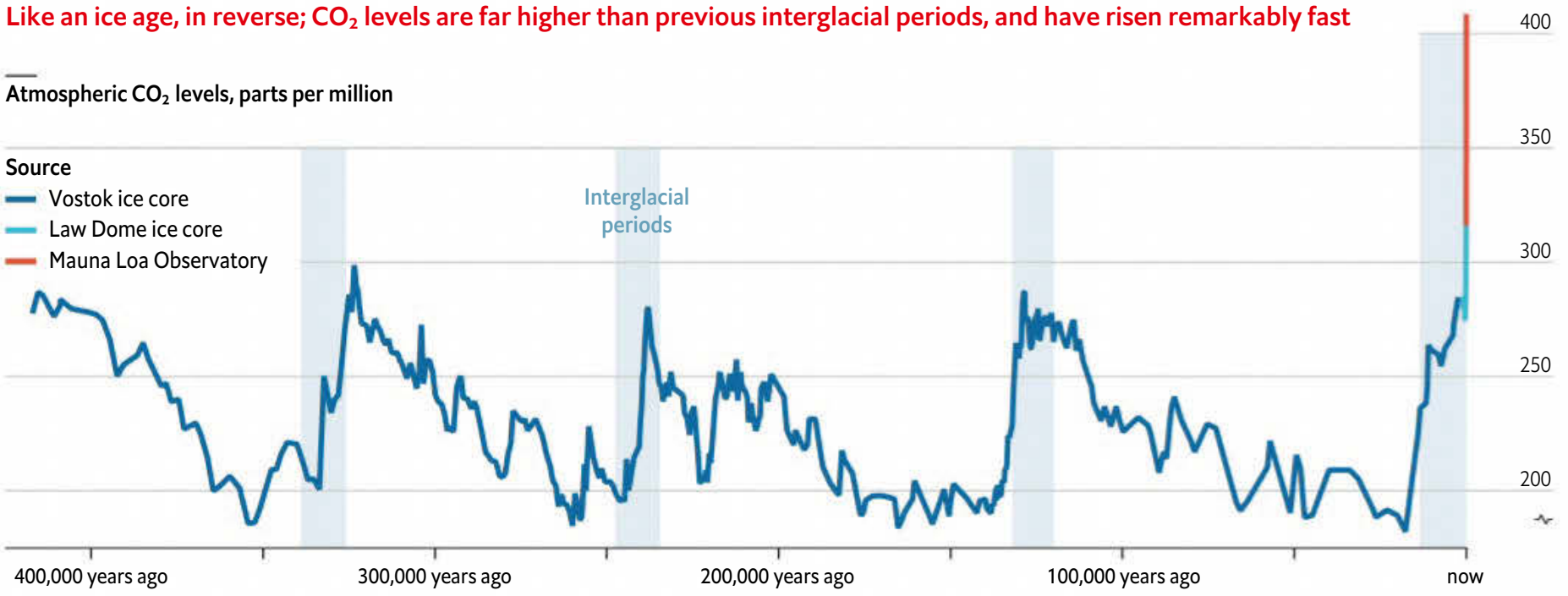
There is no evidence that President Lyndon Johnson read the 1965 report. He certainly didn't act on it. The idea of deliberately changing the Earth's reflectivity, whether with ping-pong balls or by other means, was outlandish. The idea that the fuels on which the American and world economies were based should be phased out would have seemed even more so. And there was, back then, no conclusive proof that humans were warming the Earth.

Proof took time. Carbon dioxide is not the only greenhouse gas. Methane and nitrous oxide trap heat, too. So does water vapour, which thereby amplifies the effects of the others. Because warmth drives evaporation, a world warmed by carbon dioxide will have a moister atmosphere, which will make it warmer still. But water vapour also condenses into clouds—some of which cool the world and some of which warm it further. Then and now, the complexities of such processes make precision about the amount of warming expected for a given carbon-dioxide level unachievable.

Further complexities abound. Burning fossil fuels releases particles small enough to float in the air as well as carbon dioxide. These "aerosols" warm the atmosphere, but also shade and thereby cool the surface below; in the 1960s and 1970s some thought their cooling power might overpower the warming effects of carbon dioxide. Volcanic eruptions also produce surface-cooling aerosols, the effects of which can be global; the brightness of the sun varies over time, too, in subtle ways. And even without such external "forcings", the internal dynamics of the climate will shift heat between the oceans and atmosphere over various timescales. The best known such shifts, the El Niño events seen a few times a decade, show up in the mean surface temperature of the world as a whole.

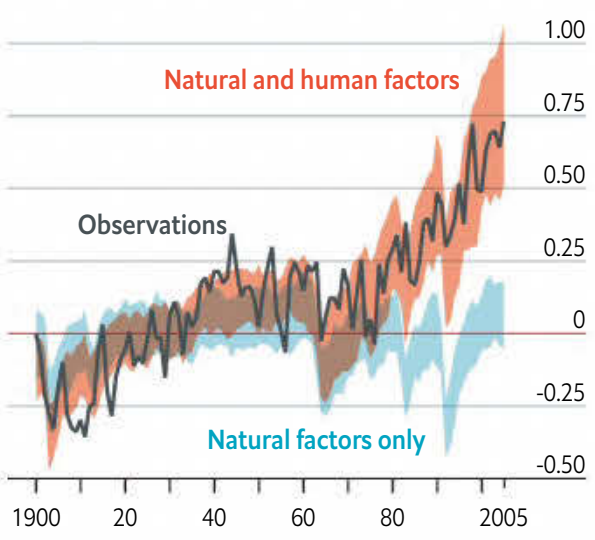
These complexities meant that, for a time, there was doubt about greenhouse warming, which the fossil-fuel lobby deliberately fostered. There is no legitimate doubt today. Every decade since the 1970s has been warmer than the one before, which rules out natural variations. It is possible to compare climate models that account for just the natural forcings of the 20th century with those that take into account human activities, too. The effects of industry are not statistically significant until the 1980s. Now they are indisputable.

**Like an ice age, in reverse; $CO_2$ levels are far higher than previous interglacial periods, and have risen remarkably fast**

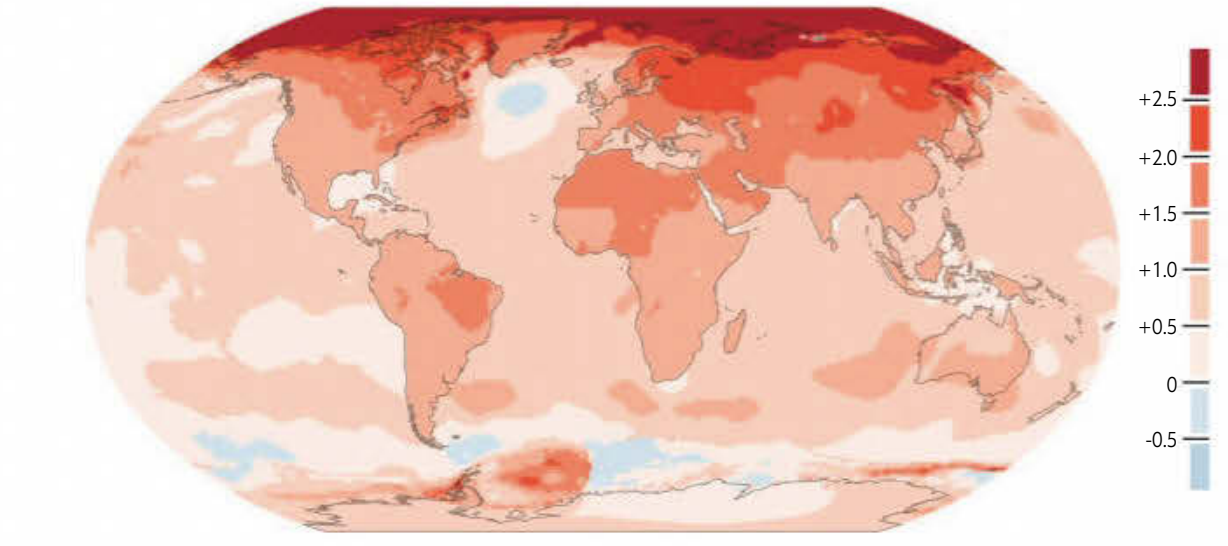



Sources: CDIAC; NOAA

**Only climate models which include human activity can explain the warming seen—which already exceeds 1.5°C in some places**

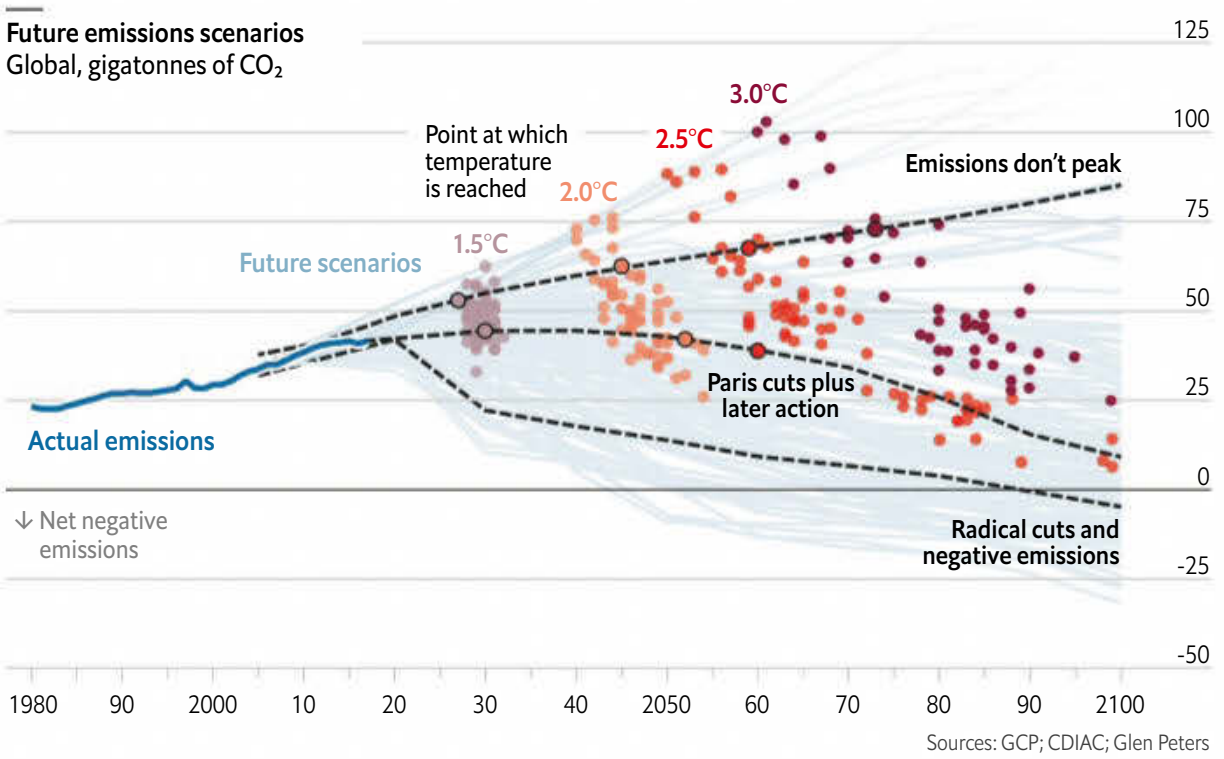



Source: US Global Change Research Programme




Source: Carbon Brief

**Scenarios for future $CO_2$ emissions, with three representative pathways picked out**




Sources: GCP; CDIAC; Glen Peters

At the Earth Summit in Rio de Janeiro in 1992, around the time that the human effect on the climate was becoming clearly discernible, the nations of the world signed the UN Framework Convention on Climate Change (UNFCCC). By doing so they promised to "prevent dangerous anthropogenic interference with the climate system".

Since then humans have emitted 765bn more tonnes of carbon dioxide; the 2010s have been, on average, some 0.5°C hotter than the 1980s. The Intergovernmental Panel on Climate Change (IPCC) estimates that mean surface temperature is now 1°C above what it was in the pre-industrial world, and rising by about 0.2°C a decade. In mid- to high-northern latitudes, and in some other places, there has already been a warming of 1.5°C or more; much of the Arctic has seen more than 3°C (see map).

The figure of 1.5°C matters because of the Paris agreement, signed by the parties to the UNFCCC in 2015. That agreement added targets to the original goal of preventing "dangerous interference" in the climate: the signatories promised to hold global warming "well below" 2°C above pre-industrial temperatures and to make "efforts to limit the temperature increase to 1.5°C".

Neither 1.5°C nor 2°C has any particular significance outside these commitments. Neither marks a threshold beyond which the world becomes uninhabitable, or a tipping point of no return. Conversely, they are not limits below which climate change has no harmful effects. There must be thresholds and tipping points in a warming world. But they are not well enough understood for them to be associated with specific rises in mean temperature.

For the most part the harm warming will do—making extreme weather events more frequent and/or more intense, changing patterns of rainfall and drought, disrupting ecosystems, driving up sea levels—simply gets greater the more warming there is. And its global toll could well be so great that individual calamities add little.

At present further warming is certain, whatever the world does about its emissions. This is in part because, just as a pan of water on a hob takes time to boil when the gas below is lit, so the world's mean temperature is taking time to respond to the heating imposed by the sky above. It is also because what matters is the total amount of greenhouse gas in the atmosphere, not the rate at which it increases. Lowering annual emissions merely slows the rate at which the sky's heating effect gets stronger; surface warming does not come to an end until the greenhouse-gas level is no longer increasing at all. If warming is to be held to 1.5°C that needs to happen by around 2050; if it is to be kept well below 2°C there are at best a couple more decades to play with.

### Revolution in reverse

Thus, in its simplest form, the 21st century's supertanker-U-turn challenge: reversing the 20-fold increase in emissions the 20th century set in train, and doing so at twice the speed. Replacing everything that burns gas or coal or oil to heat a home or drive a generator or turn a wheel. Rebuilding all the steelworks; refashioning the cement works; recycling or replacing the plastics; transforming farms on all continents. And doing it all while expanding the economy enough to meet the needs and desires of a population which may well be half again as large by 2100 as it is today.

"Integrated assessment models", which combine economic dynamics with assumptions about the climate, suggest that getting to zero emissions by 2050 means halving current emissions by 2030. No nation is on course to do that. The national pledges made at the time of the Paris agreement would, if met, see global emissions in 2030 roughly equivalent to today's. Even if emissions decline thereafter, that suggests a good chance of reaching 3°C.

Some countries already emit less than half as much carbon dioxide as the global average. But they are countries where many people desperately want more of the energy, transport and resources that fossil fuels have provided richer nations over the past century. Some of those richer nations have now pledged to rejoin the low emitters. Britain has legislated for massive cuts in emissions by 2050. But the fact that legislation calls for something does not mean it will happen. And even if it did, at a global level it would remain a small contribution.

This is one of the problems of trying to stop warming through emission policies. If you reduce emissions and no one else does, you face roughly the same climate risk as before. If everyone else reduces and you do not, you get almost as much benefit as you would if you had joined in. It is a collective-action problem that only gets worse as mitigation gets more ambitious.

What is more, the costs and benefits are radically uncertain and unevenly distributed. Most of the benefit from curtailing climate change will almost certainly be felt by people in developing countries; most of the cost of emission cuts will be felt elsewhere. And most of the benefits will be accrued not today, but in 50 or 100 years.

It is thus fitting that the most striking recent development in climate politics is the rise of activism among the young. For people born, like most of the world's current leaders, well before 1980, the second half of the 21st century seems largely hypothetical. For people born after 2000, like Greta Thunberg, a Swedish activist, and some 2.6bn others, it seems like half their lives. This gives moral weight to their demands that the Paris targets be met, with emissions halved by 2030. But the belief that this can be accomplished through a massive influx of "political will" severely underestimates the challenge.

It is true that, after a spectacular boom in renewable-energy installations, electricity from the wind and the sun now accounts for 7% of the world's total generation. The price of such installations has tumbled; they are now often cheaper than fossil-fuel generating capacity, though storage capacity and grid modifications may make that advantage less at the level of the whole electricity system.

One step towards halving emissions by 2030 would be to ramp such renewable-electricity generation up to half the total. This would mean a fivefold-to-tenfold increase in capacity. Expanding hydroelectricity and nuclear power would lessen the challenge of all those square kilometres of

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solar panels and millions of windmills. But increased demand would heighten it. Last year world electricity demand rose by 3.7%. Eleven years of such growth would see demand in 2030 half as large again as demand in 2018. All that new capacity would have to be fossil-fuel-free.

And electricity is the easy part. Emissions from generating plants are less than 40% of all industrial emissions. Progress on reducing emissions from industrial processes and transport is far less advanced. Only 0.5% of the world's vehicles are electric, according to BloombergNEF, a research firm. If that were to increase to 50% without increasing emissions the production of fossil-fuel-free electricity would have to shoot up yet further.

The investment needed to bring all this about would be unprecedented. So would the harm to sections of the fossil economy. According to Carbon Tracker, a think-tank, more than half the money the big oil companies plan to spend on new fields would be worthless in a world that halved emissions by 2030. The implications extend to geopolitics. A world in which the oil price is no longer of interest is one very different from that of the past century.

### Putting off to tomorrow

Dislocation on such a scale might be undertaken if a large asteroid on a fixed trajectory were set to devastate North America on January 1st 2031. It is far harder to imagine when the victims are less readily identifiable and the harms less cosmically certain—even if they eventually turn out to be comparable in scale. Realising this, the climate negotiators of the world have, over the past decade, increasingly come to depend on the idea of "negative emissions". Instead of not putting carbon dioxide into the atmosphere at all, put it in and take it out later. By evoking ever larger negative emissions later in the century it is possible to accept a later peak and a slower reduction while still being able to say that you will end up within the 1.5°C or 2°C limit (see "four futures" chart).

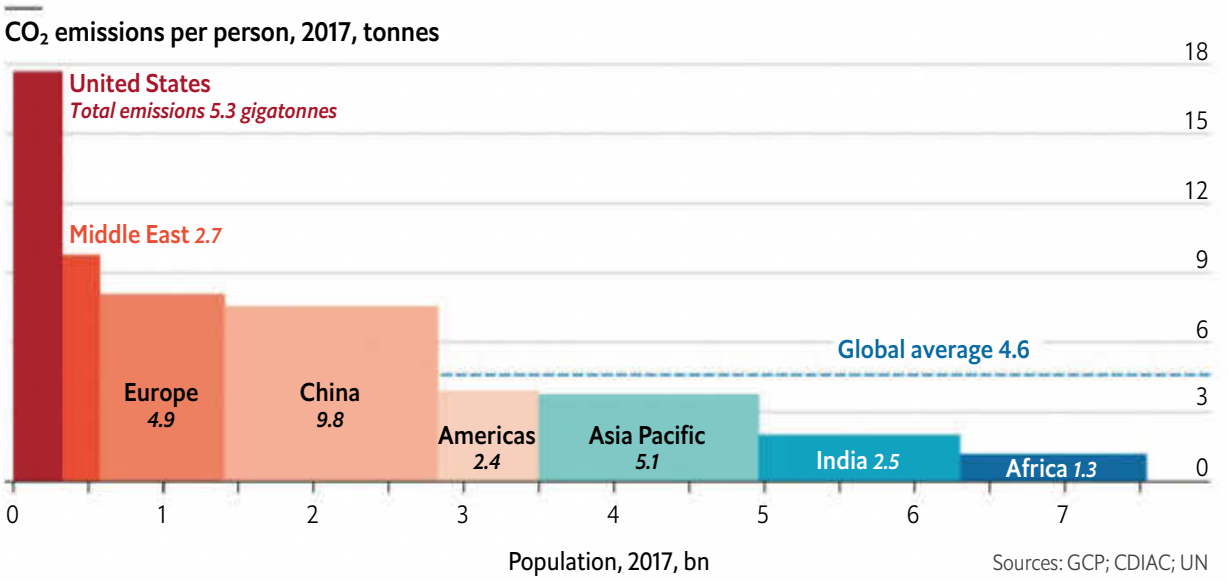
Unfortunately, technologies capable of delivering negative emissions of billions of tonnes a year for reasonable prices over decades do not exist. There are, though, ideas about how they could be brought into being. One favoured by modellers involves first growing plants, which suck up atmospheric carbon dioxide through photosynthesis, and then burning them in power stations which store the carbon dioxide they produce underground. A surmountable problem is that no such systems yet exist at scale. A much tougher one is that the amount of land required for growing all those energy crops would be enormous.

This opens up a dilemma. Given that reducing emissions seems certain not to deliver quickly enough, it would seem stupid not to put serious effort into developing better ways of achieving negative emissions. But the better such R&D makes the outlook for negative emissions appear, the more the impetus for prompt emissions reduction diminishes. Something similar applies for a more radical potential response, solar geoengineering, which like the ping-pong balls of 1965 would reflect sunlight back to space before it could warm the Earth. Researchers thinking about this all stress that it should be used to reduce the harm of carbon dioxide already emitted, not used as an excuse to emit more. But the temptation would be there.

Even if the world were doing enough to limit warming to 2°C, there would still be a need for adaptation. Many communities are not even well adapted to today's climate. Adaptation is in some ways a much easier policy to pursue than emissions reduction. But it has disadvantages. It gets harder as things get worse. It has a strong tendency to be reactive. And it is most easily achieved by those with resources; people who are marginalised and excluded, who the IPCC finds tend to be most affected by climate change, have the least capacity to adapt to it. It can also fall prey to the "moral hazard" problem encountered by negative emissions and solar geoengineering.

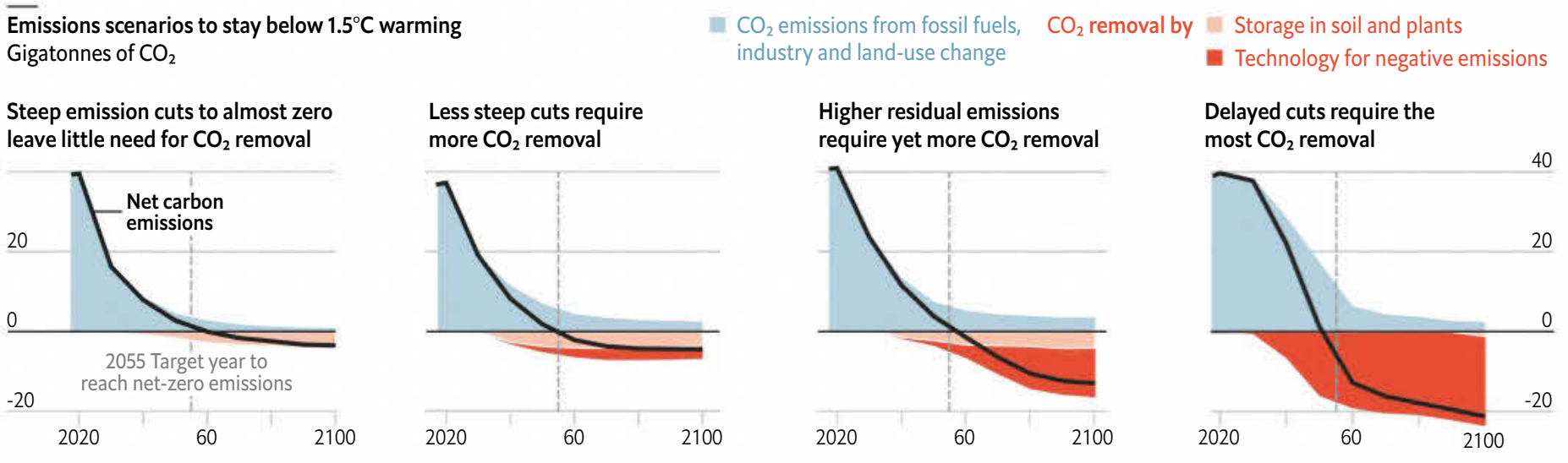
None of this means adaptation is not worthwhile. It is vital, and the developed nations—developed thanks to fossil fuels—have a duty to help their poorer counterparts achieve it, a duty acknowledged in Paris, if as yet barely acted on. But it will not stabilise the climate that humans have, in their global growth spurt, destabilised. And it will not stop all the suffering that instability will bring. ■

**The world's $CO_2$ emissions are very unevenly spread**

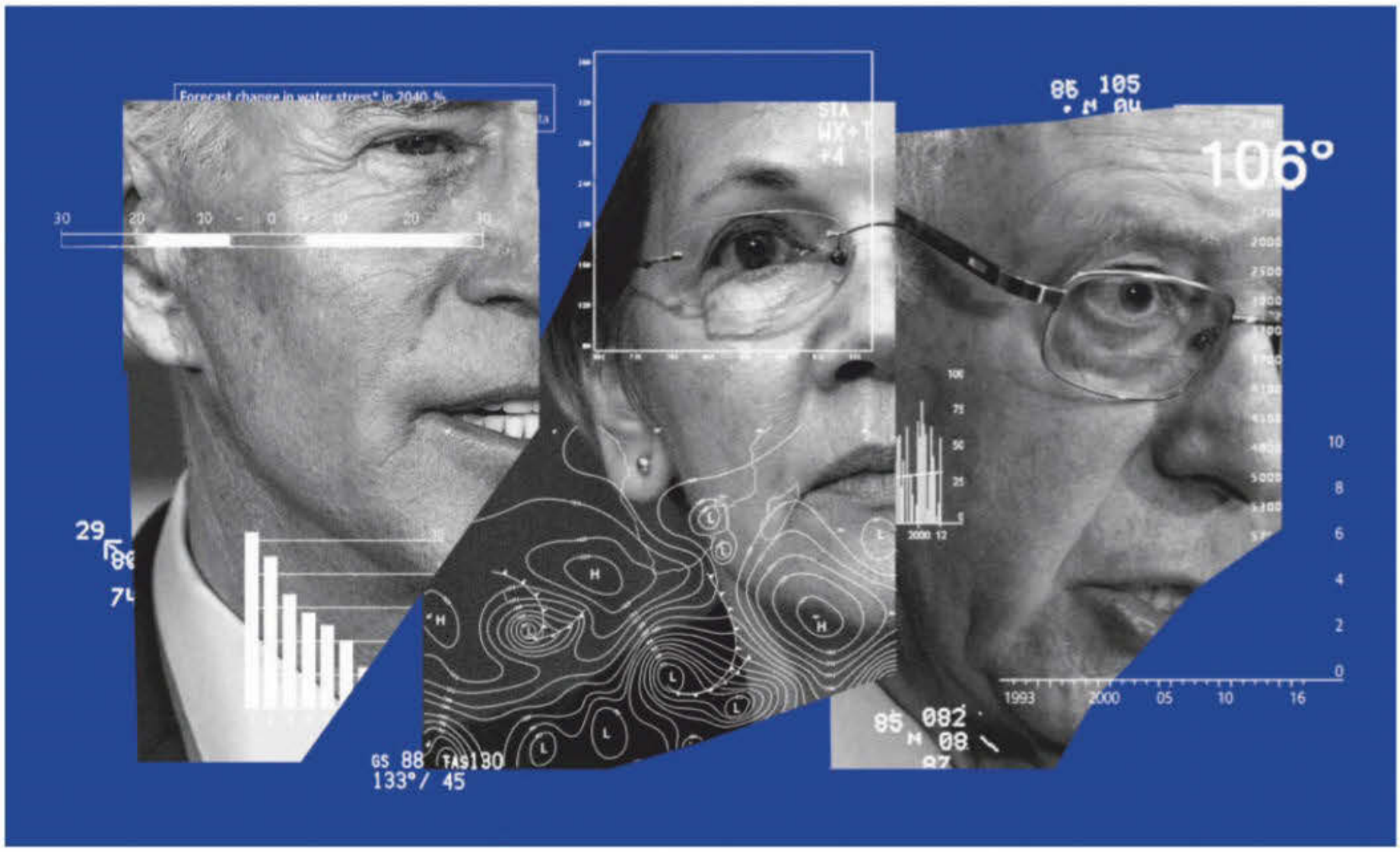



Sources: GCP; CDIAC; UN

**Four futures: the sooner and deeper you cut, the less $CO_2$ removal you need**




Source: IPCC




Green New Deals

# The obstacle course

NEW YORK

**Democrats are presenting big plans to deal with climate change. What are the chances that they would make a difference?**

EARLIER THIS month dozens of teenagers gathered in a New York City park to paint. They were preparing for the Climate Strike they would attend on September 20th, one of more than 150 rallies to be held around the world. The students made cardboard waves, to signify rising sea levels, and emblazoned banners with demands for action. "I want you to act as if our house is on fire because it is," one sign read.

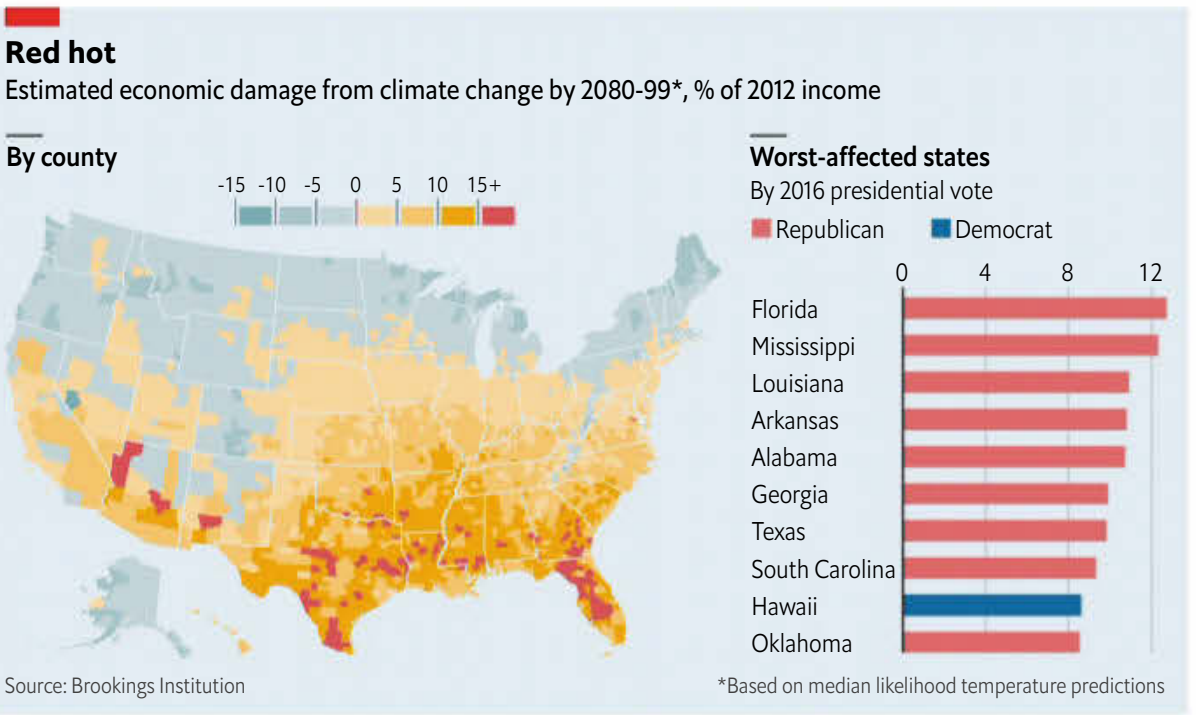
America has stood out, to date, for being the largest contributor to climate change and for its leaders' reluctance to do much about it. In 2017 President Donald Trump announced that America would withdraw from the Paris climate agreement, in which countries pledged to limit the average rise in temperatures to "well below" 2°C. In the past four weeks alone his administration has loosened regulation of methane, said it would revoke California's right to set emissions standards for cars and rolled back rules on efficient light bulbs. "I look better under an incandescent light," Mr Trump quipped, without supporting evidence.

But where the young lead, a growing number are following. Those Americans who think global warming is real outnumber those who do not by more than five to one. For the first time climate change has become a prominent issue in a Democratic presidential campaign. On September 4th CNN spent seven hours asking Democratic contenders what they would do about it. Candidates are tripping over themselves to convey their plans' ambition, from Joe Biden's $1.7trn proposal for a "clean-energy revolution" to Bernie Sanders's $16.3trn "nationwide mobilisation".



The Democrats' last serious legislative climate proposal came a decade ago. Edward Markey and Henry Waxman, two congressmen, introduced a cap-and-trade bill. Originally a conservative idea, cap-and-trade puts a price on carbon and creates a market in the right to emit. The bill passed the House and foundered in the Senate. Climate policies have had greater success on the state level—more than half of states have targets for clean energy. These policies, coupled with tax credits for wind and solar power, have helped spur a rush of investment in renewables. America's shale bonanza has created a glut of inexpensive gas that has been the main force putting coal plants out of business. Wind and solar farms have become cheap enough, in many instances, to outcompete even gas.

Democrats are now presenting broader, national plans for several reasons. Warmer oceans are linked to the stronger hurricanes, like Harvey, Sandy and Maria, that have battered America's coasts. Last year three wildfires in California killed 89 people and caused more than $11bn in damage. Mr Trump's own Director of National Intelligence warned that climate change and "ecological degradation", by fuelling competition for resources and social discontent, pose a security threat. And yet the administration has ignored or tried to rubbish such warnings—which is another reason for the spike of interest in climate on the left. The Pew Research Centre re- ▸▸




ports that 57% of Americans view climate change as a "major threat", up from 40% in 2013. Among Democrats, the share is 84%.

The contenders for the Democratic presidential nomination are also responding to the Green New Deal, a proposal unveiled in February by Alexandria Ocasio-Cortez, a new congresswoman, and Mr Markey, now a senator. The resolution calls for an economy with net-zero emissions (that is, sucking as much carbon dioxide out of the atmosphere as it puts in) and a broader social transformation, with universal health care and guaranteed jobs.

The plans proposed by the top candidates for the Democratic nomination are more detailed than this. Mr Sanders's plan is the most costly, but Elizabeth Warren, Mr Biden's closest competitor, would spend $3trn. The leading contenders aspire to net zero emissions by 2050, if not before. They would phase out subsidies for fossil fuels and increase spending on research into technologies such as energy storage (today's batteries cannot balance the variable power from the sun and wind over long periods). Most candidates propose ways to support cleaner power abroad. These include sticks—taxes on goods from countries without robust climate policies, for example—as well as carrots, such as aid for zero-emissions electricity in poor countries, to counter China's support for coal.

Three candidates—Kamala Harris, Pete Buttigieg and Julian Castro—support a carbon tax or fee, which economists like for its ability to spur lower emissions across the economy, without trying to anticipate the success of any given technology. Four former Federal Reserve chairmen and 27 Nobel-prize-winning economists advocate a carbon tax whose proceeds are distributed to Americans in equal lump sums. This also has the backing of ExxonMobil, Total and other oil giants. Mr Biden and Mr Sanders seem to favour a carbon tax, too, though their plans are less explicit. Ms Warren would consider a tax but has proposed a clean energy standard requiring electricity generators, buildings and cars to bring emissions to zero. This would not span the economy as a carbon price would, but it caps emissions for certain sectors and has the political benefit of obscuring costs.

Democrats' broader goals sometimes clash with their environmental ones. Top candidates espouse plans to support American manufacturing of clean technology, even though the deployment of renewable energy has benefited so much from cheap batteries and solar panels made in Asia. Ms Warren would require products with technology from federally funded research to be made in America with union labour, probably increasing its cost. The main feature of her "Green Marshall Plan" is $100bn of federal spending to help other countries buy such American tech. This emphasis on jobs would risk making zero-carbon power more expensive, slowing its take-up. Mr Sanders and Ms Warren would also ban nuclear power, which produces no greenhouse gases. Michael Bloomberg, a former mayor of New York who has spent a fortune campaigning for the closure of American coal plants, finds most Democrats' proposals maddening. "What on earth have any of these people done to have a cogent plan that is doable?" he asks.

Climate policy should be made palatable, especially to those most affected by a fast shift to clean power. In Los Angeles this year, dismayed workers at gas plants almost scuttled the mayor's plan to expand solar power. But the biggest risk to a better policy comes from lack of support partly from Democrats in coal- and gas-producing states, like West Virginia's Joe Manchin, and mainly from Republicans. Pew's polling shows that just 27% of Republicans consider climate change a major threat.

There are some signs of a generational conflict within the Republican Party that could eventually lead to change. Among millennial conservatives, 59% say that climate change is having at least some effect on America. More than 80% support expanding the use of wind and solar power. Alex Flint, a longtime Senate staffer, conducts polls and focus groups to help advise Republicans on climate change. In one swing district, he found that half of all conservatives were more likely to support a Republican incumbent working to limit climate change. The trend was particularly pronounced among conservative women.

The rhetoric of some Republicans has started to change, too. "I didn't come to Congress to argue with a thermometer," Congressman Matt Gaetz declared earlier this year. Lindsey Graham, a senator from South Carolina, insists Republicans "owe it to the country to have an alternative to the Green New Deal". But partisanship is working against this shift—the Green New Deal has prompted some Republicans to portray climate policies as socialist schemes to ban hamburgers. For now, those Republicans who worry about the climate venture no further than advocating for more R&D spending, as Lamar Alexander, Mr Graham and Lisa Murkowski do in the Senate.

Democrats view these proposals warily. Republican support for long-term research can give the impression of action, but can sap efforts to deploy the technologies available now. Only two of the 252 Republicans in Congress favour a carbon tax. One of them, Francis Rooney, has held town-hall meetings and lunches in his district to explain himself to conservative constituents, but he says it is tough going. Climate scepticism, he says, "is identified as conservative Republican doctrine". That is despite Republican-leaning bits of the country being at greatest risk (see chart). Eventually more Republicans may support action as the effects of climate change become clear. By then, however, the damage would be even harder to reverse. ■

Rent control

# Progressives for regression

WASHINGTON, DC

**High housing costs are making Democrats want rent control again**

AMERICAN CITIES took up rent control in a moment of crisis during the second world war, when workers migrated en masse to factories just as the building of new housing was sharply restricted to conserve materials. In response the federal government froze prices on 80% of the country's rental stock. Today America's thriving cities face a homemade crisis. The typical one-bedroom flat in New York now rents for $2,450; the equivalent in San Francisco rents for $3,620. Although the building of new housing is no longer constrained by a massive war effort—only by rules and regulations of questionable design—Democrats in charge of high-cost cities are trying to revive these old ideas.

Oregon passed a statewide rent-control measure in February. New York passed a complicated bill over the objections of its powerful property lobby in June. Gavin Newsom, the governor of California, is expected to sign one into law soon even though voters rejected a rent-control expansion effort last November. Bernie Sanders, a socialist senator running for president, included nationwide rent-control as part of his housing-policy plan (at a cost of $2.5trn over ten years). Mr Sanders's proposal suggests a nationwide cap of either 3% or 150% of inflation, whichever is higher. Elizabeth Warren has said that states should not pre-empt local efforts at rent control, but has not gone so far as to propose a national standard.

Rent control is reviled by almost all economists because of the distortions it creates in housing markets. While some people benefit, the resulting shortages harm non-subsidised residents and incentivise flat-hoarding by tenants and neglect by landlords. The most recent crop of efforts, which are better designed, may not be so bad. But they are, in the end, a means of temporary political appeasement because the true, underlying problem—supply—is harder for Democrats to tackle.

Rather than enabling bureaucrats to fix the price of all one-bedroom flats in the city, new efforts at rent control instead aim to limit the annual rate of increase on specified units. The higher this cap is set, the less distorting (and therefore more pointless) the policy becomes. Oregon has set its annual cap at 7% plus inflation. California would place it at 5% plus local inflation. Neither of these is likely to apply outside the hottest rental markets. The typical flat in Portland, Oregon, would not have been affected last year, according to data from Zillow, a property website, though those in Los Angeles would have been.

Even with more careful design, problems still arise. When three Stanford economists, Rebecca Diamond, Franklin Qian and Timothy McQuade, studied San Francisco's rent-control scheme they found that though the lucky renters stayed put, affected landlords cut supply by 15%, driving up rents by 5% citywide. More than half of rental stock in New York City is either rent-controlled or rent-stabilised, though prices have surged all the same. When *The Economist* examined the most recent New York Housing and Vacancy Survey, conducted in 2017, we found 25,000 households in Manhattan with annual incomes greater than $200,000 living in rent-controlled and rent-stabilised flats. Landlords with such affluent tenants could petition to get rid of rent restrictions, but this mechanism has now been removed by the state legislature. At least the little people are being looked after. ■

Presidential appointments

# Bob's your adviser

WASHINGTON, DC

**Donald Trump replaces John Bolton with a hostage negotiator**

TWO MONTHS before the 2016 election Robert O'Brien, a lawyer from Los Angeles, opined on Russian interference to a radio talk-show host. "It's clear that Vladimir Putin just doesn't like [Hillary Clinton], and is going to do what he can to help Donald Trump." After the election Mr O'Brien—who had advised Ted Cruz, Scott Walker and Mitt Romney in their presidential runs—changed his tune, praising Mr Trump before he even took office for getting NATO allies to boost their defence spending.

Last year Mr Trump named Mr O'Brien an envoy for hostage affairs. Mr O'Brien, according to Mr Trump, called the president "the greatest hostage negotiator...in the history of the United States." Flattery works. On September 18th Mr O'Brien became Mr Trump's fourth national security adviser, succeeding John Bolton, who was fired a week earlier.

Unlike Mr Bolton, Mr O'Brien is relatively unknown in foreign-policy circles. Jim Talent, a former Republican senator who worked with him on Mr Romney's campaign, says Mr O'Brien "absorbs enormous amounts of information quickly" and will be an "honest broker at ensuring options for the president"—the "opposite model" to Mr Bolton.



Robert O'Brien, next man up

Mr O'Brien worked under Mr Bolton at the UN, then spent four years at the State Department, spanning the administrations of George W. Bush and Barack Obama, working on the justice system in Afghanistan. Mr Trump considered him for secretary of the navy, a job he would probably have held had Mr Romney won.

In "While America Slept: Restoring American Leadership to a World in Crisis", published in 2016, Mr O'Brien comes off as a garden-variety hawk. He criticises the Obama administration's pusillanimity, condemns the 2015 Iranian nuclear agreement as "the worst diplomatic deal since Munich" and warns that Mr Obama "is decimating America's unparalleled armed forces". He urges America to support Egypt's despot, General Abdel Fattah al-Sisi, and wants to wants to "serve notice upon North Korea that it is within reach of American naval air power". It is time, he says, to return to a policy of "peace through strength".

Such views resemble Mr Bolton's, though Mr O'Brien, unlike his predecessor, has a reputation for congeniality. That may help restore comity and morale at the National Security Council. But legal work and diplomatic dabbling may not have given him sufficient expertise to guide a mercurial president's foreign policy. A former senior official who worked with Mr O'Brien describes him as a "very smart, very nice and very capable lawyer from Los Angeles with a long-standing interest in national security matters." But "there's nothing in his biography that suggests he has the experience or bandwidth to take on this job."

Rudy Giuliani's adventures

# Ukrainian vaudeville

KIEV

**The president's personal lawyer appears to have crossed a line**

OF ALL THE meetings that will take place between heads of state at the United Nations in New York next week, the one between Presidents Donald Trump and Volodymyr Zelensky (pictured), a comedian turned president of Ukraine, may be the strangest. Last month, as Ukraine's government was trying to negotiate the release of its prisoners from Russia, it received news from Washington. The White House had frozen $250m of military assistance to Ukraine that had already been approved by Congress until further review. The administration set no criteria or time frame for the review. But a month earlier, in a telephone conversation with Mr Zelensky, then newly elected, Mr Trump said he was "convinced the new Ukrainian government would be able to quickly improve the image of Ukraine and complete the investigations of corruption cases, which inhibited the interaction between Ukraine and the USA."

There were two cases Mr Trump seemed particularly interested in. The first involved the affairs of Hunter Biden, son of the candidate for the Democratic presidential nomination, who sat on the board of a private Ukrainian gas firm while his father was America's vice-president. The second involved the downfall of Paul Manafort, Mr Trump's former campaign chairman, who took a $12.7m off-the-books payment for his work for an ex-president of Ukraine, Viktor Yanukovich, and is now in prison. It was up to the new president to satisfy Mr Trump that he was on the right side.

If Mr Zelensky was still in any doubt about what was expected of him, Rudy Giuliani, Mr Trump's personal lawyer, was there to help. A few days after the telephone conversation between the two presidents, Mr Giuliani flew to Madrid to meet Mr Zelensky's adviser, Andriy Yermak. He urged Mr Yermak to investigate the matters that were of interest to Mr Trump and held out the prospect of a state visit to America and a meeting with the president.

That meeting in Madrid was arranged by Kurt Volker, America's special envoy, whose efforts to help Ukraine restore its territorial integrity and sovereignty over the Donbas region were undermined by the suspension of military aid. Although the State Department insisted Mr Giuliani was merely acting in his private capacity rather than on behalf of the state, in the eyes of any reasonable person—particularly the one from Ukraine where oligarchs wield much informal power—Mr Giuliani was more important than a state official; he was Mr Trump's consigliere.

Fittingly, Mr Giuliani's main source of disinformation on Ukraine was Yuriy Lutsenko, a controversial former prosecutor-general. Mr Lutsenko first tried to sabotage anti-corruption efforts by Ukrainian activists and American-backed investigators, then accused his critics of conspiring against Mr Trump. Trying to ingratiate himself with the White House, and settle his own scores, Mr Lutsenko declared that the stuff about Mr Manafort was all part of an anti-Trump conspiracy.

Mr Lutsenko also dragged Marie Yovanovitch, an experienced American career diplomat and ambassador to Ukraine, through the mud, alleging she was acting in the interests of the Democrats. Ms Yovanovitch, who supported the anti-corruption fight in Ukraine (a fight which also targeted Mr Lutsenko) was recalled before the end of her term, despite the State Department's statement that the claims against her were an "outright fabrication".

Mr Giuliani liked Mr Lutsenko's improbable version of events, though. In May he told Fox News that he had cancelled his planned trip to Kiev, because he thought he was about to walk "into a group of people that are enemies of the president, and in some cases enemies of the United States." One of the enemies named was Serhiy Leshchenko, a journalist, anti-corruption campaigner and member of parliament who investigated Mr Manafort.

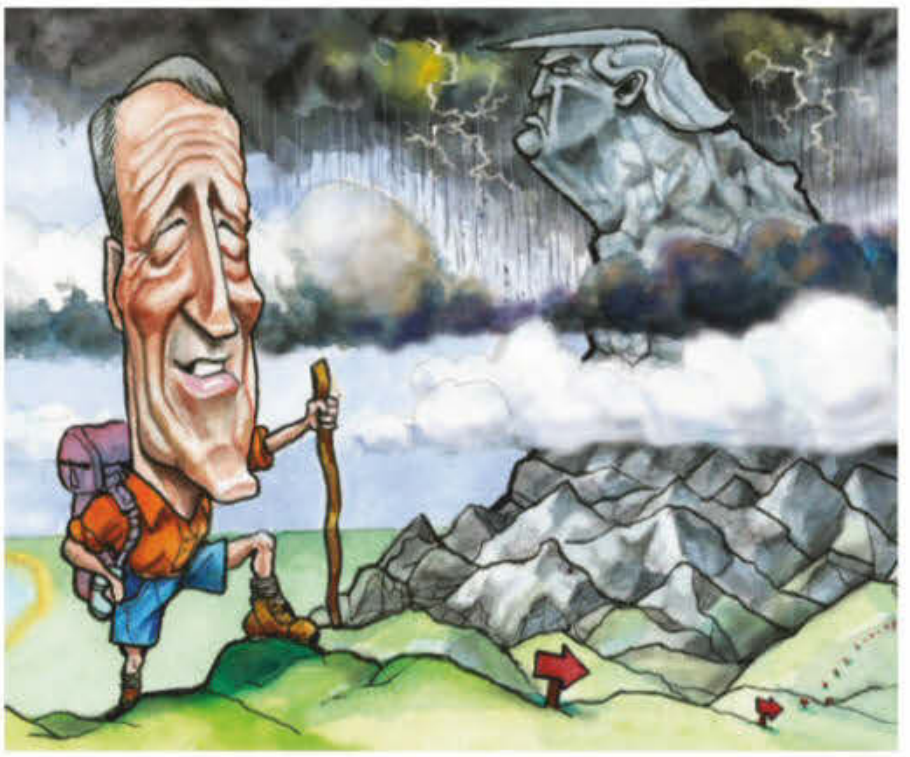
Mr Leshchenko had been working for Mr Zelensky's team, advising the neophyte president on foreign affairs. But Mr Giuliani's statement made the new president uneasy. A few days later Mr Leshchenko was told that he could not be offered a formal position in Mr Zelensky's new administration, since this would jeopardise Ukraine's relations with a strategic partner.

As a result of all this, Mr Giuliani and his boss have become the subject of an investigation by the House committees on Foreign Affairs, Intelligence and Oversight. He denies wrongdoing ("I wouldn't do an unethical thing in my life," he told CNN). On September 9th the Democratic chairmen of the three committees sent a formal request to the White House and the State Department, instructing them to turn over the documents related to what look like attempts to coerce the Ukrainian government into conducting politically motivated investigations. If Mr Trump really had pressured Ukraine to serve the ends of his re-election campaign, "this would represent a staggering abuse of power, a boon to Moscow, and a betrayal of the public trust", the letter says.

Less than a week after the launch of the investigation, the White House unfroze the funds for military assistance without explaining the hold-up. "There were a lot of senior Republicans who were asking WTF," one former official says. But the damage has been done. Mr Giuliani's adventures in Ukrainian politics undermined the American government's efforts to bolster its ally militarily and subverted its anti-corruption message. Vladimir Putin has long maintained that he is no worse than his American "partners"—they just hide things better. Mr Giuliani and Mr Trump are in danger of proving him right. ■

# **Lexington** | Mark Sanford is back on the trail

*South Carolina's former "Luv Guv" looks like Donald Trump's most serious challenger*



NOWHERE IN AMERICA is more synonymous with rebellion than Charleston harbour, where Mark Sanford launched his tilt at President Donald Trump this week. Glinting in the sun behind the veteran Republican—a two-term governor of South Carolina and five-term congressman—was Fort Sumter, target of the Confederacy's first shots. Farther off, a blur on the horizon, was Fort Johnson, where South Carolina's state flag was first raised in defiance during the revolutionary war. But Mr Sanford, who lives round the corner, was keen "not to imply any symbolism", which was understandable. His primary campaign, which he mounted with the aid of a life-size cut-out of Mr Trump he found on Amazon, a fake cardboard cheque for a trillion dollars (payable to: "Burden of Future Generations") and a couple of volunteers to hold them, may be the most doomed action the venerable port has ever witnessed.

The three state-wide rallies Mr Sanford held that day were attended by a few journalists and fewer bystanders. South Carolinians have little reason to notice his campaign. The state's Republicans, along with those in Arizona, Kansas and Nevada, have already said they will not hold a presidential primary. The Republican National Committee, which has dissolved its primary debate committee, is pressing others to follow suit. "In some countries—with all respect to your mother country—they have coronations," said Mr Sanford in his stump speech, nodding sensitively to Lexington, who had joined him earlier on a two-hour drive from Columbia. "But in the American system we have debate and elections. We need a debate on what it means to be a Republican."

Mr Trump's tightening grip on his party has probably spared him the heavyweight challenger his conservative critics have been longing for. John Kasich has no interest in a losing fight; Nikki Haley is keeping her powder dry; Mitt Romney's rebelliousness is confined to an occasional admonishing tweet. As things stand, this has left the field to three lesser challengers: Bill Weld, the moderate former governor of Massachusetts, Joe Walsh, a populist former congressman from Illinois, and Mr Sanford, whose record warrants most respect. A solid small-government conservative, for whom a big future was once predicted, he is now best-known for the calamitous denouement to his governorship and marriage a decade ago. He was found to have snuck off to visit his mistress in Argentina after informing aides that he was "hiking the Appalachian trail". Yet an improbable return to politics four years later, when he won his old congressional seat in Charleston, helped mend his reputation. And so, in some quarters, did his subsequent refusal to join his Republican colleagues in bending the knee to a president most had previously denounced and still abhorred. After criticising Mr Trump's divisiveness, protectionism and profligacy, Mr Sanford was unseated by a Trump-endorsed primary opponent last year. It was his first electoral defeat.

He says his refusal to genuflect was indirectly a result of his humiliation. "I owed it to the people who gave me a second chance to shoot straight down the middle." His disgrace might even be a political advantage, he thinks: "There's almost an added element of relatability that comes with public failure." His wrongdoing certainly made him more famous. Compared with some of the things Mr Trump stands accused of, it also looks less serious now. Of the three conservative groups he and his fellow challengers represent—moderates, working-class populists and small-government conservatives—Mr Sanford's is probably the smallest. Yet it may be the most mutinous (most moderates having already gone Democratic). While he almost certainly cannot beat Mr Trump, it is therefore not all that hard to imagine him embarrassing the president sufficiently to hurt his re-election prospects. Of the past four incumbent presidents to face a primary challenge, only one—Nixon in 1972—won re-election.

The debate Mr Sanford called is worth having, too. While he glumly acknowledges how most Republicans have cheered as Mr Trump abandoned free trade and fiscal restraint, the former governor clings to a hope that this shift will be temporary: "For 25 years I've been out there talking to people, and the central premise of this campaign is that all those conversations about the debt and spending issue were real." Mr Trump's remaking of his party has been exaggerated, he suggests, by the president's eccentric personality and lucky timing. Republican voters picked him as a disrupter and are now rewarding him for the historic growth cycle he is presiding over, but: "I would argue the value proposition with Trump evaporates the minute the economy goes down."

In truth, there was never much evidence that Republicans cared about the deficit (except in opposition, which doesn't count). Yet Mr Sanford is probably right that Mr Trump has not changed their thinking for good on other issues. History suggests relatively few voters care about trade, the president's obsession, for example. And as Mr Trump's hold on power is less firm than his hold on his party, this points to a great uncertainty about what Republicans will stand for post-Trump. In some ways the party may snap back. In others—probably including the president's antipathy to immigration, which Mr Sanford also deplores—it will not. And no doubt that rejig will again be shaped by electoral happenstance and the character of the leaders that emerge.

### Cometh the hour, cometh Sanford

Which makes it worth underlining how unlikely Mr Sanford's new role as saviour of the republic would until recently have seemed. The recklessness he displayed in his Argentine flit was not a one-off. He was accused of squandering state resources: for example, by commandeering a government plane to go for a haircut. His divorce papers noted his habit of dive-bombing his children in a family plane. Though agreeable to Lexington, he also has a mixed reputation as a boss. That such a man could now seem so heroic does not say much for the state of the Republican Party. ■

PERSONAL CAPITAL®

BEHIND THE HEADLINES:

# UNDERSTANDING YOUR PORTFOLIO RISK

**Craig Birk, CIO for wealth management firm Personal Capital, discusses portfolio decisions vis-a-vis today's news.**

**What has been driving volatility in the market?**
Three things were responsible for market turbulence in the fourth quarter of last year: trade fears; potential growth slowdown; and rising interest rates. Since then, earnings have exceeded expectations and the interest rate outlook has flip-flopped. Trade remains an ongoing risk. China is slowing down and tariffs will exacerbate the effect of this.

**How should investors respond to unsettling headlines? Should they be scaling down the risk in their portfolios?**
There are scary headlines every year; most years, markets charge right through them. Regarding trade, you can't predict what two unpredictable leaders will do. So far, proposed tariffs remain smaller in magnitude than the 2017 tax cuts. Most investors are best served sticking to a static asset allocation crafted for their needs.

People should have a strategy that works when they're not looking at the headlines. Making decisions based on the latest front page can be costly.

**How can investors know how much risk they are really taking?**
The first step is to understand what your asset allocation actually is. Most investors don't. It is common to have multiple accounts across numerous institutions; this makes it difficult to track and measure risk.

Many portfolios are collections that have been accumulated over time with little strategic thought. However, there are now online tools available that show you an overview of your portfolio positioning, both from an investment and retirement planning perspective.

**What are the common mistakes you see investors making, and what can they do to correct these?**
There are two common mistakes at opposite ends of the spectrum. First, a lot of people have become overly comfortable with the long bull run, running large over-weights in the technology sector. However, in the dotcom crash, tech stocks lost 80%. In the financial crisis, financials lost 80%. Those were the two most popular sectors, as technology is today. It's typical to underestimate the risk that comes from concentrations in specific companies or sectors.

The opposite problem is holding a large amount in cash, either through fear or through not knowing how to invest it.

**What should investors be looking at to increase their diversification?**
Continue to think globally. There's a reluctance to invest internationally because the US has done so well in this bull market, driven by technology. However, non-US stocks look attractive, developed-market stocks are cheap, and emerging-market stocks are cheaper still.

Bonds are also appropriate for almost everyone, particularly government bonds, as they are one of the few things that go up when stocks go down. Treasuries should make up the core of the fixed income portion of the portfolio, supplemented by others, such as corporates and emerging market bonds. Furthermore, although inflation has been muted for years, this won't always be the case, so some exposure to inflation-linked bonds is a good idea.

***Craig Birk***
Chief Investment Officer
Personal Capital

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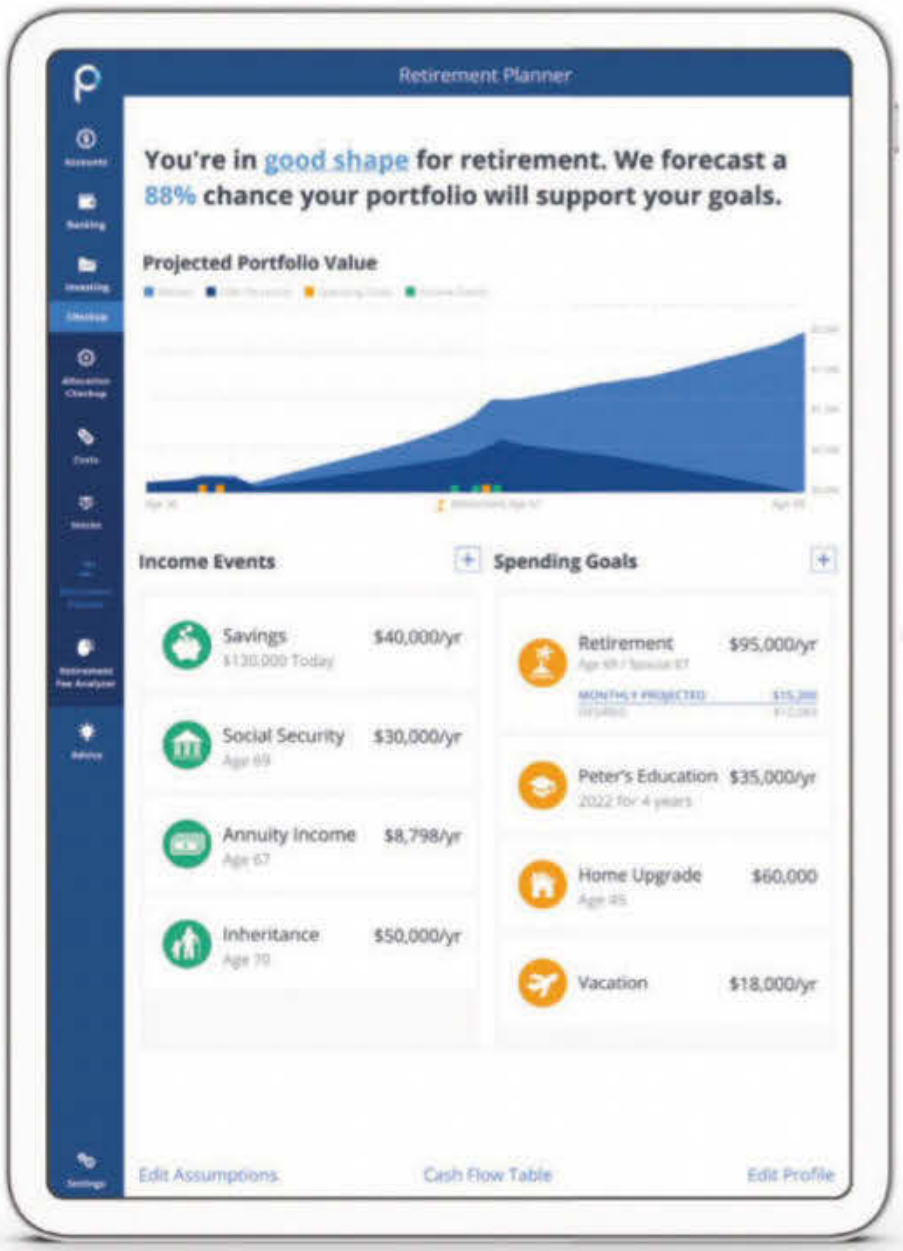


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The Panama Canal

# Beyond seasonable drought

PANAMA CITY

**Changing rainfall patterns threaten an artery of global trade**

TAKE IN THE view from atop Gatun dam and fathom what is missing. Container ships float idly on Lake Gatun, near the midpoint of the Panama Canal, awaiting passage to the Caribbean sea, their gateway to the Atlantic Ocean. What look like islands are hilltops poking up from a valley that American engineers flooded a century ago, creating what was then the world's largest artificial lake. All seems well. But a security guard from the Panama Canal Authority (ACP) points down to a problem: the water lapping against the dam is 1.8 metres (six feet) lower than it should be.

That water is Panama's lifeblood. Lake Gatun stores rain during the wet season, which usually runs from mid-April through to mid-December, for use in the dry one. It supplies drinking water to Panama city, the capital, as does man-made Lake Alajuela nearby. It is also two-fifths of the canal, a shortcut between oceans for 3% of the world's maritime trade, as well as for cruise ships and an occasional nuclear submarine. The ACP provides an eighth of the national government's revenue. "Water is money here," says Oscar McKay, an engineer at the dam site.

A normal rainy season fills Lake Gatun to 26.5 metres above sea level. By the end of the dry season that usually falls to 25.9 metres. Prolonged dry seasons have big consequences. If the water level falls below 24.4 metres, the ACP must limit the weight of big "NEOPANAMAX" container ships lest their hulls scrape on the lake bed. Below 24 metres smaller "PANAMAX" ships would risk bumping on the bottom of the locks reserved for them as they enter and leave the lake. This June, after Panama's most intense drought since independence in 1903, Lake Gatun fell nearly to that level. In 2016, during a longer (but less severe) dry spell, it fell below that for the first time.

Panama city's rising population and the canal's growing traffic make such low water levels more likely. Each time a ship passes through the canal's locks, Lake Gatun releases 200m litres (52m American gallons) of water. In a dry month, outflows through the canal can reduce the lake's level by 80cm.

This year many ships had to transit the canal with less than their maximum load of cargo. That cost the ACP a few million dollars in revenue. The canal came "this close" to losing much more, says an executive, holding his thumb and forefinger together. It narrowly avoided having to impose draught restrictions on PANAMAX ships.

Rain since July has raised the water level to 24.7 metres but has not lowered apprehensions. Several severe droughts since 2014 may indicate that dry seasons are becoming longer. That would threaten not only Panama's water supply and government revenues but the canal's role as a hub of trade. "The whole global supply chain depends on consistency," says Onésimo Sánchez, a former manager at the ACP. If the canal falters, shipping firms will turn to competing routes, even if they cost more.

### Precipitation, meet precipice

There is little doubt that climate change threatens Panama. Rising seas will submerge the low-lying Caribbean islands of San Blas, a tourist attraction and home to several thousand Guna, an indigenous group. Warmer temperatures will speed ▸▸

evaporation, and thus reduce water levels in Lake Gatun. But pinning blame for recent droughts on climate change is harder.

Panama's worst droughts have happened during extreme occurrences of El Niño, a natural phenomenon in which warm water moves eastwards across the equatorial Pacific Ocean. Longer cycles like the Pacific Decadal Oscillation, which alternates every 20-30 years between warm phases that make El Niños stronger and more frequent and cooler ones, make the role of climate change harder to discern.

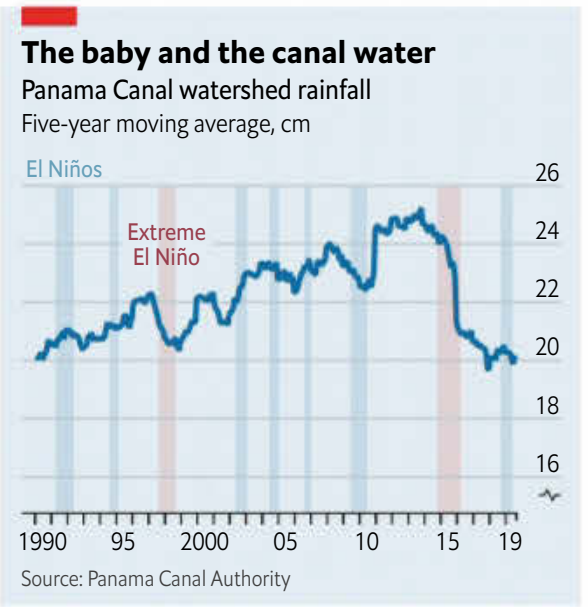
Residents of the capital do not doubt that changes are afoot. The rainy season once brought daily showers of three to four hours. Now the same amount of rain falls in an hour. Eight of the ten biggest storms in the city, measured by rainfall within 24 hours, have occurred since 2000. Despite those downpours, the canal area has had six straight years of below-average rainfall (see chart). The dry season is lengthening. This year it began a month earlier than usual and ended a month late. The current drought is the first severe one to occur in a mild El Niño year.

This unprecedented concurrence suggests that climate change is directly responsible, the ACP believes. "To be completely sure you'd have to wait a hundred years," notes Carlos Vargas, the ACP's vice-president for water and environment. And even if climate change is not the culprit now, it may strengthen future El Niños, which would lengthen droughts and increase their intensity. Some scientists think that if, as expected, the equatorial eastern Pacific warms faster than other regions, extreme El Niños will double in frequency to once a decade by 2100.

Water shortages imperil the canal's expansion plans. In 2016 a new set of locks allowed the passage of NEOPANAMAX ships. The canal needs another upgrade to accommodate new "ultra-large" vessels. But work cannot start while water levels are so uncertain, ACP officials say.

If droughts become frequent, shipping firms may favour more reliable routes between the Atlantic and Pacific oceans, such as rail lines across the United States. Someday, climate change could open up for navigation the ice-clogged Northwest Passage through the Arctic. That would cut by about 4,000km (2,500 miles) the length of a journey from Shanghai to New York, which is 19,500km via Panama.

To secure the canal's future, the ACP has to plan now. "We cannot go back to what we had in the past," says Mr Vargas. Already the ACP has stopped producing hydroelectricity from the Gatun dam. It is studying ways to raise water levels, including by digging a third artificial lake to supply Panama city and piping water from the Indio river to Lake Gatun. "They're going to have to do all of them," says Merei Heras, a former environment minister, sipping a drink in a café as rain pelts down. Deepening Lake Gatun is not an option because the mountains nearby would collapse.




Drought-proofing the canal will be disruptive, forcing people to move and hurting habitats down-river from water-diversion projects. Panama's only answer to the global havoc caused by climate change, it seems, is to do local damage. ■

Bolivia

# High and mighty

EL ALTO

**The "Aymara capital" does not see eye-to-eye with the Aymara president**

EL ALTO HOVERS over La Paz, Bolivia's administrative capital, like the blade of a guillotine. In 1781 Tupac Katari, an indigenous leader, laid siege to Spanish La Paz 500 metres (1,600 feet) below. In the early 2000s protests by *alteños* forced out of office two Bolivian presidents: Gonzalo Sánchez de Lozada, who sought to export Bolivia's gas through Chile, a rival, and Carlos Mesa, his successor, who resisted their demands to nationalise gas reserves. That paved the way for the election in 2005 of Evo Morales, Bolivia's first indigenous president, and a member of the Aymara people, who regard El Alto as their capital.

Mr Morales is counting on its support as he tries to persuade Bolivians to extend his 13 years in office in an election due in October. But *alteños* are independent-minded. Some resent his decision to run in defiance of a referendum vote in 2016. But their reservations run deeper. Mr Morales is a leftist, and El Alto is an entrepreneurial place that likes low taxes and lax regulation. Its support of his socialism is selective. Bolivia's most revolutionary city is in some ways its most liberal.

El Alto, at 4,150 metres the world's highest city, has thrived during Mr Morales's presidency. With a population of 900,000 it is Bolivia's second-largest, after low-lying Santa Cruz, and its fastest-growing. The city got its start in the early 20th century when migrants began arriving from the *altiplano*, the Andean highlands of western Bolivia. They established neighbourhoods governed by practices brought from their villages, such as rotating leadership. In 1957 these joined to form the neighbourhood council, which took on the role of the state. Alongside workers' organisations, it dug the first wells and built roads. It also provided law and order, which has sometimes meant executing suspected criminals. The council, now called Fejuve, still helps with the provision of infrastructure on the city's growing fringes. El Alto was incorporated as a city separate from La Paz in 1985.

In the "gas war" of 2003 rebels on the clifftop blocked roads that connect La Paz to much of the rest of Bolivia. Mr Sánchez de Lozada sent in the army. After nearly 60 people were killed, he fled the country. The insurrection helps define the city today. Roger Chambi, an Aymara activist, points out to a visitor the building housing Radio San Gabriel, where insurgent leaders held a hunger strike. El Alto's defiant slogan—"On its feet, never its knees"—appears everywhere.

Politics now seems less urgent. "Right now, it's all about the economy," says Mr Chambi. El Alto is the hub of an international network that trades in goods of all kinds, many of them smuggled. These link the city's rich merchants, called *qamiris*, to manufacturers in China. They often extend to other Bolivian cities and into Brazil and Argentina. Perhaps four-fifths of *alteños* work in the informal economy. Bolivia's "shadow economy" is the world's largest as a share of GDP, according to the IMF.

El Alto's commercial heart is the vast, open-air 16 de Julio market, open on Thursdays and Sundays. Nearly untaxed and unregulated, traders pay their union for permits to open stalls selling everything from herbal cures to car parts. Aymara women guard the wares, bowler hats tipped forwards. Many *qamiris* own market stalls. Beyond the market, small businesses spill onto the streets. Multi-storey dwellings are springing up. Owners leave the brick exposed in the (mistaken) belief that this exempts them from tax. Plots of land appear in city records as empty, another ruse to avoid tax. Artful dodging earns respect. When he worked briefly as a bartender, "I did everything I could not to sell beer with receipts," says Mr Chambi.

The garish façades of "chalets" relieve the brick-brown streetscape. The *qamiris* who own them may not pay taxes, but unlike Bolivia's longer-established elite they don't buy property in Miami, says Mr Chambi. They bankroll fiestas that take

place every weekend. Once a year one *qamiri* gets the expensive honour of paying more than anyone else for Gran Poder, a carnival in La Paz.

Outsiders often see El Alto as a reflection of their biases. Leftists celebrate the communal features of its economy. They include *aini*: help from neighbours for building or business, which the beneficiary is expected to reciprocate. The fiestas are a way of giving food and drink to the poor. Anarchists admire El Alto's self-regulation, liberals its vigorous capitalism. The city seems to combine all these. Pablo Mamani, a sociologist, describes El Alto as a city "with broad solidarity", but "absolutely liberal" in economic matters.

El Alto tends to vote for Mr Morales and cheered his nationalisation of gas reserves in 2006. It likes subsidies and public works, but demands that the state keep its distance. "El Alto expects a lot from the state," says Mr Mamani. That goes along with an ethic of self-reliance. In Aymara culture, "one has to work for oneself."

*Alteños* give Mr Morales little credit for their prosperity. Many are sceptical about his run for re-election (in which Mr Mesa will be his main opponent). They remember the Aymara practice of rotating leadership, even if they do not always practise it. "People view [Mr Morales's campaign] suspiciously," says Mr Chambi.

El Alto has nonetheless supported him, except on two occasions. In 2010, when he tried to cut subsidies for petrol, *alteños* blocked roads again. He backed down. Five years later they rejected his party's mayoral candidate in favour of Soledad Chapetón, an Aymara woman of the centre-left. Those are sharp reminders to Mr Morales: don't take El Alto for granted. ■

# Bello The reds and the black stuff

*Why is the Latin American left hostile to clean energy?*

"Communism is Soviet power plus electrification," declared Vladimir Lenin in 1920. A century later, Andrés Manuel López Obrador's methodology for the redemption of Mexico is his morning press conference plus oil. He wants to raise oil output by almost half, and is poised to build Dos Bocas, an $8bn refinery that will be his country's largest. Mr López Obrador (or AMLO, as he is known) defends this as boosting Mexico's energy security and sovereignty.

Jair Bolsonaro, Brazil's far-right president, claims that environmentalism is a left-wing plot. Latin American leftists' enthusiasm for oil refineries suggests otherwise. In Brazil Luiz Inácio Lula da Silva, president from 2003 to 2011, ordered Petrobras, the state-controlled oil company, to build four of them. In Ecuador, Rafael Correa conducted a $2.2bn upgrade to a refinery. Peru's Ollanta Humala began a similar $3.5bn upgrade.

There are good reasons for AMLO to want to exploit Mexico's natural resources to the full. Oil can help power growth and fill the treasury. But he is going about it in a different way from his predecessor, Enrique Peña Nieto, who opened up oil and gas to private investment but left Pemex, the state oil company, indebted and shot through with corruption. In May, AMLO's government announced that no private bidders had met the terms for Dos Bocas's construction. It will now be handled, opaquely, by the state. He is throwing public money at Pemex without requiring its reform.

In private, officials admit concern. Dos Bocas is a "*pendejada*" (a load of bullshit), admits one. Mexico has no trouble importing gasoline from refineries on the United States' Gulf coast, says David Shields, an energy consultant in Mexico City. Money would be better spent on repairing inefficient existing refineries, or on expanding distribution grids for electricity and natural gas (though private investment could do those jobs).

Ideology in part explains the enthusiasm for such projects among leftists. Fossil-fuel nationalism is a throwback to the concerns of the Latin American left of the mid 20th century. AMLO's adviser for the project is José Alberto Celestinos, aged 90, who was in charge of building refineries for Pemex in the 1970s. "Oil is a fundamental national symbol in Mexico," says Lorenzo Meyer, a historian. "To think of clean energy policies like in Europe is a luxury Mexicans can't give themselves."

And, of course, big state projects offer the opportunity for many to make money. Few people expect Dos Bocas to hit its budget. The only one of Lula's refineries to be completed cost $20bn, nine times its original estimate. Half of the $5bn that Mr Correa's government spent on oil projects was stolen, according to his successor.

In energy terms, Latin America cannot be accused of being a dirty region. It has the world's cleanest energy matrix, largely because of its large hydroelectric dams (though in Mexico, with fewer big rivers, they provide less than a quarter of electricity compared with around half in the region as a whole). Most of Latin America's carbon emissions come from land-use changes and transport, as growing middle classes jump into cars. It could do its bit for the world by halting deforestation and embracing electric vehicles.

Some Latin American countries have encouraged non-conventional renewable technologies, such as wind and solar, whose price has fallen steeply. Rather than copy European subsidies, they have done so by fixing targets and by using auctions in which the market determines the supply price, notes Lisa Viscidi, an energy specialist at the Inter-American Dialogue, a think-tank in Washington. More than 40% of Uruguay's electricity comes from wind, while solar plants provide 8% of Chile's. Both countries have had left-wing governments—but have no significant oil. The same goes for Costa Rica, which has set (and appears to be on track to meet) a target of producing all of its electricity from renewable sources by 2021.

In Mexico Mr Peña held three auction rounds for non-conventionals. AMLO has cancelled the fourth round. "They don't have a renewables policy," says Mr Shields. That is partly because the auctions involve private investment, which AMLO distrusts, partly because wind and solar power are intermittent, and partly because nature has provided Mexico with a bounty of hydrocarbons. But if AMLO looks around the world, he will see that oil is rarely fuel for corruption-free development, and that before too long it may be technologically redundant.

Planning for rising sea levels

# In deep trouble

JAKARTA AND SINGAPORE

**Climate change is forcing low-lying Asian cities to rethink their flood defences**

IN NORTH JAKARTA, not far from a quayside where workers unload frozen mackerel, a derelict building stands a metre deep in murky water. The warehouse was flooded in 2007, after torrential rains and a tidal surge submerged half the city under nearly four metres of water, displacing half a million people and causing $550m in damage. The building has remained inundated and abandoned ever since—barring the hardy soul who seems to be camping on the first floor, aided by a rowing boat.

Floods have always plagued Jakarta, but in recent years they have become more severe. Many other cities in Asia are menaced by the same phenomenon. As the planet heats up, sea levels are rising. Heavy rainstorms are also becoming more frequent and tropical cyclones more intense. And Asia's coastal cities are growing, even as the risk of flooding increases. The number of people living in flood plains in Asia is expected to more than double between 2000 and 2060, according to the Asian Development Bank (ADB). As cities grow, they exacerbate flood-risk by covering ground that would once have absorbed water with concrete and asphalt. The amount and value of the property at risk also grows. Thirteen of the 20 cities projected to have the biggest increases in annual losses caused by flooding between 2005 and 2050 are in Asia.

Jakarta exemplifies the typical response to rising tides and swelling rains. Though Akuarium, a neighbourhood of shanties, is on the coast, it is impossible to see the sea from its dirt streets. A three-metre-tall sea wall stands in the way. For centuries Jakarta's authorities have dispatched engineers to hold back the rising waters. In the 18th century they built flood canals; in the 19th century, retention ponds. After the floods of 2007 they raised the existing 30km-long sea wall, widened and dredged the canal system and dug more retention ponds. The idea that the water would recede if only nature could be tamed still motivates Indonesia's planners. After another disastrous flood in 2013, the president of the day instructed his ministers to be bolder. The result was the National Capital Integrated Coastal Development (NCICD), a $40bn mega-project consisting of a 25km outer sea wall and 17 artificial islands which would seal off Jakarta Bay.

The plan was controversial because of its huge cost, the damage it would do to the maritime ecosystem in the enclosed bay and the fact that it did not deal with a significant cause of flooding in Jakarta: subsidence. Though the sea is rising by 0.8cm a year, parts of northern, coastal Jakarta are sinking by 25cm a year, according to Heri Andreas, a geologist at the Bandung Institute of Technology. At least 40% of residents tap into aquifers, either because they are not connected to mains water or, if they are, because their supply is unreliable and dirty. As they drain the water from under their feet, the soil is compressed. Forty per- ▸▸

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cent of Jakarta is now below sea level. This means that water in the drainage system that would otherwise empty into the bay remains trapped in the city. And as Jakarta sinks, it is dragging its dykes down with it.

Building the plants and pipes to supply treated water is expensive and time-consuming, however, and the result is hidden out of sight. The NCICD plan, in contrast, would have sculpted 1,000 hectares of reclaimed land into a new waterfront city in the shape of a garuda, a mythical bird that is the symbol of Indonesia. "By developing North Jakarta, the project promises to [fulfil] the world-class city aspirations of Indonesia's political elites," writes Emma Colven of the University of Oklahoma. "People want to see visible infrastructure," says Srinivasan Ancha of the ADB.

In August the government signalled a change of tack. It announced plans to clean Jakarta's public water supply and connect the entire city to it in an effort to stop groundwater extraction. The NCICD plan has also been revised. The sea wall will no longer enclose the bay, and the artificial islands have been scrapped, although 2,000 hectares of land will still be reclaimed for development. The cost has fallen by half.

Jakarta is not the only Asian city to get cold feet about big engineering schemes in recent years, and to embrace cheaper flood-control measures. The most notable convert is Singapore, which is no stranger to monumental waterworks. It recently completed a vast underground retention pond at a cost of S$227m ($164m), a cathedral of concrete buttresses fed and drained by pipes you could drive a car through. The city is so proud of Marina Barrage, a system of huge pumps and nine 27-metre-long hydraulic gates to stop the business district flooding, that it has turned the S$226m facility into a tourist attraction. Over the past decade it has spent a total of S$2.4bn on drains. Yet as the tiny city-state runs out of space for colossal new structures, and as ever more torrential storms threaten to overwhelm even the new, improved drainage network, Singapore has had to rethink the way it manages storm water.

In 2006 Singapore launched a scheme to increase the city's absorption capacity by natural means, by converting canals and reservoirs into streams and lakes and by creating wetlands and other spaces designed to flood. Swamps, after all, can absorb potentially ruinous floods, while mangrove forests can protect cities near the coast from storm surges. Maintaining them is much cheaper than building dykes. Singapore completed 75 projects to mimic such natural flood defences between 2010 and 2018. The scheme, which also helps to harvest rainwater, is the first of its kind in the tropics. But the rest of Asia, with far less to spend on colossal flood defences, will surely follow suit. ■

Haze in South-East Asia

# Gasping for air

SINGAPORE

**Burning forests blacken skies**

THE AMAZON is not the world's only smouldering rainforest, alas: fires are also raging in the jungles of Indonesia, blanketing much of South-East Asia in thick smoke. Some 3,300 square kilometres on the islands of Sumatra and Borneo have gone up in flames. The government has deployed more than 9,000 people and 52 aircraft to fight the fires. Indonesia and neighbouring Malaysia are also trying to quench the flames and clear the haze they produce by seeding clouds. But containing the infernos is even harder than usual because of dry weather, which has become more common as the climate changes.

The haze is thought to have caused more than 200,000 respiratory infections and has prompted more than 1,500 schools in Malaysia alone to close. The smoke has been thick enough to disrupt air traffic. The president of Indonesia, Joko Widodo, says he is praying for rain.

Indonesia's environment and forestry ministry says most of the fires were lit deliberately. In one district, according to Doni Monardo of the National Disaster Mitigation Agency, 80% of the fires appear to be intended to convert forest into palm-oil plantations. In theory, using fire to do this is illegal, but the local officials who should stop it are easily bought off. The alternative—clear-felling the often swampy forest and disposing of the resulting waste—is expensive. Preparing land for plantations without using fire costs around $300-400 a hectare, says Herry Purnomo of the Centre for International Forestry Research, which is based in Indonesia, whereas burning costs $30.

The fires are particularly difficult to extinguish because many of them are in peat forests. These are swampy jungles where vegetation that falls to the ground does not completely decay because of the waterlogged soil. When peat becomes dry enough to burn, it can continue to combust underground long after the trees on the surface have been doused. The resulting deforestation is especially harmful to the climate, since peatlands store as much as ten times more carbon per hectare than other forests.

Since he was first elected in 2014, Mr Widodo, better known as Jokowi, has sought to stamp out the flames (there was another bad year in 2015, although forest-clearing fires are a feature of every dry season). In 2017 the forestry ministry launched a masterplan for protecting peatlands and preventing fires. The next year a national land-use map was released, making it easier for the authorities to establish land ownership and prosecute those responsible for fires.

Jokowi's government has come down relatively hard on the culprits. After the fires of 2015, police arrested 660 people. So far the authorities have arrested 200 people and are investigating some 370 companies in connection with the current fires. By contrast, only 40 or so were arrested under Jokowi's predecessor, Susilo Bambang Yudhoyono. Fires are often started just outside palm-oil concessions to obscure responsibility. But the government could be tougher: as of February, some $220m in fines owed by plantation companies involved in past fires remained unpaid. They, at least, should be made to feel the burn.

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Chinese students in Australia

# Waltzing Confucius

SYDNEY

**Universities are accused of sacrificing freedom of expression for cash**

SEEK "HARMONY but not sameness", advised the Chinese philosopher Confucius 2,500 years ago. Neither quality was on display when Chinese nationalists violently disrupted a rally at the University of Queensland in July in support of anti-government demonstrators in Hong Kong. Since then Drew Pavlou, one of the organisers of the sympathy rally, says he has received a litany of threats from Chinese patriots. The passport details of another participant in the rally, who is from the Chinese mainland, have been disseminated on social media. A third says authorities in China visited his family there, to warn them of the consequences of dissent.

Mr Pavlou claims his university has since tried to squelch protests that might upset China, a charge it firmly denies. It is one of 13 campuses in Australia to host a Confucius Institute, a language school and cultural centre funded by the Chinese government. Some students worry about the university's cosy ties with China. Peter Hoj, its vice-chancellor, has worked as a consultant to the Chinese state agency responsible for Confucius Institutes. Recently he quietly made a Chinese diplomat, Xu Jie, a visiting professor. Many Australians were outraged when Mr Xu praised the "spontaneous patriotic behaviour" of the Chinese students who instigated the scuffle.

Other Australians are dazzled by the money to be made teaching Chinese students. Relative to the size of its population, Australia now hosts more international students than any other country. Just over a third of them—around 150,000—come from China. In the universities most eager to woo them, Chinese students now fill about a quarter of all places, says Salvatore Babones of the University of Sydney. This has turned tertiary education into Australia's third-biggest export, enabling administrators to pump cash into new facilities and research. But the conservative coalition government seems increasingly worried about the implications for free speech and security.

Lecturers gripe about complaints from Chinese students who bristle at criticism of their government. Some have apologised publicly for supposedly hurting students' feelings; one was suspended in 2017 after he claimed that ordinary Chinese believe that government officials only ever speak the truth by accident.

Last year Victoria University cancelled a screening of a film criticising Confucius Institutes after Chinese diplomats expressed misgivings about the event. Some academics complain that administrators have encouraged them to keep awkward opinions to themselves. One grumbles that his "freedom of speech was egregiously compromised" when a panel discussion on Chinese politics was suddenly cancelled ahead of a Chinese state visit to Australia.

Students police each other as well as their teachers. Officially Chinese Students and Scholars Associations, which are backed by the Chinese state, run social events and help newcomers. But they are also assumed to snitch on dissenters, leaving many Chinese students afraid to speak their minds.

By courting controversy, these organisations may have done more harm than good to China's interests, says Mark Harrison, a Chinese-studies lecturer at the University of Tasmania. So have the Confucius Institutes, which are accused of stifling academic freedom by discouraging students from discussing sensitive topics. It is "completely inappropriate for universities to host what amount to arms of the Chinese Communist Party on their campuses", argues Kevin Carrico of Monash University.

Universities don't think they need to register the institutes under a new law that requires agents of foreign governments attempting to influence politics to declare themselves. The attorney-general's office is mulling whether they should. A separate government taskforce is investigating whether universities are doing enough to prevent sensitive research from reaching foreign governments. The Australian Strategic Policy Institute (ASPI), a think-tank, reckons 300-odd scientists tied to China's armed forces have visited Australia since 2007, studying subjects such as quantum physics and navigation technology. In one "particularly worrying" case, a professor at the University of New South Wales worked with a Chinese general to develop supercomputers used in nuclear-weapons tests, notes Alex Joske of ASPI.

Australian universities say they are working with the government to "safeguard security" without "undermining the invaluable asset of global collaboration". But few seem keen to reduce their dependency on a continuing influx of Chinese students. This amounts to a "crisis of leadership", a conservative senator recently asserted. If universities do not change their tack, says Mr Harrison, "they may find that federal agencies do it for them." ■

One university, two sensibilities

African swine flu

# Boar war

SEOUL

**The disease killing Asia's pigs continues to spread**

THE BORDER guards were to attempt to catch the infiltrators alive but, if that failed, to shoot to kill. But somehow, a few stealthy interlopers seem to have managed to sneak past the hundreds of thousands of soldiers defending South Korea from its hostile neighbour to the north. The South Korean authorities were desperate to stop the wild boars in question, for fear that they might inadvertently import African swine fever, a disease known to have been present in North Korea since May. On September 17th the South Korean government confirmed that five pigs on a farm in Paju, close to the border, had died of swine fever. The government immediately issued a 48-hour ban on moving pigs and said that 4,000 pigs on and near the affected farm would be culled. But the next day it reported a second case in a neighbouring county. Authorities are still investigating what caused these outbreaks, but wild boar are plausible suspects.

South Korea is the latest country in Asia to be affected by the disease, which is harmless to humans but usually deadly for pigs and for which there is neither a cure nor a vaccine. Since the first case was reported in China a little over a year ago, it has spread across the continent. It reached Mongolia in January, Vietnam in February and Cambodia in April. Laos reported its first case in June. In August it spread to Myanmar and earlier this month to the Philippines.

In an attempt to halt contagion, perhaps 60m pigs have been culled in China and a ▸▸

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further 5m in Vietnam. But in several of the afflicted countries the regulation and monitoring of livestock and the reporting of outbreaks is patchy, to say the least, making it hard to be certain how far the disease has spread. North Korea, for instance, has disclosed only a single occurrence, on the border with China on May 23rd, even though the arrival of the disease in the South suggests it has travelled the length of the country. The site of the first known outbreak in Myanmar, meanwhile, is Shan state, a lawless region controlled in large part by militias suspicious of the central government.

Surprisingly, Thailand, home to CP Foods, the biggest pork producer outside America and China, seems to have avoided the affliction so far, even though it has long and largely unguarded borders with three of the affected countries. That may be because pig-farming there tends to be on a bigger scale than elsewhere in the region, says Dirk Pfeiffer of City University in Hong Kong. In contrast, small farms, which produce much of the pork in China and South-East Asia, are particularly susceptible. Many smallholders either lack the expertise to protect their animals or cannot afford the fencing and uncontaminated feed needed to keep the disease at bay.

That is not the problem in South Korea. High standards of food safety and reporting and well-functioning compensation mechanisms for farmers mean that it will probably be able to contain swine fever relatively successfully, says Mr Pfeiffer. South Koreans may have to pay a bit more for their barbecued pork in the months to come. But the country's pig farmers are less likely than their counterparts elsewhere in the region to face complete destitution. ■

# Banyan Cold command

*Are authoritarian states better than democratic ones at fighting climate change?*

IT IS NOT just that Asia accounts for the greatest proportion of the world's carbon emissions, with China the biggest emitter, India the third-biggest, and Japan, South Korea and Indonesia all among the top dozen. Asians are also the most vulnerable to climate catastrophe, with melting Tibetan glaciers, less predictable rains upon which its farmers depend, and fiercer storms and rising sea levels threatening huge, sinking megacities such as Jakarta, Manila, Mumbai and Shanghai.

By and large, national governments in Asia acknowledge the challenge. A baneful exception is Australia, whose conservative government is running away from climate commitments. Its failure to show the way in cutting emissions has only reinforced an argument which, increasingly, Asian environmentalists as well as self-serving autocrats make: that a crisis as severe (if man-made) as rising temperatures can be mitigated only by the firm smack of authoritarian rule. Democracies huff and puff and, prey to vested interests and voters' distaste for hard choices, ultimately shirk the task.

America under President Donald Trump, who wants to pull out of the Paris agreement, underscores the case. Global leadership on climate falls, by default, to China. The Communist Party first baked climate change into planning in 1990. The policy output has been prolific. It includes a national climate-change programme and a renewable-energy law. By 2017 China had cut the carbon dioxide emitted per unit of GDP by 46% compared with 2005, three years ahead of schedule. It says 20% of its energy will come from non-fossil sources by 2030.

The choices China makes will be critical if the world has a chance of keeping temperature rises to no more than 1.5°C. Above all, coal use needs to fall sharply—easy improvements to date in carbon efficiency are not enough. Yet for all that China is far and away the biggest manufacturer and user of solar technology, it remains the hungriest user of coal. After a two-year pause in breaking ground for new coal-fired power stations, last year China began the construction of 28GW of new capacity. The total capacity under construction, 235GW, will boost Chinese coal power by a quarter. As for the Belt and Road Initiative, which aims to boost Chinese prestige abroad by helping countries build infrastructure, a quarter of its energy projects are coal-fired stations. The 136 belt-and-road countries account for 28% of global carbon emissions. Without decarbonisation, that ratio would rocket to 66% by 2050, according to a study backed by Tsinghua University.

Authoritarian environmentalism, then, may excel at producing policies but be no better than democratic environmentalism at producing good outcomes—

and probably worse. Policy driven by bureaucratic and technocratic elites, with almost no input, monitoring or modification from those who make up civil society, has real drawbacks: think of the provincial governments in China that lie about their coal-use figures and of the supposedly clean, China-backed hydropower projects on South-East Asia's giant rivers that are wreaking havoc with fish and water flows.

Meanwhile, even corrupt, messy India can get some things done. For three years in a row, it has invested more in renewable energy than in fossil fuels—helped by a sharp rise in coal taxes and steep falls in the price of solar power (plus 300 sunny days a year). Power not generated by fossil fuels should reach 60% of the total by 2030.

India is a paragon neither of democracy nor of environmentalism. Yet non-governmental and other independent civic groups piping up about the environment are surely better than the mandated silence in China. And even peccant democracies like Australia's can change course. As it is, state-level governments have ambitious renewables targets, while nine-tenths of Australians say the federal government's climate policy is not good enough.

If governments don't go after climate, climate will go after them. When Cyclone Nargis killed an estimated 140,000 people in Myanmar in 2008, the lying incompetence of the junta that ran the country at the time hastened its demise. When Communist leaders in China deal with natural disasters, such as the huge earthquake in Sichuan days after Nargis, they know their legitimacy is on the line. Climate is going to test many states in Asia to destruction, but authoritarian ones most of all.

Climate-change targets

# From smog to slog

BEIJING

**China has upheld its pledges on greenhouse-gas emissions. It must do a lot more**

After Donald Trump became America's president in 2017 and thumbed his nose at international efforts to curb global warming, China emerged as a hero in the campaign. Other Western leaders were relieved that it did not take the opportunity to back away as well—after all, it had once condemned climate-change talk as Western fearmongering aimed at undermining China's economic growth. The country's president, Xi Jinping, won widespread applause for insisting that emissions goals agreed at the UN's climate meeting in Paris in 2015 must be upheld.

Now environmentalists wonder whether China will lead the charge in a new round of climate diplomacy. One aim of the climate summit at the UN's headquarters on September 23rd is to remind countries that they will need more ambitious targets if the world is to keep global warming below 2°C. Work is getting under way on drawing up China's next five-year economic plan, which will take effect in 2021. It will be a test of China's willingness to raise its game. Early signs are not promising.

China certainly looks well on track to fulfil the pledges it made at the Paris conference: that carbon-dioxide emissions would reach a final peak "around 2030", and that by then one-fifth of its energy would come from non-fossil sources, up from one-sixth currently. In 2015 its carbon emissions, having surged in many of the preceding years, fell slightly for the first time this century (see chart, next page). This was because China was no longer flooding its economy with money in order to combat the effects of the global financial crisis of 2008. It was also the result of vast green projects launched by the government to assuage public anger over toxic air and other environmental damage. The smog choking China's cities was being caused, not least, by the burning of coal which was also responsible for much of the country's greenhouse-gas emissions. The air in Beijing (pictured), though still often awful, appears cleaner than it was a few years ago.

The proportion of China's energy that is produced from coal, the most polluting of fossil fuels, is still high. But it has decreased by more than ten percentage points over the past decade, to below 60%. A third of the world's electricity-generating capacity from wind is now in China, as are a quarter of the world's solar panels in use. The country is building 11 more nuclear reactors, to add to its existing 47. From next year China will start requiring fossil-fuelled power firms to buy and sell credits in a national carbon-trading scheme—though it may be years before the system results in big cuts in emissions.

But the pledges made in Paris by China and the world's other main emitters of global-warming gasses are far from enough. Fulfilling them may still allow temperatures to rise by 3-3.5°C, which would be cat- ▸▸

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astrophic. The UN wants countries to propose tougher targets by the middle of next year and agree on these at another climate conference at the end of 2020.

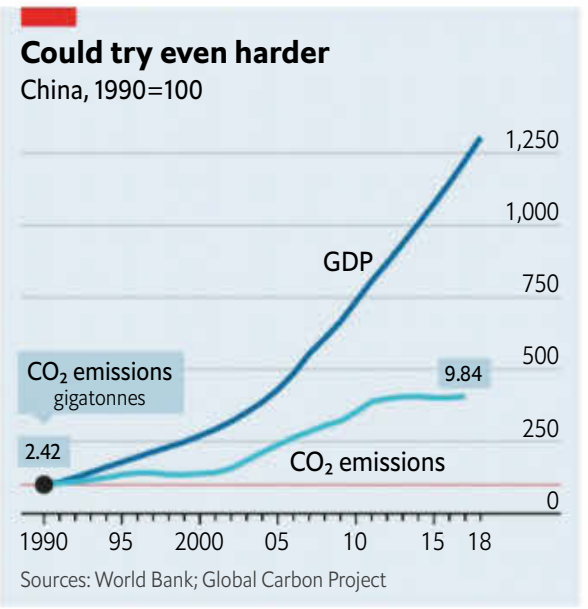
China does not encourage public debate about this. Even as the country's leaders have been basking in the glow of global gratitude for their climate-change efforts, they have been tightening controls on NGOs. The state-run media rarely question the government's policies. But some Chinese experts have been calling on it to step up to the plate. In June an influential Chinese think-tank, the China Council for International Co-operation on Environment and Development, said the country should pledge that its emissions will peak by 2025 rather than 2030, and that by then non-fossil fuels should contribute at least one-quarter of the energy it consumes.

China has real incentives to keep up the pace. It wants to reduce the economy's dependence on labour-intensive manufacturing and boost the role of high technology and services. It worries about dependence on imported fossil fuels: last year 72% of its oil was imported and 43% of its gas. The attacks on Saudi Arabia's oilfields on September 14th were scary for China: the country had been by far the biggest source of China's imported oil.

But some analysts doubt whether China is ready yet to commit to tougher emissions targets. The main reason is that the economy is slowing faster than officials would like. This year the aim is to expand it by between 6% and 6.5%. That would be in line with China's long-term aim of achieving more sustainable, less frothy, growth. But China's prime minister, Li Keqiang, said this week that even 6% has not been easy to achieve, citing a global slowdown and the "rise of protectionism and unilateralism"—a veiled reference to the trade war with America.

In August a senior Chinese climate official warned that economic uncertainty caused by the trade conflict, among other factors, was making it less likely that China would reduce its emissions any more swiftly than promised. China's leaders can hardly be keen to put aside money for stiffer green policies while the economy is going through such a bumpy patch.

To keep the economy growing within the target range, officials have allowed more credit to flow to some high-emitting industries such as steel and cement, and cranked up coal-fired plants to meet the resulting increase in power demand (and it is building them apace abroad as part of its Belt and Road Initiative, a global infrastructure-building scheme—see Banyan). After falling in 2015 and 2016, China's carbon emissions began creeping upwards again. Greenpeace estimates that carbon-dioxide emissions grew 4% in the first half of this year.




Large state-owned companies with vested interests in fossil fuels sense an opportunity. In March power firms proposed that the government allow another 300-500 coal-fired power stations to be built by 2030, a 30% increase in capacity. Officials must resist the temptation. If not, the planet is damned. ■

Science and dissent

# Relatively revealing

SHANGHAI

**An exhibition celebrates Einstein's genius but not his politics**

"FREEDOM OF TEACHING and of opinion in book or press is the foundation for the sound and natural development of any people." In China even uttering these words in public may get a person into trouble. But it was Albert Einstein who wrote them, and he is officially revered. The quotation appears on bookmarks at the gift shop of the World Expo Museum in Shanghai, where the scientist's work is being celebrated in an exhibition that opened in August. Einstein visited the city in 1922, locals are proud to recall.

Crowds have been flocking to see the memorabilia, which will be on display until late October. A big draw are Einstein's notes on special relativity, in which he sets out the formula $E=mc^2$. There is no mention of how controversial even the famous theory once was in China. During Mao Zedong's Cultural Revolution, it was attacked by some scholars in the Chinese Academy of Sciences. They wrote a paper describing relativity as "a profound reflection of Western bourgeois reactionary political viewpoints". In an attempt to restore sanity Zhou Enlai, who was then prime minister, eventually stepped in. "The Jewish nation has produced many outstanding talents. Marx was Jewish, so was Einstein," he said.

The exhibition does not, however, explore Einstein's views on freedom of expression. These are revealed only among the souvenirs, one of which is a biography of Einstein by an American, Walter Isaacson. It describes the German-born scientist's nonconformity and hostility to state control. "Tyranny repulsed him, and he saw tolerance not simply as a sweet virtue but as a necessary condition for a creative society," it says. But the book is on sale only in English. There is nothing in Chinese at the exhibition that reveals Einstein's opinions on political freedom.

This year, especially, the authorities are keen to avoid tricky questions about science and dissent. It is the 30th anniversary of pro-democracy unrest in Tiananmen Square that was crushed by the Chinese army with huge loss of life. Among the most vocal of the intellectuals who supported the protests were several Chinese physicists: Wang Ganchang, who led China's nuclear-weapons programme; Fang Lizhi, an astrophysicist who later defected to America; and Xu Liangying, China's preeminent translator of Einstein's works.

All three are now dead. Like the others, Xu kept calling for democracy into old age. Remarkably, however, Xu's work is acknowledged at the exhibition by a display of a translation in his handwriting. Curators sought advice from Xu's son and invited him to the opening.

But this is no political thaw. Since Xi Jinping took over as China's leader in 2012, he has tightened the screws on dissent. Scientists have not been immune. Zheng Wenfeng, an associate professor at the University of Electronic Science and Technology of China in the south-western city of Chengdu, had the temerity this summer to question the significance of the "four great inventions": the compass, printing, papermaking and gunpowder. China cites these as evidence of its ancient scientific prowess. No patriot can question that. Mr Zheng was duly punished with two years' suspension from teaching. ■

# **Chaguan** | An atheist party gets religion

*Why Communist Party bosses love Mazu, a folk goddess of the sea*

THERE ARE several ways to gauge whether the Communist Party of China approves of an institution. A brass nameplate, issued by an arm of the party or state, is one sign. A stamp for endorsing important materials can be used as a further badge of respectability. But the best test of approved status, arguably, is the issuing of lots of paperwork. Somewhat surprisingly, a Ming dynasty temple hidden up an alleyway off Shipu harbour, one of eastern China's largest fishing ports, passes all these tests.

An incense-scented haven of red woodwork and worn grey flagstones, the temple is dedicated to Mazu, a tenth-century maiden who miraculously saved relatives from a shipwreck and later became a goddess. Older residents remember when the temple risked destruction as a den of feudal superstition. During the Cultural Revolution of 1966-76, when sacred sites were razed by Maoist zealots and countless priests and monks were harried to death, the temple became a primary school. Red Guards tried to ransack the place, says Han Sulian, a temple volunteer. But locals "threatened to beat them up so they backed off", she recalls with pride. Sailors never stopped believing in Mazu, adds Ms Han. They would wear incense pouches as secret talismans when they left Shipu to hunt eels and yellow croaker in the East China Sea.

Today, fishermen need not hide their prayers. Chaguan visited the temple on September 16th, hours before party bigwigs and other officials arrived. They were in Shipu to open a new fishing season, ending a ban imposed on May 1st to allow exhausted stocks a chance of recovery. A brass plate on the temple's weathered façade shows it is licensed by the Ethnic and Religious Affairs Committee of Zhejiang province. Inside, new banners in embroidered yellow satin lie on the altar, ready for marking in red ink with the temple's stamp, before being flown from boats' masts. Paperwork, in the form of stacks of prayer slips, combines belief and bureaucracy. A slip bears the hull numbers of two ships, their skippers' names and handwritten appeals for the boats to encounter calm seas and return with full holds. Crews will burn their slips before leaving Shipu, a pretty harbour surrounded by steep wooded hills. Meanwhile local women busy themselves sorting bottles of wine, left over from a fishermen's banquet the night before. That open-air feast, overseen by beaming officials and filmed by state television, culminated in a waterborne procession of illuminated trawlers. The boats carried statues of Mazu and other deities past tourists on the harbourside, glowing smartphone cameras held aloft.

The party remains officially atheist. Though formal tolerance of five faiths—Buddhism, Daoism, Islam and two strands of Christianity, Protestantism and Catholicism—was reinstated in 1982, six years after the death of Mao Zedong, rules have tightened under President Xi Jinping. He has called for the "sinicisation" of religion. In plainer language this means that all beliefs must in the end bow to a worldlier credo, involving party-ordained patriotism and family values. Organs of state repression have targeted Muslims accused of excessive piety, particularly in the western region of Xinjiang, where hundreds of thousands of Muslims, mostly from the Uighur minority, have been detained in re-education camps. Tibetan Buddhists live in a surveillance state largely closed to foreigners. Even in prosperous Zhejiang, officials have ordered crosses that are too prominent to be torn off hundreds of Christian churches, and shut down unofficial "house churches". In contrast certain forms of faith are encouraged, especially those with roots in China and big followings among overseas Chinese. Mazu-worship fits that bill. Over the centuries migrants from China's maritime provinces have built temples to the goddess, also known as Tianhou, from Macau to Malaysia and Melbourne. Helpfully, Mazu worship is classed as a folk belief and not as a religion, notes Zhou Jinyan of the China Mazu Cultural Exchange Association, a semi-official body. That allows for looser regulation and for the faith's promotion for economic and political ends.

Mazu has a big following in Taiwan. In 2011 Mr Xi urged officials to "make full use" of Mazu to woo Taiwanese, most of whom have ancestral ties with the mainland. Taiwanese money built a gaudy new temple to Ruyi, a sister deity of Mazu's, on a hill above Shipu. A lot of it came from relatives of the late "Blacky" Ko Sau Leung, a popular crooner and stuntman known for jumping the Yellow River in a sports car. Ko was among thousands of Zhejiang folk who were evacuated to Nationalist-held Taiwan in 1955 when the offshore islands they called home were overrun by Communist forces, some years after China's civil war. Many settled in the Taiwanese port of Fugang, nicknamed "little Shipu". Fugang believers are honoured guests at Shipu's fishing festival, bustling about in T-shirts reading "Goddess of the Sea".

**For those in peril on the sea**

Grand ceremonies for Mazu were unknown 40 years ago when Zhou Quanyang, the owner of a 150-tonne fishing boat, was a boy, and China a much poorer place. "It's when your belly is full and you have some money, that's when you pray," says Mr Zhou. Every fisherman has faith in Mazu, he says, as the town's 2,800 vessels are readied for the fishing season. His own daughter, a university student, does not believe, he adds. This prompts unexpected sympathy from Chaguan's minder, an official from the local county propaganda office listening to the exchange. With a father in such a dangerous line of work, that daughter "should probably believe more, and pray for her dad", the minder exclaims.

Mazu has competition, revealed by the Chinese characters for "Emmanuel" discreetly painted on a few ships putting to sea. Perhaps 100 boats are Christian-owned, claims Peter, a local Protestant. Party leaders see Christianity as a foreign intruder, he laments. That is why they promote folk religion and "cultural confidence". Yet the fishing life calls for deeper faith, Peter argues: the ocean reminds man how small he is in the face of nature. ■

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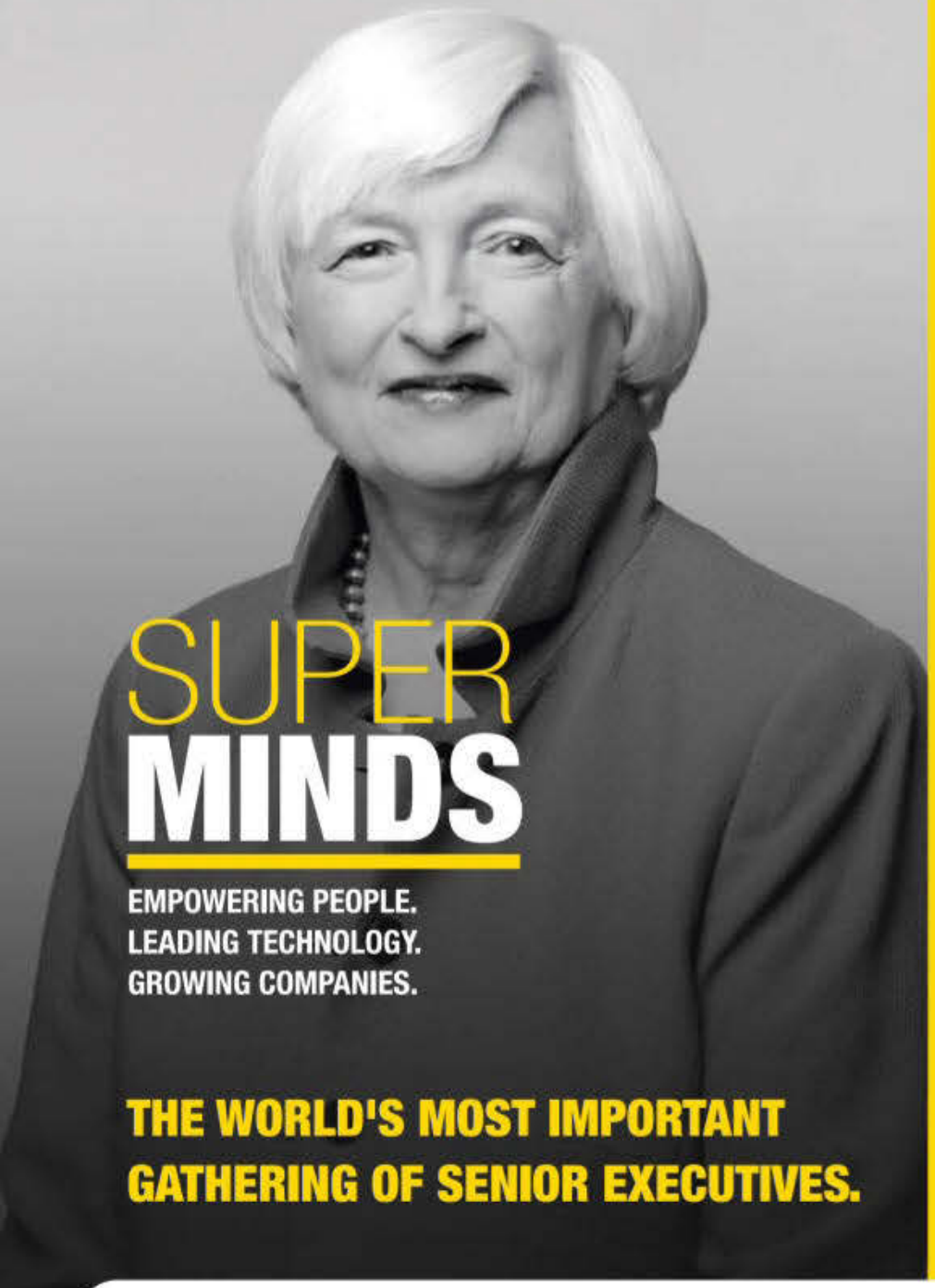

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Conflict in the Gulf

# Iran's dangerous game

**A strike on Saudi Arabia moves a shadowy conflict closer to open war**

THE MISSILES streaked down and turned the night sky orange. In the early hours of September 14th a barrage of fast-moving weapons hit Abqaiq, a town in the eastern Saudi desert that is home to the world's largest oil-processing facility. They punched holes in the spheroids that process crude oil and smashed five of Abqaiq's 18 stabilisation towers, lighting up the night. A separate volley set ablaze the Khurais oilfield, 185km to the south west.

When the sun rose a few hours later, thick plumes of smoke were visible from space. The images reminded some of the 1991 war with Iraq, when Saddam Hussein's retreating army set fire to oilfields in Kuwait. Oil prices briefly surged 20% on news that more than 5.7m barrels a day of oil production had been halted. This was the biggest disruption to the world's energy supply in decades (see next article).

The attack appears to be the most dangerous escalation yet by the Islamic republic in its simmering conflict with America and its allies. After months of sabre-rattling and increasingly brazen acts of aggression—from mine attacks on ships to the seizure of a British-flagged oil tanker—Iran (or its proxies) has moved on to strike directly at the jugular vein of the world's economy. The barrage, by a mix of cruise missiles and drones, also marks a worrying transition to open war from the shadowy proxy conflict that Iran has waged with Saudi Arabia and its allies.

Iran has made mischief in the region, and beyond, for years. The Quds Force, a special-operations arm of the hardline Islamic Revolutionary Guard Corps (IRGC), provided explosives used in attacks on American troops in Iraq a decade ago. Iran was also implicated in terrorist activities in Europe and the Americas long before that.

But the regime's most dangerous card—a nuclear programme that may have left it months away from the ability to manufacture an atomic bomb—was removed from the deck in 2015. An agreement struck between Iran and six world powers saw it accept strict limits on uranium enrichment in exchange for relief from some economic sanctions. The deal may have also helped to dissuade Iran from aggressive acts that could have threatened the foreign investment and other benefits promised by the deal. But that calculus changed when President Donald Trump unilaterally withdrew America from the agreement in May 2018 and in effect banned the export of its oil a year later. Iran's exports have shrunk from a peak of 2.8m barrels a day last year to less than 1m now. Mr Trump has since added to the pain with new sanctions on entire industries, such as petrochemicals and the gold trade, and on individuals including Mohammad Javad Zarif, the foreign minister.

This pressure has prompted Iran to hit back. It first sabotaged oil tankers in the Persian Gulf. Then it stepped up a notch to seizing them, most recently grabbing a vessel on September 16th that it said was smuggling fuel to the United Arab Emirates (UAE). Iran has also begun to flout some aspects of the nuclear deal itself, by enriching uranium to proscribed quantities and levels of purity.

There was a logic to this escalation. Iran hoped that by threatening to step away from the nuclear pact it would press the other signatories, in particular France, Germany and Britain, into offering it support such as credit lines to mitigate the impact of American sanctions. And by menacing shipping in the Gulf it wanted to demonstrate that the regime could impose costs on America and its allies. But what may have started as a way of signalling Iran's unhappiness has since escalated into more dangerous actions such as the latest attack on Saudi Arabia's oil facilities.

In part this is because of Mr Trump's tepid response to earlier provocations. For all his hawkish rhetoric and sanctions, a cam- ▸▸

paign he calls "maximum pressure", the president is averse to military conflict. He ordered retaliatory air strikes after Iran shot down an American drone flying over the Gulf in June, only to recall the bombers at the last minute.

Much is still unknown about the latest attack. But it is reasonable to conclude, as Saudi Arabia (and its ally America) soon did, that Iran had a hand in it. The Islamic republic denies involvement, but circumstantial evidence links it to the weapons used. The first claim of responsibility came from the Houthis, who control northern parts of Yemen and its capital, Sana'a. UN investigators have previously said that Iran had supplied the Houthis with advanced weapons, including drones, missiles and equipment to make rocket fuel.

Many Houthi drones look almost identical to Iranian ones. Scores have been flown into Saudi Arabia, aimed at airports, military bases and other targets. In December 2017 the Houthis even launched missiles towards a nuclear reactor under construction in Abu Dhabi. In January the UN noted that the Houthis had acquired a new drone with a range of up to 1,500km. In May the group claimed to have struck two oil-pumping stations and a pipeline deep in Saudi territory using such drones.

### Houthi dunnit?

The weapons used in the latest attack seem to have been developed in Iran. Fabian Hinz, an analyst with the James Martin Centre for Nonproliferation Studies, wrote that wreckage found near Abqaiq looked like a cruise missile known as the Quds-1, probably designed by Iran. At a press conference on September 18th Saudi Arabia showed the wreckage of drones and missiles that it claimed proved Iran's involvement. America says that these were launched from a base in southern Iran. Satellite photos indicate a sophisticated and precise operation, with clean strikes on Abqaiq's facilities. It is hard to imagine the Houthis conducting such an attack without Iran's help.

If oil output, and by extension the world economy, was the first casualty, then the second was surely Saudi credibility as a dependable guardian of that supply. Last year Saudi Arabia spent between $68bn and $83bn on defence (estimates vary), behind only America and China. Saudi Arabia was one of the first foreign buyers of America's Patriot missile-defence system in 1991 and now operates six batteries of them.

Yet its ground forces have been humbled by four years of fighting rebels waging guerrilla warfare in Yemen. And its air defences seem to be just as inept at fending off conventional threats. To be fair, drones and cruise missiles are especially hard to stop, particularly if they overwhelm defences by arriving in large numbers. They


are small and they fly low, hiding from radar behind the curvature of the earth. And they are manoeuvrable, so they can skirt known missile-defence sites. Some reports suggest the Aramco barrage snuck in via Kuwait. Saudi air defences are relatively thin in the eastern province, with most of its batteries focused to the south on the threat from Yemen.

Even so, Saudi forces seem to have had only limited success in using their Patriots against ballistic missiles, which are easier to spot. The company that makes the Patriot claims that its batteries have batted away more than 100 Houthi missiles over Saudi Arabia and the UAE. But Jeffrey Lewis, an expert at the Middlebury Institute of International Studies at Monterey, says there is no evidence that they have intercepted any missiles. If the Patriot and similar systems are leakier than assumed, Saudi oil facilities may be worryingly vulnerable to Iran should the conflict escalate.

America's standing as the ultimate guarantor of security in the region has also been damaged. Mr Trump first said that America was "locked and loaded" to respond to the attack. Then he prevaricated, as he had done in earlier incidents, kicking the ball back to Saudi Arabia, saying he would wait "to hear from the kingdom" before acting. The following day he stressed his desire to make a deal with Iran. On September 18th Mr Trump announced that he would impose further sanctions. But their impact will be limited, because the administration is running out of effective targets.

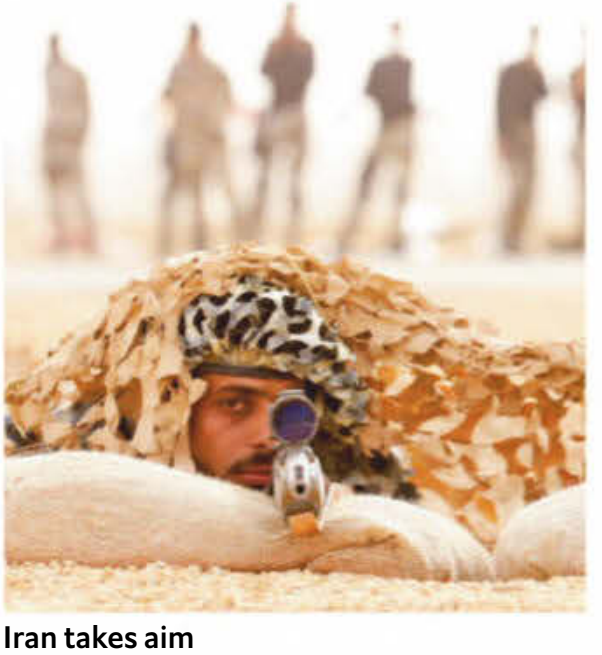
An aide to the vice-president, Mike Pence, said that "locked and loaded" was in fact a reference to American energy independence, a prize bit of spin even for Mr Trump's White House. The erratic swerves then continued with Mike Pompeo, the secretary of state, calling the attack an "act of war" in a visit to the kingdom.

Saudi Arabia has tried to downplay the incident at home. King Salman said that his country has the "ability to respond"—hardly a war cry. Much of the public commentary on the attack has come from oil officials, not military men. Two days after the attack the front page of *Al-Riyadh*, a pro-government daily, led with a story about the crown prince attending a camel race. Coverage of the Aramco incident came further down. It emphasised international support for the kingdom and avoided photos of burning oilfields.

This seems in keeping with Saudi tradition. For decades the kingdom was conservative in its foreign policy and shunned the use of hard power. Under the previous monarch, King Abdullah, it would have been unthinkable for Saudi Arabia to conduct a military strike without America's full support.

Times have changed. The crown prince, Muhammad bin Salman, has ploughed ahead with a ruinous war in Yemen despite deep misgivings in Washington and other Western capitals. He has also worked to cultivate a new Saudi identity, one rooted in muscular nationalism instead of Islam. Officials in the Gulf have warned for months that the kingdom would eventually have to retaliate against Iran for the seemingly endless string of drone and missile attacks on its facilities.

Yet Saudi Arabia remains hesitant to pick a fight with a foe that can fight back. The experience of its air force in Yemen is not encouraging. Air strikes by the Saudi-led coalition have killed thousands of civilians, despite Britain and America providing precision munitions from their own arsenals and targeting assistance in a bid to reduce "collateral damage". Iran, which operates the Russian S-300 air defence system, would be an even harder target for Saudi warplanes. (Vladimir Putin, in a sublime bit of political trolling, suggested on September 16th that Saudi Arabia might want to buy the same system, while Mr Rouhani chuckled on a stage next to him.) The kingdom does have its own arsenal of Western-built cruise missiles, but their



**Iran takes aim**

short range means they could reach only parts of Iran.

If further evidence of Iran's role comes to light, Mr Trump may face more pressure to act. "The strike on Abqaiq is arguably the most serious attack on energy infrastructure in the Gulf since Saddam Hussein's forces invaded Kuwait in 1990," says Michael Singh of the Washington Institute for Near East Peace Policy, a think-tank.

Mr Trump has a range of options. His proposed strike in June was aimed at the radar and missile batteries involved with shooting down the American drone. This time he could target facilities from which the attack on Saudi Arabia was launched—although drones and cruise missiles tend to be mobile and easy to launch from austere sites. Another option would be to target facilities associated with the IRGC. Attacking their bases and personnel outside Iran—whether in Iraq, Syria or Yemen—might be considered less escalatory than striking Iranian soil. A larger show of force is also possible. In 1988 America responded to Iranian attacks on shipping in the Persian Gulf with Operation Praying Mantis, a major air and naval assault on Iranian ships and platforms.

**Quds in**

Iran would not sit by. Its conventional means are limited; its $13bn defence budget is a fifth of Saudi Arabia's, and one-fiftieth that of America's. But it could target further missile volleys at ships, bases and other critical infrastructure throughout the Gulf. The Quds Force could also mobilise regional allies, from the Houthis in Yemen to Hizbullah in Lebanon, to attack Western and Arab interests, which is one reason that the Pentagon is discouraging Mr Trump from ordering a military strike. More subtly, Iran's accomplished cyber-forces could disrupt energy, financial and political networks within the region and beyond. In 2012 Iranian hackers were blamed for crippling 30,000 of Saudi Aramco's computers in one of the costliest cyber-attacks ever.

A wild and uncontrolled backlash is unlikely. In choosing their parry, Iran's leaders would need to balance between facing down America by raising the stakes, and avoiding an all-out war that would threaten the regime's survival. Their hope is that Mr Trump would lose the stomach for a fight long before matters reached such a stage.

This was always the inexorable endpoint of Mr Trump's policy of "maximum pressure". He and his aides thought they could pummel Iran into a new deal that constrained not only its nuclear programme but also its foreign policy. Instead they convinced Iran's hardliners that the only way of dealing with America was through muscular confrontation. Neither side will find it easy to back away. ■

Oil markets

# Now what?

### Saudi Aramco tries asserting control amid chaos

THE WORLD'S oil markets depend on Saudi Aramco, Saudi Arabia's state-owned giant. In turn Aramco depends on Abqaiq. Crude from Saudi Arabia's legendary oil fields—Ghawar, Khurais, Shaybah—comes to Abqaiq to be processed, coursing through its sprawling network of pipes, spheroids and stabilisation towers before being sent to customers around the world. Last year about half of Saudi Arabia's production flowed through the facility. Little wonder that the kingdom's enemies have long sought to cripple it.

On September 14th they succeeded. Drone strikes at Abqaiq and the Khurais oil field knocked out 5.7m barrels per day of production, a staggering 60% of the kingdom's output and 6% of global supply. By September 17th, however, Abqaiq had resumed processing 2m barrels of oil. Amin Nasser, Aramco's chief executive, said that capacity would be fully restored by the end of the month and that the attack would not affect plans to list a portion of Aramco's shares in what is expected to be one of the biggest initial public offerings (IPO) ever.

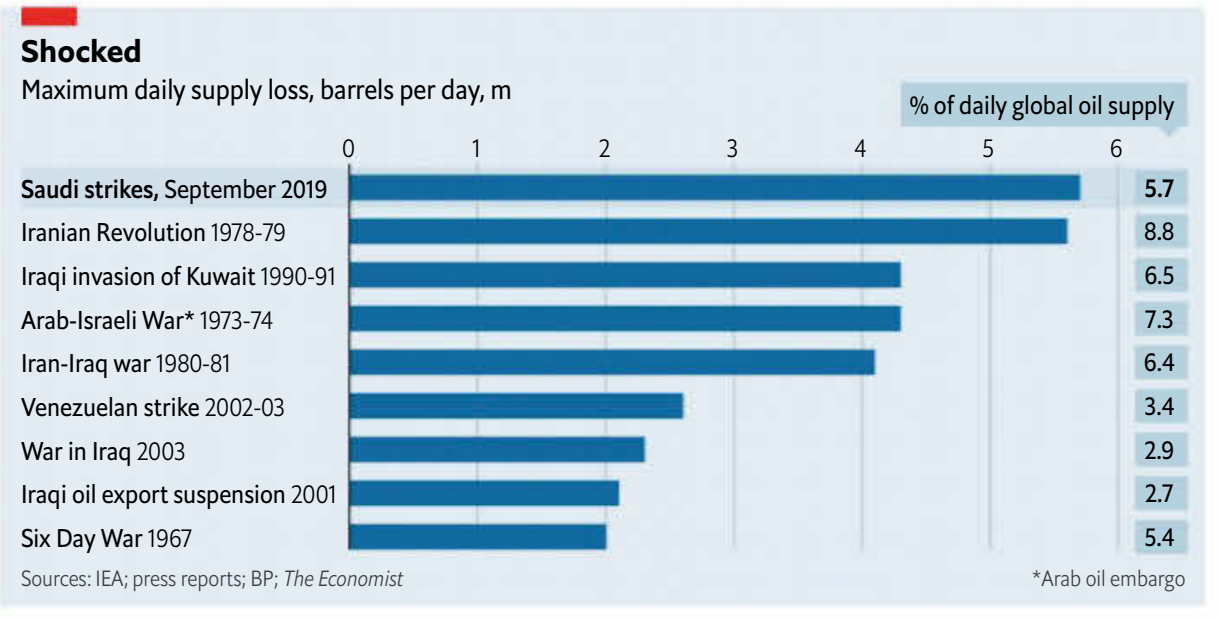
The price of Brent oil, which had briefly jumped as much as 20% after the attack, slumped back to $64, just $1 above its level a week earlier. Aramco has so far maintained exports by drawing down supplies, but its stocks were already at a 12-year low. Much depends on whether it can meet its own timeline for resuming production. Yet its assurances were greeted sceptically by some industry veterans. "Does anybody actually believe that after looking at the satellite imaging photos?" questioned one oil man. And even if Aramco does resume full operations quickly, big questions haunt the company and the oil market.

In the past year oil prices have jumped and slid, alternately pushed up by concerns that American sanctions on Iran and Venezuela would curb supply and depressed by fears of slowing economic growth. In December the Organisation of Petroleum Exporting Countries (OPEC), Russia and other oil producers agreed to reduce output by 1.2m barrels a day. Saudi Arabia has cut more than it promised to, keeping oil prices from sinking as far as they might have otherwise. Even so, the price of Brent crude on September 13th, the day before the attacks, was about 20% lower than it had been in late April.

Faced with such challenges, Saudi Arabia has shaken up its oil hierarchy. A new oil minister, Prince Abdulaziz bin Salman, and a new chairman of Aramco, Yasir Othman Al-Rumayyan, assumed their posts in the past month. But stabilising oil prices and speeding Aramco's IPO now look harder than ever.

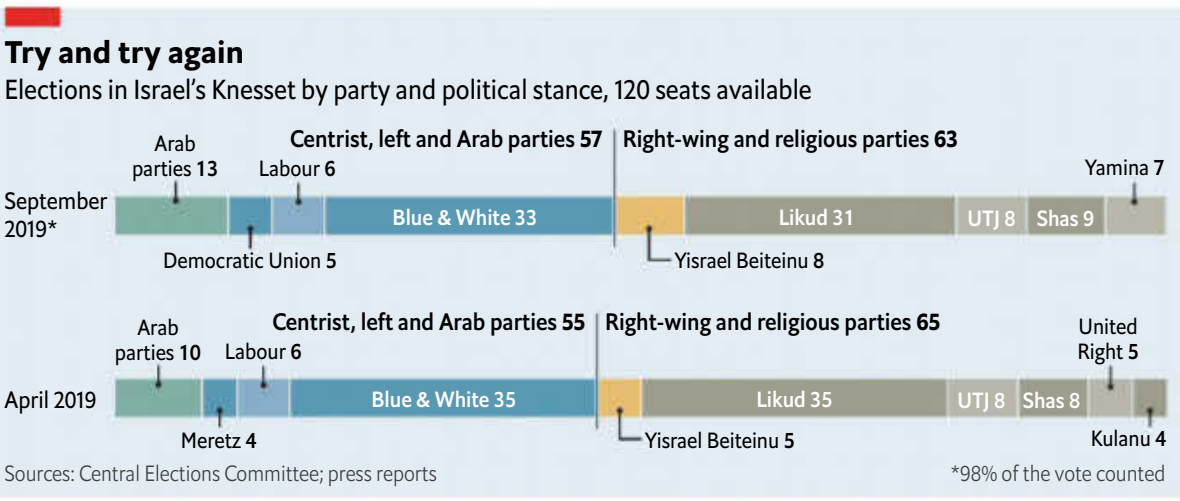
Start with Aramco's delayed IPO, which has tantalised investors since it was first announced in 2016. In April possible investors drooled over the figures in its first ever bond prospectus: Aramco's $111bn net income was almost twice that of Apple's, the world's most profitable public company, and larger than the earnings of ExxonMobil, Royal Dutch Shell, Chevron, Total and BP combined. Some also fretted that its production is much more dependent on a single country than its major competitors. Mr Nasser has sought to downplay such concerns, insisting that its production was reliable. But Aramco's vulnerabilities have been laid bare and this may be reflected in the valuation it attracts.

Oil traders are now looking for signs that Aramco's customers are seeking oil elsewhere, says Michael Tran of RBC Capital Markets, a bank. The biggest uncertainty is whether the conflict in the Gulf will escalate and remove millions of barrels of Saudi production from the market. Were that to happen it is not immediately clear what would replace it. ▸▸



Shale has made America the world's biggest oil producer, but Donald Trump cannot ramp production up and down because he does not control shale companies. If oil prices rise many shale firms would probably return cash to shareholders rather than boost output, says Chris Midgley of S&P Global Platts, an energy analytics firm.

All this points to uncomfortable realities for the world's two energy superpowers. Despite talk of America as a new swing producer, it is Saudi Arabia that remains the oil market's central banker, with its ability to dial production up and down quickly, helping to keep prices steadier. But markets can no longer ignore the threats to its supply. Meanwhile claims of American energy independence have never looked so hollow. Even with America set to become a net exporter of oil, it still imported 10m barrels a day last year, not least because shale produces light, sweet crude and many of its refineries need heavy, sour stuff. If oil prices rise elsewhere, they rise in America, too. Mr Trump claims that American "energy dominance" makes the country less likely to be entangled in conflicts abroad. It doesn't look that way. ■




Israel's election conundrum

# Down but not out

JERUSALEM

**Israel's prime minister will struggle to stay in office**

BINYAMIN NETANYAHU spent the last two hours of voting in Israel's general election on September 17th speaking through a camera to an online audience, begging people to come out and vote for Likud, his ruling party, before it was too late. "All the battles I fought as a soldier in an elite unit, all the battles I fought against a president of the United States [Barack Obama], all my other battles in Congress and at the United Nations—I did it for you. And now I'm asking you for something small. Go the polling station. It's only a five-minute walk."

As he wheedled and begged his voice grew hoarser. He took phone-calls from fans. Occasionally he stood up to gesture at a map of the Middle East on the wall, pointing to the menace of Iran. At one point, he mockingly showed puppets of his rivals. It was a bravura and sometimes bizarre performance of an embattled prime minister, frantic for every last vote. For the first time in over a decade he was staring at defeat. As the results came in, they confirmed that he had failed. Likud and the clutch of right-wing and religious parties backing him would lack a majority in the new Knesset.

On May 30th, seven weeks after the previous election, Mr Netanyahu took the unprecedented step of dissolving the Knesset to call for a second election, since he was just one seat short of a majority in the 120-strong parliament. Now he is short by six.

He had thrown everything at his foes. He had accused them of treasonous behaviour. He smeared Israel's Arab citizens with allegations of voter-fraud (Facebook briefly suspended a chatbot on his page after a message accused Arabs of wanting "to destroy us all"). He promised his right-wing base that he would annex chunks of the occupied West Bank. And he tried to enlist other world leaders, including Donald Trump and Vladimir Putin, to endorse him. But this time it wasn't enough. The man dubbed "the magician" for defying the odds to pull off improbable election victories had run out of tricks.

About 54% of Israel's voters picked parties opposed to Mr Netanyahu. Some are right-wingers who back many of Mr Netanyahu's policies yet refused to vote for Likud or its allies. This was a personal rebuff.

Ironically, a key constituency that helped bring him down was the Arab one, which he had tried to deter from voting with a law, which failed to pass, that would have let party officials film voters in polling-stations. The turnout of Arab voters rose by around ten percentage points. Their Joint List won three extra seats.

Mr Netanyahu has not yet had to concede. He will remain in office as a caretaker prime minister until a new government is sworn in. That can take months. Benny Gantz, a former general who leads the centrist Blue and White party, which is now narrowly the largest in the Knesset, lacks a majority too. Mr Netanyahu's assorted opponents do not share enough common ground to form their own coalition government. Many Israelis refuse to consider the Arab parties as legitimate coalition partners, though a growing number of Arab voters want to play a bigger role.

So Israeli politics looks deadlocked all over again. But there is a precedent for solving the conundrum. In 1984 neither Likud nor its main rival, the Labour party, could form a ruling coalition. Instead they agreed to a national-unity government with a "rotation" between Labour's leader, Shimon Peres, and Likud's Yitzhak Shamir, with each agreeing to serve two years of the prime minister's term.

This just might work again. Likud and Blue and White are nearly even in their tally of seats. Together they command a majority, which could be strengthened by a couple of other parties joining such a coalition. Mr Gantz is experienced in military matters, having commanded Israel's army, but is a political novice. He could benefit from working with Mr Netanyahu.

But big obstacles remain. On October 2nd Mr Netanyahu faces a pre-trial hearing before the attorney-general, which may herald criminal charges for bribery and fraud. Mr Gantz has promised not to serve under an indicted prime minister. Mr Netanyahu, however, hopes that by clinging to office he will be shielded from prosecution. Had he won even a narrow majority, he could have tried to pass a law granting immunity. That prospect is now fading.

A third obstacle to forming a national-unity government is the former defence minister, Avigdor Lieberman, a hardliner whose party, Yisrael Beitenu, broke last year with Mr Netanyahu's coalition. He is now refusing to back either candidate for prime minister without a promise to pass a bunch of laws that would enrage the religious parties, who are Mr Netanyahu's closest allies. Among these is a law that would conscript religious seminary students into the army. Another would force ultra-Orthodox schools to teach a national curriculum or lose state funding. And another would cancel a prohibition on shops from opening on the Sabbath, the sacred day of rest. Once notorious for vilifying Israeli-Arab citizens, Mr Lieberman can now be credited with bringing Mr Netanyahu down. As well as acting as kingmaker, he wants to establish himself as the champion of secular Israelis, who complain of the rabbis' excessive influence in politics.

But Mr Netanyahu is not going anywhere yet. Despite losing his majority twice this year and still facing indictments, he will try to stymie any attempt to form a coalition without him. He has yet to realise he is no longer the magician. ■

War in South Sudan

# Au revoir to arms

**Africa's bloodiest war has cooled. But even peace can be dangerous**

In July 2016 Riek Machar, a rebel leader who was then first vice-president of the world's newest country, fled South Sudan on foot. Fighting had broken out in the capital, Juba, between his forces and those of the president, Salva Kiir. Under fire from helicopter gunships, some 2,000 of his soldiers and their families walked more than 100 miles to Garamba National Park in the neighbouring Democratic Republic of Congo. By the time the UN evacuated the rebels from the park, some were so starved that they weighed less than 45 kilograms.

On September 9th Mr Machar returned to Juba for talks with Mr Kiir—the first time he had been in the country since his escape. South Sudan's civil war, which caused a famine and encouraged more than 2m people to flee, is winding down. Humanitarian aid, which had been all but blocked by fighting, is reaching most parts of the country. Could one of Africa's bloodiest wars be coming to an end at last? Maybe. But do not bet on it just yet.

South Sudan's conflict began in December 2013, just two years after independence from Sudan. It started with a dispute between Mr Machar and Mr Kiir, both veterans of the war with Khartoum, but quickly deteriorated into ethnic bloodletting. A first attempt at a peace deal, brokered in 2015 by Sudan with Western encouragement, led Mr Machar to return to Juba with his soldiers, who set up in a cantonment on the edge of the city. That deal held only until the following July. Mr Machar's flight in 2016 helped to spread the war, which had previously been mostly confined to the swampy north where he and Mr Kiir come from, to the Equatoria region, in the south of the country. Fighting still continues there despite the ceasefire elsewhere.

Diplomats hope that the new agreement will hold up better. The idea is that by November a government will be formed, with Mr Machar back at his post. It could then begin to organise South Sudan's first elections as an independent state. Those were supposed to take place in 2015, but have been put off every year, and are now scheduled for 2021. Mr Machar thinks that he may be able to win an election.

Many things could go wrong, however. Alan Boswell of International Crisis Group, a watchdog, wonders about Mr Machar's security in Juba: "How does a vice-president join a government when he is afraid of its army?" Under the proposals, a new joint VIP bodyguard will be formed that includes some soldiers from Mr Machar's forces (who are mostly Nuer, Mr Machar's ethnic group) and some from the government's (who are mainly Dinka, Mr Kiir's). Other rebel forces will be folded into a new, unified national army.

Ready for peace?

That looks worryingly like the failed deal of 2015, says Mr Boswell. With the two forces thrown together, a small argument could quickly escalate. And Yasmin Sooka, the head of the UN commission on human rights in South Sudan, warned on September 16th that children were already being forced to join armed groups of various sorts. The warlords are expanding their forces partly to prevent their enemies dominating the new national army and partly because a deal could lead to salaries being paid. Girls are being kidnapped to serve soldiers as cooks and sex slaves.

If there is any hope, it comes from bleak economic reality. South Sudan's conflict has been driven largely by money. Oil makes up 99% of the country's exports and provides a sizeable pot to fight over. On September 18th the Sentry, an investigative group founded by George Clooney, an actor, and John Prendergast, a human-rights lobbyist, published a report documenting the many ways in which South Sudanese politicians have stolen cash and diverted it to weapons and themselves. But oil output is down, and the government has already borrowed heavily against future revenues. Perhaps it is time for the warlords to give peace a chance. ■

Malawi

# When it rains

KAMWENDO

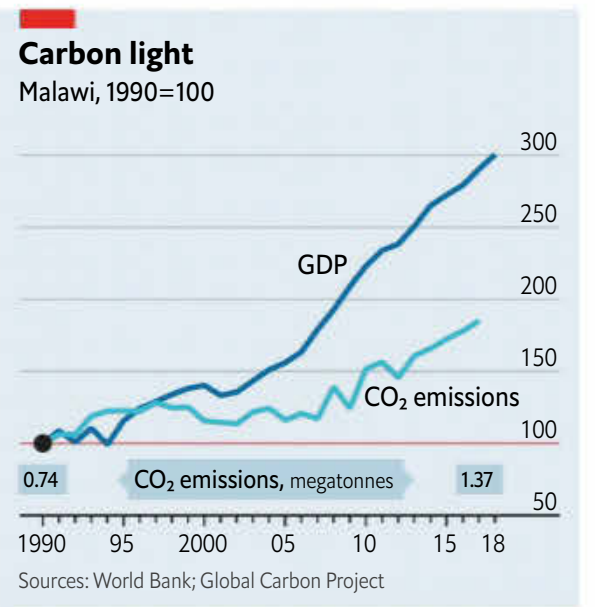
**How climate change makes it harder to reduce poverty in one of the world's poorest states**

Like most Malawians, Wema Kaloti lives off the land. She grows maize on her family plot in Kamwendo, a village in the south of the country. But farming is getting harder as rainfall grows erratic. "Sometimes a lot, sometimes a little," she says, glancing at the sky. Yields have dwindled. A hectare that once produced 20 sacks of maize now brings in seven. "There is not enough to sustain ourselves."

Malawi is one of the poorest countries in the world. GDP per capita is lower in just five others. Fully 71% of Malawians earn less than the international poverty level of $1.90 per day. Most of the labour force works in agriculture. Improving Malawians' lot, therefore, depends on making farming more productive or developing better ways of making a living. Both tasks are made more difficult by climate change.

Malawi is especially vulnerable to rising temperatures and erratic rainfall. Most farmers in the country are smallholders. Four in every five grow maize. Almost all of them rely on a single rainy season. If it is disrupted, their livelihoods are at risk.

And disruption is on the way. Research summarised by Future Climate for Africa (FCA), a research group, points to two trends. The first is rising temperatures. By 2040 there may be more than 100 days a year when the mercury rises above 30°C, a threshold at which maize suffers, compared with about ten days now. The second

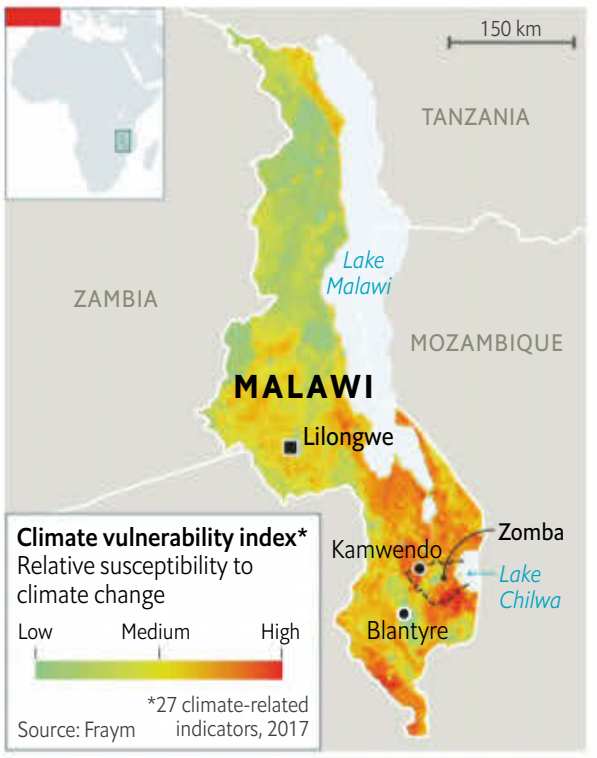


trend is that although there may be fewer rainy days in future, when it does rain, it is more likely to pour. This is a recipe for floods, droughts and shorter rainy seasons.

In 2015 both drought and floods occurred, and a year later further drought. Maize production fell by 30% in 2015, then by another 12% in 2016, when 6.7m people (in a country of 18.1m) needed food aid. In 2018 Lake Chilwa, in south-east Malawi, dried up completely. Residents of Chisi Island, in the middle of the lake, which was once the country's second-largest body of water, no longer needed to use canoes to reach the mainland.

In Zomba district, the region that includes the lake and Kamwendo village, climate change has had profound effects on the economy. Maize yields have slumped as the onset of the rainy season has moved from early October to mid-November. Rice fields near Lake Chilwa have flooded. Livestock farming has become harder with less water and feed. Around Lake Chilwa, the drying of the lake forced 7,000 fishermen to seek work elsewhere, mostly on Lake Malawi, which covers a fifth of the country.

It is not just climate change that is hurting farming. A growing population has meant dwindling farm sizes; today the average plot is 0.8 hectares, less than the area of a football pitch. Soils are being degraded because they are farmed too intensively and often by using damaging practices. Nearly 40% of agricultural land has soil that is too acidic for decent yields. Malawian maize farmers get only 11-28% of the potential yield from the crop, according to the World Bank. Widespread deforestation, often by desperate farmers who need to sell wood for extra income, has made it harder to manage water flows.




Some efforts are afoot to adapt to climate change while improving land management. In Kamwendo, Ms Kaloti is part of a "farmer field school" supported by the Food and Agriculture Organisation, a UN agency. Farmers like her are experimenting with faster-growing varieties of maize and growing banana trees in gullies to lessen the effects of floods.

At Lake Chilwa, Sosten Chiotha of the University of Malawi has been leading a similar project. Farmers have doubled yields by improving the soil through mulching and using seeds that can grow in a shorter rainy season. Tree-planting has helped to protect rice fields from drowning. Solar-powered fish-dryers have speeded the process of preparing the catch for market. Mr Chiotha has set up a "weather chasers" WhatsApp group to raise awareness of incoming storms.

There is, however, a danger that adaptation schemes will never be enough to help Malawian farmers escape poverty. "Ultimately there are too many small-scale farmers," says Pamela Kuwali of the Civil Society Agriculture Network, an NGO. She argues that the government—and aid donors who account for the bulk of public spending in many areas—need to do more to increase the 4% of farmland that is irrigated for commercial use. Instead, policy is a mess. A ban on exporting maize hinders trade in the crop. A fertiliser subsidy scheme takes up most of the spending on agriculture.

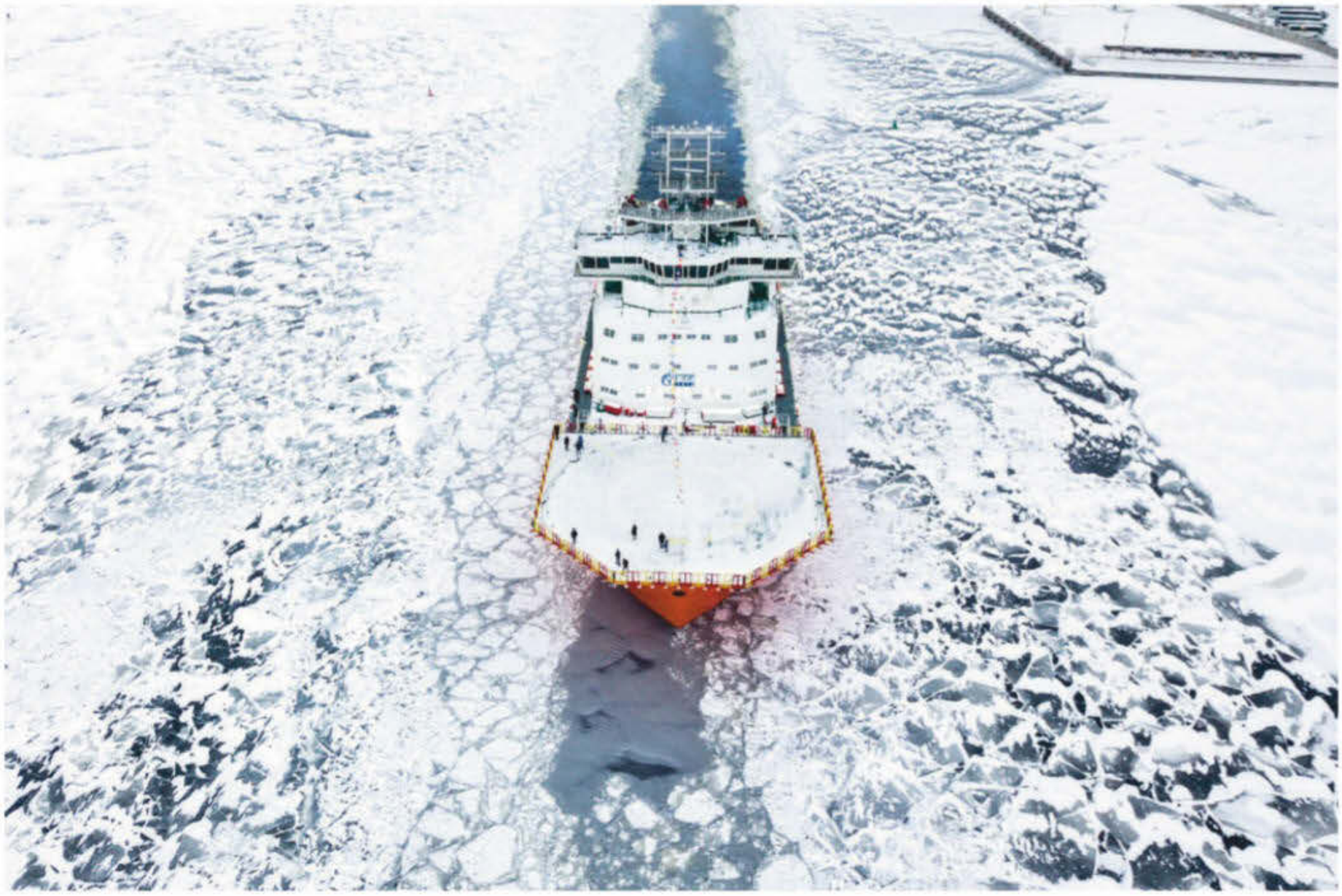
Irrigation would leave Malawi's farmers less at the mercy of the rains. But it has its own problems. Lake Malawi feeds the hydro-power stations that provide more than 90% of the country's electricity. In 2015 these stations lost two-thirds of their capacity because of droughts, leading to widespread blackouts. This hampered irrigation schemes as well as affecting businesses in the cities of Lilongwe and Blantyre. Malawi's power sector is "massively exposed to fluctuations in the lake level," says Declan Conway of the London School of Economics.

Mr Conway is one of the academics in the Future Climate for Africa project. It is trying to produce more accurate modelling of Malawi's climate, with the hope that it will help policymakers plan. But Mr Conway acknowledges it can be hard to get politicians to see climate change as an immediate threat.

One hope is that voters may push them to stop ignoring it. Afrobarometer, a pan-African outfit, says that the share of Malawians who are aware of climate change (78%) is the joint second-highest of the 34 African countries it has polled. A separate survey by Afrobarometer in 2018 found that 81% of Malawians said conditions for agricultural production were getting worse. Such views seem to correlate with poor opinions of the government.

Yet Malawians are not just angry at their government. "There is so much hypocrisy around climate change," says Isaac Ali, an official in Zomba. "Donor countries give us money to plant some trees, but they keep polluting." It is too much to expect Malawi to carry the burden for changes it did not cause, he argues. "They're using poor countries to cleanse their own sins." ■

**Where the fish once swam**



Climate change

# A warmer Russia

MOSCOW AND YAKUTSK

**No bad thing, reckon some Russians, especially in frozen Siberia**

FIRST CAME fires that turned the Siberian skies into a wall of solid smoke stretching for thousands of kilometres. Then came a drought that sucked the Lena river nearly dry, leaving boats marooned in the mud. It has been an arduous summer in Yakutia, an icy republic in Russia's far east. Add to that the fact that the regional capital, Yakutsk, stands upon thawing permafrost that warps roads and buildings, and climate inaction becomes hard to defend. "I've lived here my whole life, I remember what the winter used to be like, and what it's like now," says Sardana Avksenteva, Yakutsk's mayor. "I can confirm that global warming is a problem."

Some 1,000km (600 miles) to the north, on the republic's Arctic coast, the dying town of Tiksi would beg to differ. From its frozen vantage-point, warming has been a boon. Arctic sea ice is now receding at an alarming rate. In 1980 it covered 7.9m square kilometres (3m square miles) at its summer minimum, whereas last year it dipped to only 4.6m. So the Northern Sea Route (NSR) through once-impassable waters has emerged as a potential global shipping artery. The Russian government has pledged to direct some 735bn roubles ($11bn) over the next six years towards its development. The route holds the promise of cutting delivery times between Asia and Europe by weeks, compared with going by the much longer Suez Canal route—with Russia poised to take a healthy cut for helping the cargo through. Tiksi has seen a new military base go up. It is in the running for a 2.5bn-rouble port project.

This tension between catastrophe and opportunity has shaped the contours of the climate-change debate in the world's fourth-largest carbon-emitter. Russia has signed but has not ratified the Paris agreement, making it the only large emitter outside the pact (though President Donald Trump has said he intends to withdraw America from its strictures). It is not only the world's second-largest producer of oil and gas combined, it also possesses ice-locked coasts and a vast, underpopulated hinterland which, some argue, could use the boost brought by a few degrees of warming. At an Arctic forum in 2017, Vladimir Putin called climate change "a factor that bolsters optimism", adding that it "provides more favourable conditions for economic activity in this region". He once quipped that climate change would enable Russians to spend less money on fur coats.

Yet the downsides are proving harder to ignore, as Mr Putin himself acknowledged at a G20 summit this summer. Russia is warming more than twice as rapidly as the ▸▸

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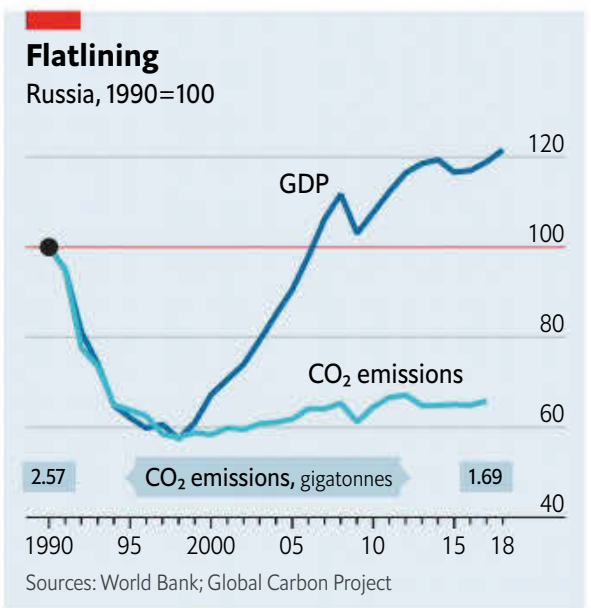
world's average rate, and is experiencing a full range of climate-change-connected calamities for itself. The Ministry of Economic Development has accelerated climate policymaking. A national adaptation plan is in the works, and bills introducing carbon taxes and other mechanisms to regulate greenhouse-gas emissions have also been drafted. Earlier this year, Russia's main industrial lobby dropped its opposition to the Paris agreement. Russia's companies "understood that they lose more by remaining on the sidelines than by joining," says Mikhail Yulkin, head of the lobby's climate-and-environment committee. The economy minister, Maxim Oreshkin, tells *The Economist* that ratification is in the works. Rumours say it may come this autumn, though probably not in time for the UN Climate Action Summit that opens in New York on September 23rd.

Ratification, though, will have minimal practical impact. Russia's emissions-reduction pledge for the Paris agreement uses as a benchmark its levels in 1990—a year before the collapse of Soviet heavy industry. This means that cutting emissions by 25-30%, which Russia promised to do by 2030, requires virtually no reduction from today's less industrial levels (see chart).

### Northern lights

There is little pressure from the citizenry to do more. Although 55% of the Russian population believes that humans are causing climate change, the number has changed little over the past decade, and climate change is on the periphery of Russian discourse. The worsening state of the environment came in ninth place when Russians were asked to name their main concerns, whereas concerns about the economy and corruption dominated. Even Russia's embattled opposition has ignored the issue: the manifesto of Alexei Navalny, its leader, does not contain a single mention of climate change. Although young people have come out in their thousands to protest against corruption, Arshak Makichyan, a 22-year-old violinist who launched the Russian branch of Fridays for Future, an international group of students demanding action against climate change, reckons that the movement has just 50-100 active members in Russia.




Russia's leaders, in turn, see decarbonisation as a prospect too distant to care about. The government's in-house think-tank reckons that global carbon-dioxide emissions will not decline until after 2040, and that the world's appetite for Russia's hydrocarbons will last that long, too.

If Russia goes greener, it may not be in a way that Western environmentalists will like. It has a flourishing domestic nuclear industry, and a well-stocked foreign order book. Mr Putin recently raised eyebrows with an attack on wind turbines over the harm they do to birds and, he said, worms. "They shake, causing worms to come out of the soil," he said. "This is not a joke." Instead, warmer temperatures tantalise with the prospect of easier access to natural-resource wealth, an expanded farm belt, a reduced winter heating bill, and tolls from the Northern Sea Route.

Yet those benefits are hardly certain. The number of ships taking the NSR remains a fraction of those taking more established paths, such as the Suez Canal; tapping its potential will require big investment. Though land in the north may become arable, it will be farther from the agricultural know-how, infrastructure and logistical base of traditional farming regions. Those established farmlands, meanwhile, will have to adjust the crops they plant and cope with ever more frequent droughts. "The bad will be there no matter what, while the good requires major efforts," says Vladimir Kattsov, director of Russia's Voeikov Geophysical Observatory.

Unstable weather patterns are already on the rise. In 2000 Russia's weather service recorded 141 "severe weather phenomena", which it defines as intense weather conditions—from heatwaves to heavy winds—that threaten human safety and can cause significant economic damage. Last year there were 580.

Frequent severe weather will trigger alarming consequences across Russia's vast territory, its environment ministry warns. Modern-day infectious diseases will spread and ancient ones may return, as thawing permafrost exposes old burial sites. Arctic infrastructure will crumble as the ground becomes softer. In Yakutsk, locals have already taken to calling one tilting nine-storey apartment block built on the thawing ice their own leaning tower of Pisa. The floods that have devastated the Russian far east in recent years will become more common. So, too, will forest fires like the ones this summer that struck Siberia. "Nature is sending us little signals," Ms Avksenteva says. Russia, and the world, would be wise to notice. ■

Spain's coming election

# Back to the ballot

MADRID

**Will a November election break or prolong political deadlock?**

"I'VE TRIED everything, but it was impossible." So said Pedro Sánchez, Spain's socialist prime minister (pictured), as time ran out this week on his efforts to put together a governing majority, thus almost certainly condemning Spaniards to vote again on November 10th in their fourth general election in as many years. Theoretically those efforts could drag on until September 20th. But his statement marked the start of a new election campaign. It was an attempt to shift the blame that other political leaders say attaches to him for a failure that has both personal and structural causes and from which few of them come out well.

Mr Sánchez's Socialists won the most votes in April's election, but with 123 seats (out of 350) fell well short of a majority. His options were limited from the outset by the refusal of Albert Rivera, the leader of Ciudadanos, a centre-right party with 57 seats, to contemplate any kind of deal. In clumsy negotiations in July, Mr Sánchez's team instead offered a coalition government and some plum cabinet posts to Podemos, a left-wing party with 42 seats. In an error of judgment that he soon regretted, Pablo Iglesias, Podemos's leader, turned this down. When negotiations resumed this month, the Socialists had withdrawn their coalition invitation, claiming that they had lost trust in their potential partner. A last-minute offer by Mr Rivera to abstain in the vote to install a new government if Mr Sánchez promised a harsher line against Cata- ▸▸

Italy

# Demolition man

ROME

**Matteo Renzi quits his Democratic Party just after it returns to government**

THE SWEARING-IN this month of a government yoking the populist Five Star Movement to the centre-left Democratic Party (PD) was a big relief to investors in Italy's volatile government debt and to others with a stake in the country's political stability. Among other things, the new alignment promised to keep the Northern League, a Eurosceptic and nativist party led by Matteo Salvini, out of office until at least 2023 when the next general election is due.

But on September 17th Italian politics were once more cast into commotion. Matteo Renzi, prime minister for almost three years until December 2016, announced he was leaving the PD to form a separate parliamentary caucus. That appeared to be his first step towards the foundation of a new centrist party along the lines of France's La République en Marche and Spain's Ciudadanos.

Mr Renzi called the incumbent prime minister, Giuseppe Conte, to assure him that the new group would continue to support the government. And it was soon apparent that a majority of Mr Renzi's followers in parliament intended staying in the PD. Until now, he has been able to count on the loyalty of more than half the party's 111 deputies and 51 senators. Yet only about 20-odd in the lower house and 13 in the upper were reportedly prepared to join him. Pollsters mused that, in an election, Mr Renzi's proposed new party would scrape only 5% or so of the national vote. Markets stayed calm, with the spread between Italy and German bonds increasing only fractionally.

The danger, though, is that Mr Renzi will soon have the means to strip the government of its majority. One assessment, which cheers the markets, is that this will enable him to impose moderate, business-friendly policies on the coalition. But another view, considerably more alarming, is that Mr Renzi, who stepped down as leader of the PD last year, remains hungry for power and will dispose of the government as soon as he believes it is in his interests to do so.

Mr Renzi, still only 44, once revelled in the nickname *rottamatore*, "demolition man". That was meant to reflect his energy, determination and reforming zeal. But the greatest destruction the former prime minister wreaked was on his own party, which split once before while he was in office. He may be about to complete the job.

lan and Basque nationalists smacked of a first blow in the blame game rather than a serious move.

Mr Sánchez's team reckons it will make gains in November. Opinion polls suggest that it may be right, that the conservative opposition People's Party (PP) will do well too, and that voters will turn against the three newer parties, Ciudadanos, Podemos and the right-wing Vox. Their emergence reflects public anger, first at the banking crisis and economic slump in 2008-13, and then at the illegal bid for independence by separatists in the Catalan regional government in 2017. As the political system has fragmented since 2015, the country has been condemned to a series of weak minority governments.

Spaniards generally like voting, perhaps because they were denied it for 40 years under General Franco's dictatorship. But their patience is being tried. The first risk for Mr Sánchez is that turnout drops sharply from April's 76%; lower turnout tends to hit the left disproportionately. The second risk is that the November vote merely prolongs the stalemate.

A strong, stable and reformist government is urgently needed. A robust economic recovery has slowed markedly this year. That is one reason the Socialists had second thoughts about Podemos: their putative coalition would have involved some attractive but unaffordable promises and Mr Sánchez would have been the bad cop who had to say no, says José Ignacio Torreblanca, a political scientist in Madrid. Next month the Supreme Court will deliver its verdict in a long-running trial of 12 Catalan separatist leaders for their part in the unconstitutional independence bid. If it metes out long jail sentences, civil disobedience in Catalonia may follow.

Many commentators long for Spain's political leaders to adopt the coalition habits of other European democracies. They have not done so partly because the party system is still in flux. "The main players have all been hyper-tactical," says a former official. "They are bad managers of tactics and are not measuring their words well."

Mr Sánchez got to the Moncloa palace through a mixture of obstinacy and daring, and by tacking left. But he has not handled the past few months well. The November election will be a battle for the centre. Its aftermath will require compromise if Spain's democracy is not to suffer more damage. ■

Albania

# Changing sides

KUCOVA

**Once part of the Warsaw Pact, Albania will soon host a NATO air base**

FLYING IN PERFECT formation, they wheel over the runway before touching down. For now these pigeons are the only ones making active use of Albania's Kucova air base. Not for long, though. Early next year heavy machinery is expected to be moving in to upgrade this otherwise silent air base into a NATO one. Seventy-one rusting and broken Soviet and Chinese planes will be evicted. "The glory days are coming back," says Viktor Vangjeli, aged 78, a retired MiG pilot.

Communist Albania had a formidable air force, but by 2005 safety concerns and a lack of cash meant that the last of its MiGs were grounded. In Kucova they sit forlorn on flat tyres. Lettering on fuel tanks recalls the 1970s, when engineers from China assembled the MiGs they had shipped here and when men like Mr Vangjeli trained there. Now the Albanian air force flies just helicopters. Kucova plays host only to occasional agricultural planes and a few military visitors. It remains open in case of emergencies.

A NATO team is deciding how it will invest around $50m in a first phase of upgrading the base. Albania has been a member of NATO since 2009, having left the Warsaw Pact in 1968 after years of disagreement with Russia. The plan is not for the alliance to have jets based there permanently, but for it to be an operational base for refuelling and for ammunition to be stored in its communist-era tunnels, origi-

Look on my works, ye mighty

nally built to house 100 warplanes.

In the 1970s the base employed 3,000 people, says its commander, Major Arqile Olldashi. Now the number is 110. That, plus the demise of communist-era industries, means that Kucova's population has plummeted from 20,000 to about 12,000. Still faintly visible is the first runway, laid by an Italian oil company in 1939. Locals hope that the restoration of the base will mean work for them. In its heyday an average of 25 flights roared in and out every day.

In 1999 NATO flew drones from the base during the Kosovo war. Even though it is a majority Muslim country, Albanians are ferociously pro-American, in particular because of American support for the Kosovars against the Serbs at that time. NATO officials downplay reports that they are worried about what the Russians might be up to in the western Balkans. But the hard cash they are plainly investing in Kucova implies otherwise.

Albania's military beef is being restored in other ways. A radar station partly funded by the Pentagon is being built in the mountains; from next year, it will plug black spots in NATO's Balkan surveillance capability. This, says Olta Xhacka, Albania's minister of defence, will make her country NATO's "eye in the region". ■

Germany

# Dirty, and not quick

SPREMBERG

**Germany's "coal exit" is pricey, complex and controversial**

THEY CAME in hi-vis jackets and anoraks, beating drums and blowing whistles as the rain pelted down, defiantly defending their dying industry. Perhaps a thousand miners and other workers turned out at the Schwarze Pumpe coal-fired power plant in eastern Germany on September 9th, presenting a boisterous welcome to visitors at a conference on the future of the local Lausitz region. In a clever stunt, they forced those attending to enter through one of two makeshift arches marked "2030" and "2038", signifying two possible end-dates for the use of coal in Germany. Anyone taking the first was roundly booed.

Next year Germany will miss its emission-reduction targets. Continued dependence on coal is one of the main reasons for this. The share in the electricity mix of brown coal (lignite), the cheapest and dirtiest sort, has remained stable for two decades. No country burns more of it than Germany. Last year the government assembled a commission spanning politicians, industry, scientists, activists and unions to get itself off the stuff.


This approach was designed to ensure common ownership of whatever proposals emerged. The commission's 275-page report, issued in January, commits Germany to end the use of coal no later than 2038, and pledges subsidies worth up to €40bn ($44bn) over 20 years for Germany's remaining coal-mining areas. Regular reviews will determine when mines must close, and owners will be compensated.

The compromise, not yet implemented in law, left everyone a little dissatisfied. Utilities murmur about supply insecurity; business lobbies fear rising energy prices. The biggest howls come from environmentalists, who want the closure advanced to help meet Germany's target of cutting emissions by 55% on 1990 levels by 2030.

A trip across the Lausitz, where a third of Germany's lignite is mined, helps explain why coal-workers find this hard to swallow. This remote rural region, straddling the eastern states of Saxony and Brandenburg, once provided East Germany with 90% of its electricity (today it supplies around 7% of Germany's power). The otherwise featureless landscape is pocked by the vast opencast mines from which lignite is stripped, and the lakes formed when disused ones are flooded. Fans of FC Energie, based in Cottbus, serenade their players with hymns to coal. But this sentimental attachment to coal, notes Johannes Staemmler at the Institute for Advanced Sustainability Studies in Potsdam, goes along with fear of change born from the ravages of deindustrialisation after German reunification in 1990, when most of the Lausitz's mines were shut down and tens of thousands lost their jobs.

Today there are no big employers in the Lausitz other than LEAG, the Czech-owned operator of the region's mines and coal plants. LEAG's three Lausitz plants, including Schwarze Pumpe, all sit among the top ten carbon emitters in the EU, but they also provide 8,000 well-paid jobs in a region not groaning with them, and thousands more indirectly. Such arguments helped local politicians secure €17bn of the promised €40bn. Plans to spend the cash have mushroomed, covering transport and mobile infrastructure, investment in R&D and the creation of government jobs. Christine Herntier, the mayor of Spremberg and a member of the coal commission, has her heart set on a state-of-the-art hydrogen plant at Schwarze Pumpe. Yet she too is losing faith, worried that federal funds will be spread too thinly, irritated that poor communities like hers must provide co-financing, and infuriated by turncoat greens.

When foreign competition devastated Germany's solar industry a few years ago, notes Felix Ekardt, head of the Research Unit Sustainability and Climate Policy in Leipzig, politicians simply shrugged and pointed to market forces. But private decisions are resented less than political ones. "People don't forgive the state if it removes jobs," says Jörg Steinbach, Brandenburg's energy minister. Two of the three remaining lignite regions are in the former East Germany, where old grievances have found new political expression. In recent state elections the populist Alternative for Germany (AfD) swept the board in Lausitz after campaigning against the planned closures.

Mr Steinbach remains optimistic. "There will be losers," he says, "but not many." Two-thirds of lignite workers are already over 45, which will limit forced redundancies, and the skills younger ones pick up are often transferable. Yet independent forecasts have shown how exposed the local economy remains to closures. In the Lausitz there are few other employment opportunities, as there are in the lignite area in the Rhineland. "Well-trained people will see their future elsewhere," sighs Wolfgang Rupieper, head of Pro Lausitzer Braunkohle, a pro-coal association in Cottbus. Like others, he grumbles about the efforts expected of coal when emissions from other sectors, like transport, have barely shifted since 1990.

Such concerns animated a broad package of climate-protection measures the government was due to unveil on September 20th. Chief among these was expected to be some form of carbon price, needed to ensure that the end of coal does in fact reduce overall emissions. The costly and complex commission approach fits awkwardly with more efficient emission-reduction strategies. Yet as other countries attempt to walk the line between protecting the climate and sheltering left-behind economies, they will be watching the German experiment closely. ■

# Charlemagne | Fade to brown

*Climate change is destroying ancient olive groves in southern Europe*

"THIS ONE has seen Napoleon," says Massimo Arsieni. "It has seen the world wars. It has seen everything. And soon it will be dead." He throws his arms around the fat, gnarled trunk of the olive tree. He means to emphasise its age, but could be clasping a dying relative. Mr Arsieni's family has owned these groves outside the village of Cellino San Marco since 1800. Though harvest season is drawing near in Puglia, in the heel of the Italian boot, the tree's branches are mostly bare and its remaining leaves are grey-brown. Its few olives are discoloured and weather-puckered. "A disaster," Mr Arsieni sighs. The olive groves that have encircled Cellino San Marco since ancient times are now turning into what locals call tree cemeteries.

The cause is a bacterium called *Xylella fastidiosa*. Carried by sap-sucking insects called spittlebugs, it arrived in the port of Gallipoli, near the southern tip of Puglia, in 2013. Olive farmers nearby started to notice that their trees were turning rust-brown. The bacteria start in the leaf-tips and work their way into the trunks, blocking the xylem (the water-carrying arteries) and preventing the trees from absorbing water. Eventually the trees die. "*Xylella* works incredibly fast," says Eugenio Arsieni, Massimo's brother. "If it gets to 10% of the tree, it will soon take over 80%." The drive to Cellino San Marco from the nearby port of Brindisi passes fewer healthy groves than infected ones, their tree crowns bare or patchy. Last autumn's olive harvest in Puglia, which supplies almost half of Italy's olive oil, was down 65% on the previous year. Over 1m olive trees in Italy are thought to have died already, and this spring the country came perilously close to running out of native olive oil altogether.

A reminder of the good old days hangs on the wall of the Arsieni family's olive-oil shop in the market square of Cellino San Marco. The aerial photo of the groves in 2017 shows a healthy green sea of trees. That year production was close to 100% of the normal amount, explains Eugenio. Last year it was down by 40%. This year the loss will be more like 70%, he estimates. On a hike around the family's land he points to one avenue of skeletal trees: "Last year these were all green." Olive oil is the blood of Cellino San Marco. An olive tree features on the village's crest, and locals traditionally test whether they have received the evil eye by putting three drops of oil into a bowl of water and observing the shape they make. Today that world is vanishing. Some farmers are simply abandoning their land and emigrating; to Australia to restart their farming careers, or to northern Europe to work in coffee shops. Pugliese olive presses are being sold off to producers in north Africa.

The speed with which *Xylella* has taken hold in Puglia has astonished scientists as much as farmers. Its spread prompted the EU to require Italy to create a buffer zone—with susceptible trees destroyed and spittlebug-friendly grasses cut—but implementation has been slow. The bacterium has continued to move north. In recent months traces have been found in other parts of Italy, such as Tuscany, and on September 6th France's Ministry of Agriculture confirmed that *Xylella* had been detected in two olive trees on the country's Mediterranean coast. Vytenis Andriukaitis, the European commissioner for health and food safety, calls this "the biggest phytosanitary crisis confronting the EU for many years."

### Nature versus nurture

Climate change is not the root cause of the *Xylella* outbreak; it was probably introduced by an ornamental plant from Costa Rica. But it appears to explain its drastic spread. In recent years Puglia has experienced a series of extraordinary weather events, including uncommonly harsh summer droughts, spring frosts in 2017 and hailstorms earlier this year. Winters have been cold enough to weaken the trees, but not cold enough to kill the spittlebug populations. Riccardo Valentine of the Euro-Mediterranean Centre on Climate Change has argued that these extreme events have made the olive trees vulnerable to the bacterium. Climate change also helps to explain *Xylella*'s northward spread: Martin Godefroid of the French National Institute for Agricultural Research and others have shown that "climate change may strongly impact the distribution" of *Xylella*, with milder winters making this tropical bacterium viable far north of its natural habitat.

The story in Puglia is not untypical. Climate change is destroying, or contributing to the destruction of, ancient olive groves across southern Europe. Unusually hot summers and heavy rains in Greece have produced surges in the olive-fly populations; the harvest there is expected to be down 35% this year. In Portugal droughts have also reduced yields. In Spain, yields are up but water shortages threaten whole regions in the medium term.

So while the EU treats Puglia as an exception, a place to be quarantined, the region typifies wider trends. Centuries-old agricultural firms are going out of business. Nature is being thrown out of balance. And locals are having to decide whether to fight against change or to work with it. Elsewhere in Europe that means a choice between building dykes and giving up land to the sea, or between continuing to grow hops and switching to vines. In Puglia it means the choice between anti-*Xylella* interventions and adaptation to it. Examples of the former are plentiful—signs all over Brindisi airport warn that taking plants out of the affected zone is "STRICTLY FORBIDDEN"—but ineffective. "You can't stop *Xylella*, you can only live with it," says Massimo Arsieni. He mourns his family's ancient olive trees. But without a cent of help from the EU he has planted 25 hectares (60 acres) of new olive trees of the leccino and favolosa varieties, whose broader arteries are less prone to *Xylella*'s water-restricting effect. For him, adaptation is the answer. "Look," he says, holding out a handful of plump, shiny olives from the new generation of saplings. "This is the future." ■

open future festival 2019

# Congratulations to the winner of our youth essay competition

***What fundamental economic and political change, if any, is needed for an effective response to climate change?***

**Winner**

**Larissa Parker, 25**
**Montreal, Canada**

## Give future generations legal rights

"FOR THE most part, only current generations have legal standing to sue; and to do so, they have to prove the impacts that they have experienced or are experiencing. This is problematic in the context of climate change because the effects of greenhouse-gas emissions take decades to manifest themselves.

One solution is to recognise the rights of future generations to a healthy environment, which would open the door for lawsuits on climate inaction and keep governments accountable to their commitments under international law. If a government does not take sufficient action on climate change now, then it is ... violating their rights to a healthy environment."

**Read the full essay at Economist.com/essaywinner**

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Our thanks to the nearly 2,400 entrants, including the finalists.

SHORT-LISTED FINALISTS: Gonzalo Fernandez-Codina, Daevan Mangalmurti, Sanaa Mariam, Jeremiah Milbauer and Hank Sparks

LONG-LISTED FINALISTS: Denzel Chung, Tomas Green, Nicholas Hulbert, Hassam Khattak, Hannah Kirk, Antje Lang, Emily McDermott, Joanna Nowinska, Olga Okhotinskaya, Toure Owen, Drew Pendergrass, Jacob Smessaert, Prakhar Tripathi and Emanuel Zbeda

Wind power

# The experiment

HULL

**Lessons from the world's biggest offshore-wind market**

ABOUT EVERY seven days, turbine parts are loaded onto a giant ship in Hull docks: blades measuring 75 metres (250 feet), 90-metre-high towers and 400-tonne nacelles, the masses of steel, fibreglass and gears that together transform wind into power. The ship brings its cargo 120km into the North Sea, where foundations wait in the waves. Workers erect four wind turbines, then the ship returns to shore for more parts. In the next few weeks installations for the Hornsea One project will be completed, with 174 turbines dotted across 407 square kilometres of water. It will be the largest offshore wind farm in the world. Hornsea Two, already planned, will be bigger still.

Britain is already the world's largest offshore wind market. Last year turbines planted off its coasts had eight gigawatts (GW) of capacity, about a third more than the next-biggest market, Germany. That number is due to jump. In 2030 Britain will have 30GW of offshore wind capacity, forecasts BloombergNEF, an energy data firm, second only to China, which is set to zoom ahead (see chart on next page). Britain's Committee on Climate Change expects investment to continue, with offshore wind a crucial part of the government's efforts to achieve net-zero emissions by 2050.

To some, Britain proves how government can spur the rapid deployment of clean technology. To others, it shows the cost of meddling in power markets. Both assessments are correct.

Governments around the world are seeking to slash emissions from electricity generation, a task made more urgent by the shift to electric cars. Offshore wind has natural appeal. The wind blows at night and in winter, complementing the power from solar panels. Place turbines in the sea and you also dodge the NIMBYs who detest them on land. Even so, offshore wind's global capacity is about one-twentieth that of onshore wind or solar. The main reason is that, until very recently, it was extremely expensive.

Yet Britain has seen a boom. That is due in part to geography, with high winds and shallow seas, and in part to policy. Britain's push for renewable power gained steam in 2008, when the Climate Change Act required greenhouse-gas emissions in 2050 to be at least 80% below their level in 1990. Politicians have favoured offshore wind, funding research and a giant facility in Northumberland to test blades. Most important, however, has been subsidy.

The government decided to provide more financial support to early large-scale wind farms, such as the London Array off the Kent coast, completed in 2013, than to onshore wind or solar. Offshore wind was capital-intensive and immature, the logic went, so needed help. In 2013 ministers authorised competitive auctions for low-carbon power. Companies bid to supply electricity in 15-year contracts and the government pays the difference between the bid price and the market price. Since 2015, those auctions have excluded onshore wind and solar.

Long contracts gave companies the certainty to invest. Siemens Gamesa, which is making the turbines for Hornsea One, decided in 2014 to build a blade factory in ▸▸

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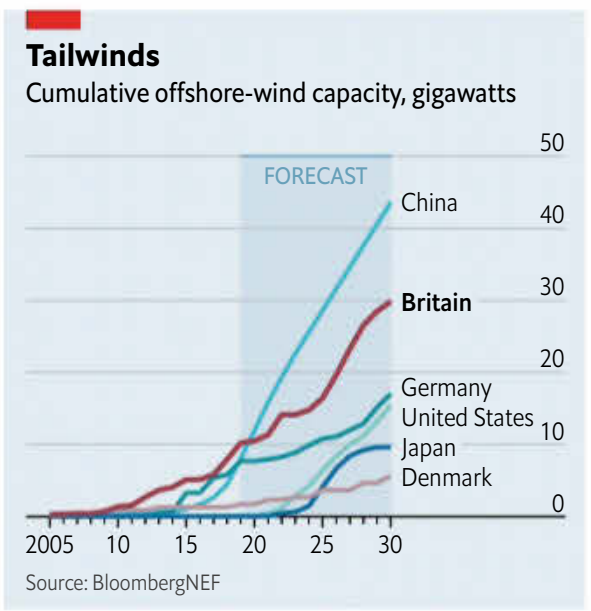



Hull. "We could see there was volume coming," explains Clark MacFarlane, who runs the company's British business. Siemens will build longer blades in Hull for Hornsea Two, so more power can be generated from fewer turbines, lowering installation costs. The new turbines' diameter will be 167 metres, 40% wider than the London Eye.

The rest of the industry has matured, too. Orsted, a Danish firm that is now the world's biggest offshore-wind developer, cut its teeth in Britain. In 2014 it won contracts to build three big wind farms, including Hornsea One. "It allowed us to start industrialising the way we built," says Henrik Poulsen, the firm's boss. Orsted made bulk purchases of turbines and cables, and refined each stage of development, from site planning to maintenance.

By some measures, results have been a big success. In the past decade offshore-wind capacity in Britain has grown 20-fold, meaning it now comprises a quarter of renewable generation. The lowest price secured in the first round of auctions, in 2015, was £114.39 ($142) per megawatt hour (MWh). In 2017 the cheapest projects, including Orsted's Hornsea Two, won with bids of just £57.50. The next contracts are expected to be announced on September 20th. Other countries, including America and Taiwan, now have their own plans for offshore wind, benefiting from the expertise that companies honed in Britain.

Even so, big questions loom. In March the government announced an agreement with the offshore-wind industry that it hopes will amplify its economic impact. The government will hold auctions every two years. In return, it said, "we expect the sector to continue cutting costs, committing to lower their impact on bill-payers, while investing in and driving growth in the UK's manufacturing base."

Offshore wind has produced factory jobs, as at the plant in Hull. But it is not clear that creating British manufacturing jobs advances the aim to lower power prices, given Britain's relatively high labour costs. Richard Howard of Aurora Energy Research, an analytics firm, points out that the country has expertise in building and servicing wind farms, as well as exploring technical problems through research. Britain "doesn't tend to have a comparative advantage in making things—it tends to have a comparative advantage in making knowledge."

The debate over costs may escalate, too. In 2017 Dieter Helm of Oxford University wrote a scathing review of Britain's energy market, pointing out that consumers were paying high prices even as the cost of renewables plunged. He named lengthy, generous offshore-wind contracts as a principal culprit. Orsted agreed to build Hornsea One for £140 per MWh, about three times today's wholesale price. Last year environmental policies accounted for a fifth of consumers' electricity bills, according to Ofgem, the energy regulator. Mr Helm argues that an economy-wide carbon price would help the country choose the cheapest power with the lowest emissions. Instead, he says, "we make those choices by protecting different technologies."

As Britain aims for net-zero, it must also grapple with the broader challenge of balancing the grid. This year the Committee on Climate Change suggested that offshore wind capacity may reach a staggering 75GW in 2050. That would require about 180 of today's biggest turbines to be installed in each of the next 30 years. Generating that much more power from intermittent sources will need investment in technology that does not yet exist, including batteries that can store power for weeks.

The current state of the grid does not inspire confidence. Lightning strikes on August 9th contributed to halting operations at Hornsea One and a small gas plant, causing a power-cut. The blackout illuminated broader problems in Britain's electricity system that will need to be resolved as it tries to decarbonise. The government was due to publish an energy white paper this year to deal with such questions. Amid broader political turmoil, the paper, like so much else, has been put on hold. ■

Abstemious students

## Tequila crammers

PORTSMOUTH

**Once the centre of campus life, university bars are calling time**

TO THE DISAPPOINTMENT of Molly, a 19-year-old at the University of Portsmouth, the Waterhole Bar is no more. "I enjoyed pre-ing in there with friends," she sighs. "We'd get together, have a few snakebites, get hyped." Access was restricted to students, meaning it felt safe. Karaoke Fridays were fun. But students were recently told the bar would be replaced with a "vibrant, student-centred and social-gathering space".

In a pre-mobile-phone era, university bars were a place to bump into people you knew and enjoy cheap drinks. Brewers sold booze at below cost price to get students hooked on certain brands. No longer. Abertay, in Dundee, has also closed its bar. Chester and Coventry have transformed theirs into "events spaces". Many have already become places which offer not just alcohol but also pizzas, coffee and laptop charging, notes Jim Dickinson of Wonkhe, a think-tank.


**Swots do shots**

In the 2000s pubs began competing harder for students' custom, taking business away from university bars. And young people are drinking less. Three in ten 16- to 24-year-olds are teetotal, up from two in ten in 2005. Many of those who indulge will pre-drink at a friend's flat, rather than a bar, before heading to a club. To stroll through Portsmouth's campus in freshers week is to be bombarded with information about nights out: Dirty Disco (drinks: £1.50, or $1.90), Connection ("indie, retro and electro alternative") and the Eskimo Project ("the club so big it requires 2 venues").

Ben Archer, a third-year student, stayed away from the Waterhole. "It was quite grim, it didn't smell great," he recalls. College bars were not the best places to induct foreign students—who make up 14% of undergraduates—into British drinking culture. And the culture has anyway been watered down, says Ian Dunn, Coventry University's provost. "Students are more serious about study," he explains. "The library is full."

# **Bagehot** | A counterfactual Cameron

*This week David Cameron published his memoirs. Here we print an extract from the book he might have written had he won the referendum*


A FRIEND ONCE asked Margaret Thatcher what she would do differently if she had her time again. After a pause for thought, she replied: "I think I did pretty well the first time." I don't feel quite the same way. I was wrong to withdraw Conservative MEPs from the European Parliament's centre-right alliance. I was wrong to surround myself with so many chums from school and university. On reflection the "Big Society" contained too much hot air. But I do pride myself on one thing: I left behind a country that was far more at ease with itself than the one I inherited.

The reason for this was the defining act of my career, the Brexit referendum of 2016. After the result was announced, the pundit class assured me with one voice that I didn't deserve any credit for doing the blindingly obvious. "Mr Cameron was confronted with an open goal," the *Times* editorialised. "All he did was kick the ball." These were often the same people who, before the vote, had informed me that I risked unleashing monsters. I can only say that the referendum didn't feel like an open goal at the time. The campaign tore the country apart and strained some of my closest friendships. And the result was worryingly close. I sometimes torment myself, in my more masochistic moments, by imagining what might have happened had it gone the other way!

The fever of Euroscepticism eventually broke and Britain entered its current age of Euro-contentment. Nigel Farage moved to America for a gig with Fox News and a slot on the speaking circuit. I'm told that he has built quite a place in southern Florida—a mock-Tudor mansion complete with red telephone boxes and a working pub serving real ale, pie and mash. With his guiding hand removed, the UK Independence Party was captured by people who were so nauseating and ill-disciplined that membership collapsed. The *Daily Mail* was the only big-selling newspaper to continue to champion the lost cause and, after a particularly foam-flecked leader about "the traitor in Downing Street", Viscount Rothermere stepped in to replace Paul Dacre with Geordie Greig, a sensible man as well as a good friend.

What went unreported at the time was that the death of Euroscepticism also took a lot of work on my part. A good chunk of the Tory party had campaigned for the losing side. Millions of good people had voted to leave, not because they were fed up with Europe but because they were fed up with Britain. I tackled the Tory problem by forgiving the most talented Leavers, such as Boris Johnson and Michael Gove, while simultaneously marginalising the irreconcilables. New MPs only have to look at the desiccated hulks of Iain Duncan Smith and Jacob Rees-Mogg lounging in the parliamentary tea-room to know their fate if they step out of line. I dealt with the problem of the left-behind by announcing the end of austerity at the 2017 party conference and encouraging Boris, as business secretary, to make revitalising the north and the Midlands his priority—or, as he put it, a matter of "do or die".

I also threw myself into the European issue in a way that I'd never done before. I learned two things from the frustrating renegotiations leading up to the referendum. First, you can't be a part-time member of the club—you have to put in time sitting on the committees. Second, you can't underestimate the inflexibility of transnational bureaucrats. I kept up the pressure, ably assisted by Sir Ivan Rogers, agitating for the completion of the single market in services and issuing blood-curdling warnings about what would happen if they didn't rethink freedom of movement. My position was enormously strengthened by Britain's close relations with America, and my personal rapport with President Clinton (thank goodness she beat that charlatan calling himself "Mr Brexit").

I hope I'm not showing my colleagues any disrespect when I add that my greatest helper was not anybody on my side. Jeremy Corbyn is the gift that kept giving: an antediluvian leftist with noxious views and even more noxious friends; a dim bulb who prefers working on his allotment to mastering his briefs; and an old man in what, on our side at least, is a young man's game (I'm 17 years his junior and I was one of the oldest members of our cabinet). At one point the fanatic was even overheard muttering "Fuck business." Tony Blair used to say he felt physically sick while preparing for prime minister's questions against William Hague. I came to look forward to my weekly duels with the Steptoe of Islington.

Thankfully, from my perspective, Corbyn was good at just one thing—clinging onto power. He packed Labour's executive committee with crazies and cronies. He introduced a programme of "rolling deselections" to weed out moderates. (One of the things that makes me proud to be a Conservative is that we would never stoop to deselecting MPs.) The more unelectable Labour became, the more Corbyn and his Stalinist controllers were entrenched in power. A tragedy for the country but a godsend for my party.

**But yet so far**

Political obituarists like to quote Enoch Powell's melancholy observation that "all political careers...end in failure". I'm fortunate to have escaped that fate. The past few years have been heady ones. I don't for a minute regret breaking my pledge not to stick around for a third term. The election victory in 2020 exceeded our wildest expectations. The Tory party is now everything I dreamed of all those years ago in Notting Hill—a national party with MPs in every corner of the country, from Scotland to inner-London, and a thoroughly modern programme. The EU has at last caved in on freedom of movement. And although I will miss Downing Street, in Ruth Davidson the party now has an ideal new leader. I know that Boris had a good claim to the job—and he has made clear that he is annoyed at being gazumped by a newcomer to Westminster—but the party rightly decided that a second Bullingdon boy in a row would be a mistake. Ruth is just the right person to carry on the work of modernisation, consigning Scottish nationalism to the dustbin of history in the same way that I saw off the madness of Brexit. ■

Small islands and climate diplomacy

# Nothing so concentrates the mind

**On the front line of climate change, small island states have had an outsized influence on global policy. Yet many still face extinction**

WHEN HURRICANE DORIAN rolled across the Abaco islands on September 1st, packing winds of 300kph (185mph) and bringing sea surges of nearly eight metres (26 feet), it was as powerful as any Atlantic storm ever to have hit land. The destruction it wrought was devastating, the death toll said to be "staggering". Dorian's ravages have drawn attention to the vulnerability of small islands. It is, laments James Cameron, head of the ODI, a development think-tank, "a vision of the future".

The fear is that climbing global temperatures will bring more extreme storms and rising sea levels which threaten the very existence of small island states and low-lying coastal regions. They are vulnerable not only to violent weather but also to loss of livelihoods as farmers and fishermen feel the effects of warming. Eventually whole islands may be submerged. More than half of the territory of the Maldives is less than a metre above sea level. "We are most impacted and we are continuously leading the way by example, advocating and persuading others to increase ambition on addressing climate change," says Thilmeeza Hussain, the Maldives' ambassador to the UN.

Small island developing states (SIDS) account for less than 1% of the world's GDP, territory, population and greenhouse-gas emissions. On most issues their voice barely registers on the world stage. Yet on climate matters they have, over three decades, become an effective lobby.

Mr Cameron was one of a small group of young British lawyers who helped them come together. In 1988 he wrote a legal opinion for Greenpeace on whether the United States could be taken to the International Court of Justice for its failure to act on climate change. He concluded that such a case would be hard to bring as America would refuse jurisdiction for it, but that the arguments for state responsibility based on the evidence could and should be made in an international treaty. Along with the most affected states, he and others pushed for one. This led to the formation in 1990 of the Alliance of Small Island States (AOSIS).

By the Earth Summit in Rio de Janeiro in 1992 Mr Cameron had his treaty—the UN Framework Convention on Climate Change. AOSIS had grown to more than three dozen members and gained recognition as representing a distinct set of interests. Today, its 39 full members and five observers are spread across three regions (the Caribbean, the Pacific and a group straddling the African, Indian and South China seas) and include some low-lying coastal countries, such as Belize and Guyana. Individually, they have limited means: when Fiji presided over the annual global climate gathering in 2017 it had to be held in Bonn. But their collective influence has been big.

"AOSIS put the climate crisis on the map, way before anyone else was taking it seriously," says Mark Lynas, a writer and adviser to the Maldives' government. Island states were the first to feel the impact of rising sea levels. They risked being drowned by richer nations' carbon emissions—and they told those countries so. "They've been incredibly successful in changing the tone and influencing policy," says Mr Lynas.

They have managed to get wording included in climate accords that addresses their specific concerns—on losses and damages from climate change, for example, or on their need for financial support to adapt to it. In the Paris agreement of 2015 the inclusion of an aspiration to restrain global warming to 1.5°C above pre-industrial levels (going beyond the target of 2°C) was "almost entirely down to SIDS and other developing states", according to Mr Lynas. More generally, the island states have

offered an example of getting organised and pushing for international collaboration, in an area where joint action is the only way to make a difference.

On September 27th a whole day is to be devoted to the SIDS towards the end of the UN General Assembly in New York. Leaders will review progress of the SAMOA Pathway (short for SIDS Accelerated Modalities of Action Pathway), a blueprint for sustainable development which happened to emerge from a summit in Samoa in 2014.

Why the outsized impact? The SIDS have three things going for them. One is focus: survival concentrates the mind. Ms Hussain, of the Maldives, estimates she spends 70-80% of her time on climate-change and sustainable-development issues.

Second, their moral argument packs a punch. The islanders have been skilled at pointing to the peril they face, with catchphrases such as "Save Tuvalu, save the world" and "1.5 to stay alive". Shortly before the Copenhagen climate summit in 2009, the Maldives' government held a cabinet meeting under water.

Island leaders do not mince their words. Take the recent summit of the Pacific Islands Forum in Tuvalu. Australia, one of the group's 18 members, insisted on removing references to coal in the final declaration and on softening the language. Tuvalu's prime minister, Enele Sopoaga, chided his Australian counterpart, Scott Morrison: "You are concerned about saving your economy in Australia...I am concerned about saving my people in Tuvalu." Mr Sopoaga reported that during the meeting Tonga's prime minister, Akilisi Pohiva (who died this month), "actually cried".

Third, crucially, the SIDS have strength in numbers. Together, they are about a third of all developing countries and a fifth of UN members. That gives them ample speaking time and voting power in the UN.

Kevin Conrad, who became an activist after seeing beaches disappearing at home in Papua New Guinea and now heads the Coalition for Rainforest Nations, recalls the drama of the Montreal climate summit in 2005. More than 20 countries spoke in support of greater efforts to reduce greenhouse-gas emissions that America was resisting. The momentum worked: "Building broad coalitions is what wins," he says.

Mr Conrad was involved in more drama two years later, at the UN climate conference in Bali. Once again, America was holding out against the consensus, this time for a plan for a new climate treaty. Speaking as Papua New Guinea's representative, Mr Conrad addressed the United States: "We seek your leadership, but if for some reason you're not willing to lead, leave it to the rest of us; please, get out of the way." He was cheered. In a moment that has gone down in climate-diplomacy lore, America soon announced it would join the consensus.

There is no chance of a similar moment at the UN secretary-general's Climate Action Summit in New York on September 23rd. President Donald Trump is not about to reverse his decision to take America out of the Paris agreement. But the island states are still hoping to make a splash in New York next week, and have put together a "SIDS package" to be presented there.

For a start, they want to highlight the need to heed the warnings from the Intergovernmental Panel on Climate Change (IPCC) on what is required to limit global warming to 1.5°C. In a report published last October the IPCC stressed the difference in terms of impact between capping warming at 1.5°C and letting it rise to 2°C; drastic action would be needed over the next decade to have any hope of achieving this. The islanders are calling for scaled-up ambition. They hope to see the bigger carbon-emitters publicly accepting the IPCC's report.

They also want to show how bold action can be taken. "SIDS have absolutely nothing to do with this mess that we're in with climate change, we have contributed the least, and yet we want to proceed by example," says Lois Young, the UN ambassador of Belize, which this year took over from the Maldives as chair of AOSIS. They aspire to shift to 100% renewable energy and map a path to carbon neutrality. The Marshall Islands have led the way in submitting a plan to become carbon-neutral by 2050.

### No island is an island

Such plans are costly, as is investment needed in things like reinforced harbours and desalination plants to adapt to the climate changes the island states are already seeing. So mobilising finance is another priority. The SIDS complain that the money pledged to date is inadequate and often tied up in red tape. In New York, they want chunky commitments from big countries.

Impressive as their diplomatic efforts have been, however, the island states face further struggles. Keeping the world's attention is not easy. Belize has been scrambling to persuade world leaders to attend the SIDS day on September 27th. Climate outrage has spread, and other groups of countries have piled in. For the island states the broadening of climate concern is welcome but means their own leaders are less often the go-to spokespeople.

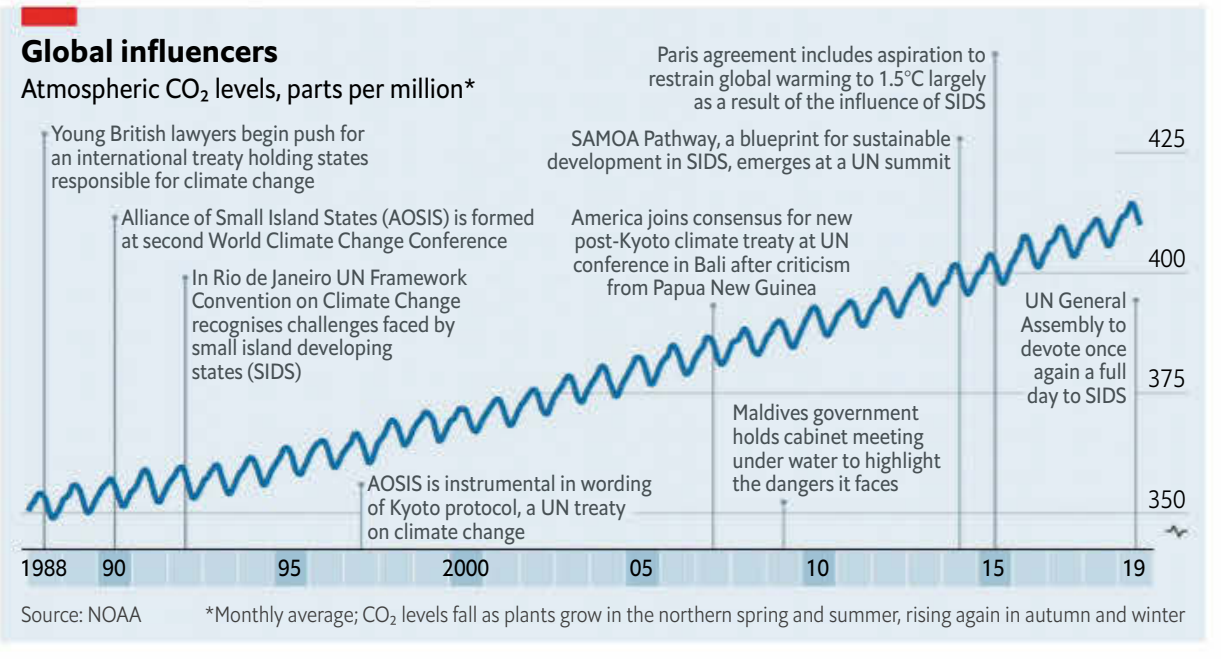
AOSIS remains largely united in its message and strategy. But its members are affected by climate change in different ways so divisions can arise. Advisers who push for climate radicalism and those who give priority to getting things done for development do not always see eye to eye.

Nor is it clear that the island states are winning the diplomatic fight. Apparent victories in public forums can get beaten back in subsequent bureaucratic battles. As the spat with Australia in Tuvalu shows, and as arguments ahead of next week's review of the SAMOA Pathway also suggest, the island states still find themselves having to argue over language that reflects the scale of action needed.

Above all, the threat has not gone away. In the long term, extinction still beckons since the world has done far too little to curb greenhouse-gas emissions. "Adaptation can only go so far when your nation is going under water," says Mr Lynas of the atoll countries. If the moral case does not work, some say, it is time for a new strategy, for example embracing radical technologies such as climate engineering.

Failing that, for some small island states the future may involve negotiating with countries that can offer higher land to move their people to, or trying to defend rights over territorial waters whose boundaries were drawn based on land that has become submerged. AOSIS could find itself back where it began—with lawyers.

Hence the urgency in the run-up to the sessions in New York next week. At stake is the islands' future—and much more. According to Janine Felson, Ms Young's deputy and Belize's technical lead for AOSIS, "we have a very small window of opportunity to make a very big shift." ■



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Climate capitalists

# The not-so-dirty dozen

NEW YORK

**Some tycoons are putting serious money into climate-friendly investments—and expect serious returns**

BETS ON CLEAN technologies have ballooned this decade. Over $2.6trn has flowed into low-carbon energy alone since 2010, according to BloombergNEF, a research firm (see chart 1 on next page). Now that some ventures have soured, after green subsidies grew stingier around the world, many investors are thinking again.

Many, but not all. A clutch of industrialists and entrepreneurs are doubling down. *The Economist*'s unscientific survey has identified 12 with notably climate-friendly dispositions, and a combined net worth of $200bn (see chart 2). Some, like Elon Musk, Bill Gates and Michael Bloomberg, are household names. Others are little-known outside their industry. Their wagers cover mature technologies (electric cars, wind turbines), fast-maturing ones (high-voltage grids, meatless burgers) and out-there ideas (turning carbon from the air into useful stuff). All want to do good by the planet. Most expect to do well for themselves.

The world's most prominent green mogul is Mr Musk. Having made a killing with PayPal, an online-payments firm, he ploughed some of his fortune into Tesla. The carmaker is in trouble; last year it lost roughly $1bn. But it has turned electric vehicles from an unsightly curiosity (think G-Wiz) first into an object of desire, then, with its mass-market Model 3, into something reassuringly ordinary. Production of the Model 3 has hit snags. But no big car firm can today go without its own EVs.

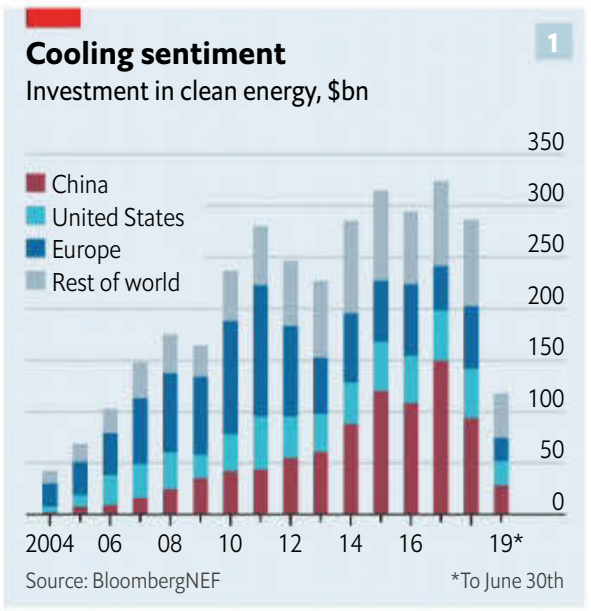
Mr Musk has also put billions into batteries, for Teslas and to balance the electric grid. The minerals inside them are the preserve of our second tycoon, Robert Friedland. His brash style and early mining investments earned him the nickname "toxic Bob" from the press. But his investments in battery metals, made through holdings like Ivanhoe Mines, make him look greener today. He is digging up cobalt and nickel in Australia, and developing what could be the world's second-biggest copper mine in Africa. His joint-venture with Chinese investors is working on metal sulphates for lithium-ion cells.

Wang Chuanfu is the closest China has to Mr Musk. BYD, the company he founded in 1995, started out making rechargeable batteries. Today its sprawling campus in Shenzhen shows off solar cells, electric cars, heavy machinery, mobile-phone components and much else besides that needs energy storage. In 2008 Warren Buffett's Berkshire Hathaway invested $232m in BYD. The stake is now worth over $1.5bn. BYD's sales surpassed $18bn last year, putting it among the biggest makers of batteries and electric cars.

Like Messrs Musk, Friedland and Wang, others from our list joined the ranks of tycoons by seeing their ideas mature. Mr Wang's compatriot, Zhang Yue, runs Broad Group, a huge manufacturer of chillers that recycle waste heat. Brazil has Rubens Ometto, the man behind the world's biggest bioenergy firm and its first ethanol billionaire. His company, Cosan, produces sugar and, through a joint-venture with Royal Dutch Shell, an Anglo-Dutch energy giant, sugar-cane ethanol. In Germany Aloys Wobben, who built his first wind turbine at university and later developed a pioneering variable-speed model, turned Enercon, which he created in 1984, into a leading producer of such equipment.

## More than bluster

A second group of moguls funnels money made elsewhere into climatically noble projects seeking scale. Consider Philip Anschutz, whose empire stretches from oil to entertainment (and whom the *New Yorker* described as the "man who owns LA"). He has spent a decade promoting a $3bn high- ▸▸




voltage electric grid, TransWest Express, to send 3GW of wind power (which he is backing separately) from blustery Wyoming to electricity-hungry California. It should start construction in 2020.

Or take Bill Joy, who co-founded Sun Microsystems. As befits a self-assured Silicon Valley software pioneer, he reckons his climate bets could tackle half of all annual greenhouse-gas emissions. In 2011 he backed Beyond Meat, a maker of plant-based alternatives to burgers; meat production accounts for 14.5% of global emissions. The company's share price is up sixfold since it went public in May. To clean up cement-making (6% of emissions), in 2014 Mr Joy invested in Solidia Technologies, which has found a way to cut the industry's carbon footprint by 70%. LafargeHolcim, a Franco-Swiss cement colossus, is helping commercialise it.

### Beyond meat and cement

Besides imminently scalable ventures, Mr Joy has supported speculative ones like Ionic Materials, a firm that has come up with an energy-storage technology that uses solid polymers (*Wired*, a magazine popular among geeks, called it the "Jesus battery"). When it comes to moonshots, though, it is hard to beat Mr Gates. This week the co-founder of Microsoft told the *Financial Times* that those who want to change the world should stop wasting time urging investors to dump fossil-fuel stocks and put their money and energy behind disruptive technologies.

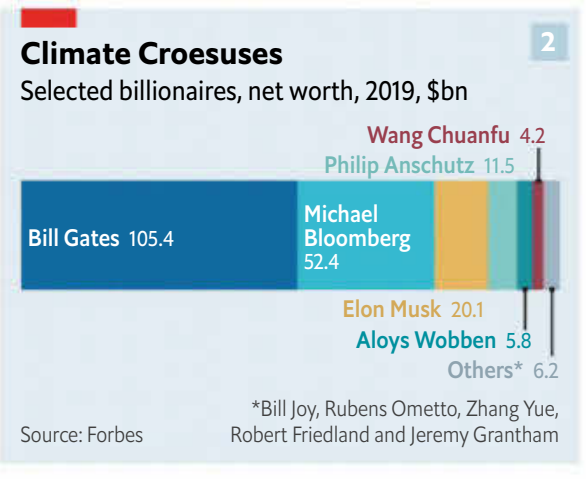
Mr Gates is putting a part of his $105bn fortune where his mouth is: into blue-sky projects. Literally, in the case of Carbon Engineering, a company working to turn $CO_2$ in the air to fuel. Because its carbon is being taken from the atmosphere, it has no net-effect on the atmospheric stock when burned. He co-founded TerraPower, which has developed a new type of nuclear reactor. And in 2016 he launched Breakthrough Energy Ventures, a $1bn pot of "patient, risk-tolerant capital" to bankroll technologies that radically cut annual emissions. Only those with the potential to shave 500m tonnes (1% or so) or more off today's global total need apply. Investments include Boston Metal (which aims to decarbonise steelmaking) and Commonwealth Fusion Systems (which is pursuing nuclear fusion). Fellow plutocrats have been enlisted into the fund: Mr Bloomberg, Amazon's Jeff Bezos, Alibaba's Jack Ma, Masayoshi Son of SoftBank and Mukesh Ambani of Reliance, an Indian conglomerate.

The last kind of climate tycoon does not seek returns, at least directly. Jeremy Grantham of GMO, a $70bn investment fund, is giving away most of his $1bn fortune to climate politics and research. It isn't really philanthropy, he says. "It's sensible defensive investing in the broadest sense." Mr Bloomberg has poured $500m into Beyond Carbon, an initiative to kill off coal plants in America by financing green lobbyists and politicians at state and local level.

Our twelfth apostle of climate action is not himself deep-pocketed. But Pope Francis, the greenest pontiff to date, has ultimate control over the Vatican Bank's $3bn-worth of assets—and a bully pulpit to exercise moral suasion over much more. In June he rounded up oil bosses from BP, ExxonMobil, Shell and Total, and strong-armed them to support "economically meaningful" carbon prices and disclose risks posed by climate change to their companies (see next article).

Our list is necessarily incomplete. Other fat cats back clean investments. So do firms, even historically carbon-cuddling ones like GM, whose carmaking prowess may do more to popularise EVs than Tesla, or McDermott, which builds oil rigs but whose subsidiary has put money in NET Power, a builder of power plants in which carbon dioxide released by burning natural gas in pure oxygen is heated and then used instead of steam to turn a turbine (with any excess captured).

Many clean bets continue to rely on tax breaks, subsidies or the prospect of high carbon prices. Plenty will fail in the marketplace. But some may succeed. Without creative destruction powered by climate capitalists, including profit-seeking ones, safeguarding the planet would be considerably more daunting than it already is. ■




Business and climate change

# Planet Inc

## A short guide to global warming's consequences for companies

LIKE ALL human enterprise, business is threatened by climate change. And, as with humanity as a whole, these risks may not become catastrophic for the corporate world for decades. But some corporate citizens will be vulnerable sooner—if they are not already. Global regulators, such as the Financial Stability Board (FSB), want firms to get to grips with the three ways in which the climate affects their prospects

Physical effects of global warming—rising sea levels, drier droughts, stormier storms—imperil factories and other assets, as well as transport and energy links that knit supply chains together. They hurt worker productivity—or, if companies spend on adaptation, like air-conditioning to keep employees cool, increase overheads. A study of over 11,000 globally listed firms found that accounting for physical risks would shave just 2-3% off their market value on average. But the most exposed could lose 20%.

The risk of climate calamities rises imperceptibly quarter to quarter. For most firms it would become material when present-day assets, which seldom last more than 15 years, and bosses, who typically stick around for less, are a distant memory. Even long-term asset managers tend not to hold on to shares for more than a decade. Credit raters and insurers are trying to factor in physical risks when evaluating borrowers and pricing premiums. For now, the market signals are too subtle to detect.

Investors are more attuned to "transition risks". Carbon taxes, tradable emissions permits and other policies to chivvy along the process of making economies greener impose costs on companies. Of the 195 signatories of the Paris climate agreement, 81 mention a carbon price in their pledges to limit global warming. Half of those have announced a carbon tax, cap-and-trade scheme, or both. Add state and local schemes, and they cover 15% of the world's emissions, up from 4% in 2010.

Being a function of politics rather than physics, transition risks are less certain than physical ones. The costs are currently trifling; governments raise perhaps $30bn a year worldwide in carbon levies, a fraction of the $2trn in profits that America Inc generated last year. But if they lived up to the Paris deal's aim of keeping warming within 2°C of pre-industrial levels, 15% of ▸▸

global stockmarket value might be on the line. A study in 2018 found that electricity producers would have to retire a fifth of capacity, and cancel all planned projects.

The final threat looms in the courtroom. It is the hardest of the three to assess. This month PG&E reached an $11bn settlement with insurers seeking compensation from the Californian utility for payouts they made to homeowners and businesses in connection with wildfires. These were sparked by its power lines—and climate change increased their likelihood. Proving a company's culpability for natural disasters is rarely this uncomplicated. Plaintiffs must show that they have suffered an injury, that the defendant caused it and that the court can redress it (with damages, say). In 2012 a federal court threw out a case brought by residents of Mississippi against 34 big carbon emitters for harm resulting from Hurricane Katrina, which they argued climate change made more destructive.

Still, climate lawsuits against companies are mounting. Last year New York state sued ExxonMobil for deceiving investors about risks to the firm from climate-change regulation (the firm denies this). Better climate science has made establishing causality more credible, if by no means easy. Some American counties have sued a number of oil giants on grounds akin to those of the Mississippi claimants.

In 2017 the FSB issued voluntary guidelines to firms and investors about disclosing such risks. Big asset managers, including BlackRock, back these in principle. But firms are reluctant to be the first to own up to vulnerabilities. They fear, rightly, that the market will punish honesty, not reward it. Until disclosures are made mandatory, companies are likely to prevaricate. ■

# Bartleby Masters of Business in Asia

*How executives get taught in Hong Kong*

ASIA'S RISING economic power is remaking the world. Chinese corporate champions like Alibaba and Tencent are challenging their Western counterparts. Are they bringing with them a specifically Asian management style? Bartleby visited two highly rated business schools in Hong Kong in an attempt to find out.

First, temperament. Yuk-fai Fong is a professor of management, strategy and economics. During a stint at the Kellogg School of Management in Illinois, he recalls, his Asian students tended to be quiet. On arriving at Hong Kong University (HKU), he discovered that students there were not diffident at all but instead stereotypical, opinionated MBAs. Mr Fong concludes that, in America, Asian students were unfamiliar with corporate culture and even company names. They may have been more self-conscious about speaking in a second language in a second country. In Hong Kong they felt, naturally, more at home.

Where Mr Fong did find a difference was in the attitudes of MBA students towards leadership styles. He conducted a survey of MBA alumni and current and past students on HKU's executive MBA course (which, like other such courses, is part-time and aimed at people already involved in running companies). It asked respondents about their views of behaviours that are broadly desirable (for example, having integrity, being visionary or prizing performance), broadly undesirable (being dictatorial, asocial or non-explicit when communicating), or culturally contingent (the extent to which managers were, say, bureaucratic or status-conscious).

The survey found that Asian respondents were more tolerant than their Western counterparts at HKU of undesirable leadership characteristics such as authoritarianism and asociality (each group disliked such traits, but Western respondents disliked them more). It also revealed that those who worked for local companies were more enthusiastic about performance-oriented leaders than peers employed at Western firms.

That may reflect prevailing organisational structures in Asia, where family businesses, often led by a founding patriarch, are more common. Steven Dekrey, the associate dean of the Hong Kong University of Science and Technology (HKUST), says that the classic case studies of large Western corporations developed by American business schools are less pertinent in the Asian context. So HKUST uses more cases based on family businesses; the executive MBA programme allows students to bring examples from their own experience, much of which also comes from family firms. And because the family orientation of Asian companies means that few businesses are used to being challenged by their boards, Mr Dekrey runs a programme for developing independent directors to plug the gap.

His school is also encouraging students to think of corporate "purpose", beyond making money. Whereas firms in America or Europe increasingly profess to care about things other than the bottom line (with varying degrees of sincerity), that is a novel idea in Asia, where executives are mostly guided by the pure profit motive.

Of course, business schools can teach all this only to students who enroll. Corporate Asia has yet fully to appreciate the benefits of an MBA education. That is the last big difference from the West. But Mr Dekrey sees encouraging signs for the growth of business education in Asia. Among those students who are interested in an MBA, more appear willing to choose an Asian school such as the HKUST—nicknamed the "University of Stress and Tension" but in fact a rather attractive place to study, with views of Clearwater Bay conducive to reflection and learning.

Indeed, having set up its executive MBA programme with the help of Kellogg, the school has now itself begun to mentor colleges in other countries, such as the Skolkovo School of Management in Moscow. And this month HKUST will break ground on a new campus in the Chinese province of Guangdong. Many faculty members are expected to move to the mainland.

When the British empire was expanding, the saying was that "trade followed the flag". Perhaps today business education follows economic power. One day Chinese management styles may come to be seen as exemplars for international companies—and Chinese business schools may rival the top American ones.

**Economist.com/blogs/bartleby**

Purdue Pharma

# Peddler's gambit

NEW YORK

**How to divvy up the remains of an infamous opioid-maker**

POWERFUL OPIOID painkillers have helped fuel a crisis of addiction and death in America in the past two decades. If one company has become the villain of this tragic tale, it is Purdue Pharma. The Sackler family, which controls the drugmaker, made billions of dollars peddling the drugs—often, state prosecutors have charged, and which Purdue and the Sacklers deny, with aggressive sales tactics and questionable marketing campaigns that downplayed the dangers of OxyContin, its blockbuster opioid medication.

They will not profit from them any more. On September 15th the company declared bankruptcy. The move is part of a sweeping settlement agreed with plaintiffs in Ohio, where a case against makers and distributors of the drugs, due to start in a federal court next month, brings together claims from some 2,000 states, local governments and Native American tribes.

The settlement comes on the heels of a landmark ruling in August in Oklahoma, where a state court found that a sales campaign of Johnson & Johnson, a giant drugmaker, contributed to the state's opioid crisis and ordered it to pay $572m towards an abatement plan. J&J risked a trial rather than settling (as Purdue had, for $270m, without admitting guilt) because it felt it had a strong case; it sold a tiny fraction of the pills in the state. J&J maintains its innocence and plans to appeal. But the judge's decision has sent a chill through the opioids supply chain, which suddenly felt less invincible.

Purdue was the first to crack. Under the deal, it is to be reconstituted as a public trust. The plaintiffs in the Ohio case will receive future proceeds from sales of opioids and drugs used to treat addiction to them (which, in a bitter irony, Purdue also makes). The deal is valued at some $10bn: perhaps $3bn from the Sacklers and the rest from their company and other assets. Neither Purdue nor the family need admit wrongdoing.

Those who favour the arrangement say it gives governments some money to pay for treatment of addicts and other measures to combat the public-health crisis caused by opioids. Despite J&J's loss, the case against Purdue in Ohio could have dragged on and proved indecisive. It would be expensive. Purdue has reportedly spent $250m so far on legal fees. Better to give what money it has left to opioid victims, not lawyers, the reasoning goes.

Others worry that the bankruptcy is a financial wheeze which lets the company and its owners off too easily. Letitia James, New York's attorney-general, who together with her opposite numbers in 25 other states declined to join the Ohio settlement, has called the deal with Purdue "an insult, plain and simple".

New York has issued subpoenas to several dozen banks and financial advisers in an effort to understand the family's financial picture. Ms James's investigators have already unearthed $1bn in wire transfers by the Sacklers. Some of the money ended up in Swiss bank accounts. This may have been completely legal, as the family asserts. Even so, many Americans find it grating that though the Sacklers will not make more money from opioids, they may be able to keep much of the fortune they have amassed from these controversial drugs. ■

Masayoshi Son

# Impaired vision

**The WeWork debacle encapsulates the worries about the Vision Fund**

WEWORK'S BUILDING in Tokyo's Shibuya district is a cross between an iceberg and a plastic bottle passed through a shredder. Fitting, then, that the office-rental firm's abortive listing, shelved on September 17th, threatens a financial shredding for its mastermind, Masayoshi Son—and that the debacle may be the tip of an iceberg for his $100bn Vision Fund (VF).

Mr Son bet on Adam Neumann, WeWork's charismatic co-founder, after meeting him for half an hour in 2017. SoftBank, the Japanese group Mr Son controls, and the VF then gave the firm $4.4bn, despite its tenuous claim to techiness. Mr Son would reportedly have handed over another $16bn this year had Saudi Arabia's sovereign-wealth fund, the VF's biggest backer, not objected. But SoftBank gave WeWork $2bn anyway. All told, the VF and SoftBank have invested or committed to invest $10.65bn in the firm and own 29% of it.

Had WeWork gone public at $20bn (less than half the valuation of $47bn in its latest funding round), the VF and SoftBank could under one scenario have faced unrealised losses of up to $7.5bn, estimates Atul Goyal of Jefferies, an investment bank. As sentiment soured, partly owing to WeWork's weak corporate governance, reports surfaced of Mr Neumann contemplating a value as low as $10bn.

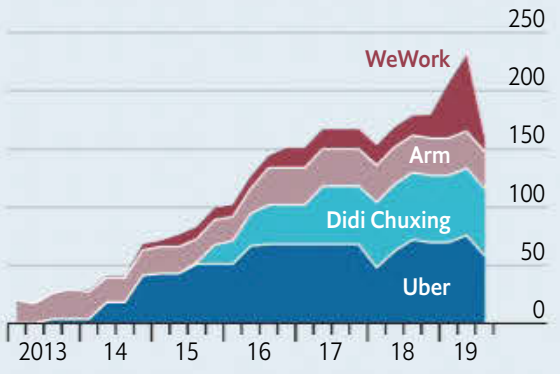
WeWork will again attempt to list later this year—presumably with a better story about governance and path to profit. Still, an initial public offering (IPO) may prove hard. Investors may be disinclined to embrace a stock with a good chance of losing value quickly. If WeWork cannot raise new capital, Mr Son may have to come up with cash to keep it going. SoftBank's own share price has fallen by 20% since July.

Even with the IPO on ice, and no price set, the VF and SoftBank may still need to adjust WeWork's fair value. That means the VF's stated returns may still have to be lowered when market prices are eventually taken into account. In June it reported $20.2bn of gains on total investments of $71.4bn. Some were realised; many were paper gains on hard-to-value investments.

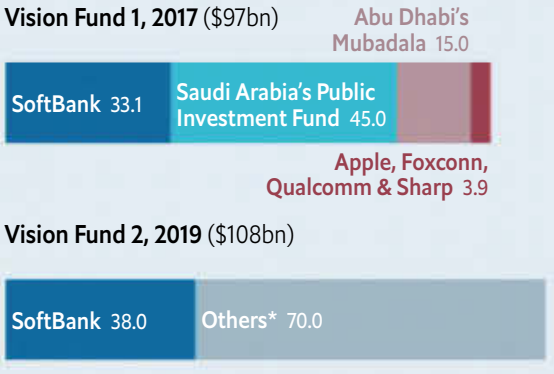
The deeper worry is that unicorn valuations in the private market may have risen materially above what public-market investors will pay in an IPO, says Pierre Ferragu of New Street Research. Many of the VF's 83 investments could suffer unrealised losses if and when they go public. True, it could enjoy post-IPO share-price rises. Shares in Guardant Health, a VF-backed diagnostics firm, have more than tripled in price since its IPO in 2018. But Uber's shareholders have seen 30% of its value wiped out since it listed in May. The VF is looking at more unrealised losses, of $3.9bn, on the ride-hailing firm, Jefferies reckons. ▸▸

**Son also falls**

**Total company valuations of selected SoftBank Vision Fund investments, $bn**




**Investors in SoftBank Vision Funds, $bn**




Sources: PitchBook; Datastream from Refinitiv; press reports; FT research; *The Economist*

*Apple, Foxconn, Kazakhstan's National Investment Corporation, Japanese banks and others; based on signed memorandums of understanding

The WeWork fiasco comes as Mr Son's $108bn Vision Fund 2 was about to start. In August he said he would begin spending its cash within a month or two. Memorandums of understanding have been inked with investors. Worries about tech IPOs and an economic slump may make it harder to close. The Saudi fund and Abu Dhabi's Mubadala Investment, another big investor in the original VF, are reportedly considering whether to scale back their investment in the new one. An executive at one big sovereign-wealth fund says SoftBank may need a face-saving way to reduce the new VF's size. "Markets are too toppish to try and deploy another fund of that scale."

The VF says WeWork, one of many firms in the portfolio, gets too much attention. And Mr Son, who lost most of his wealth in the first dotcom bubble, is no stranger to the ups and downs of venture investing. WeWork's Mr Neumann has admitted to feeling "humbled" by the delayed IPO. His cheerleader-in-chief is probably not. ■

Siemens

# Kaeser's reign

BERLIN

**Nobody said reforming Europe's biggest conglomerate was going to be easy**

JOE KAESER cuts an unusual figure among the taciturn bosses of Deutschland AG. The wiry 62-year-old is bursting with energy. He unabashedly tweets (in both English and German) about his concern over the rise of the hard-right in Germany—and, more atypically still, considers such pronouncements to be part of his job as a captain of German industry.

Mr Kaeser's boldness has made him friends, but also bitter enemies, who accuse him of calculated PR, hypocrisy, double standards and far worse. He was widely criticised for meeting Russia's president, Vladimir Putin, shortly after his annexation of Crimea and for cosying up to the governments of Saudi Arabia, China and Iran when big contracts are at stake. "The voice of morality is flexible," was the headline of a recent article about Mr Kaeser in the *Neue Züricher Zeitung*. Mr Kaeser admits that moral values and business interests can clash. "It is a thin line to walk," he says. But "values don't always create jobs."

These days Mr Kaeser may be making headlines for his worldview. But his six-year effort to spruce up one of Germany's industrial giants deserves equal—if not greater—attention. True to his temperament, he has gone about this mammoth task in a thrusting manner. Success, he believes, is near. Is it?

The son of a mechanic from Lower Bavaria, who betrays the region's lilt in both English and German, has worked at Siemens for 40 years. In 2013, when he was promoted from finance chief to chief executive, only two of nine divisions of the group, which makes everything from software and body scanners to trains and gas turbines, were doing well. A good chunk of sales was generated by businesses that made no profit at all. Mr Kaeser slimmed the group's bloated bureaucracy, centralising human resources and other functions and ordered division bosses to focus on developing, building and selling their wares. By 2017 most of the heavy lifting appeared to be done. Siemens's share price recovered to highs last seen in 2007. The supervisory board prematurely extended Mr Kaeser's tenure to 2021.

**In the limelight**

Some felt that at this point Siemens deserved a pause from the restructuring drive. Instead, Mr Kaeser accelerated it. He spun off the group's remaining stake in Osram, a maker of light bulbs, sold its kitchen and washing-machine business to Bosch, another German engineering giant, and flogged its hearing-aids unit to EQT, a Scandinavian private-equity firm. He merged Siemens's wind-turbine arm with Spain's Gamesa and listed Healthineers, its medical-technology business, on the Frankfurt stock exchange. Traditional conglomerates do not have a future because, he says, their inherent lack of focus drives mediocrity.

This furious diet has not had entirely the desired effect. Since the start of 2017 Siemens has underperformed Germany's stockmarket and counterparts like Alstom of France and Philips of the Netherlands. In February the European Union blocked the proposed merger of the rail business with Alstom's, on competition grounds. Mr Kaeser is looking at alternatives, including a public listing for the unit. On August 1st Siemens missed analysts' earnings forecasts in all its industrial divisions bar rail.

With characteristic punchiness, Mr Kaeser blamed investor angst on geopolitics and macroeconomics. Fresh from a trip to China with Chancellor Angela Merkel, he is himself nervous about trade tensions between China and America. "A decoupling of economic systems and standards driven by a political agenda would be a nightmare," he says, predicting it would set the world back by decades. Siemens has 33,000 employees in China, its second-largest international market after America, representing a tenth of sales.

Some of the company's recent weakness may indeed be down to the global slowdown. But some surely reflects the difficulty of turning around a sprawling 172-year-old giant. Industry-watchers estimate that its shares are still trading at a discount of up to 30% compared with its sum-of-parts value. Mr Kaeser expects vindication next September, when he plans to list the ailing gas-and-power unit. The business, which employs 80,000 people and makes €30bn a year in revenue from dirty energy industries, will be tarted up by adding Siemens's 59% stake in Gamesa. Hiving it off will remove a big drag on the parent's performance, suggest analysts at Deutsche Bank.

"The endgame is to transform Siemens into a slimmer world leader in industrial-automation software and smart infrastructure," says Ben Uglow of Morgan Stanley, an investment bank. Margins on the digital and automation arms are 17-23%, well above the 10% for the rest of the group. If Mr Kaeser has his way, these will form the core of the future Siemens.

On September 18th the group's supervisory board proposed that Michael Sen, who sits on the management board, lead the soon-to-be-sold energy business. It also appointed Roland Busch, the operations and technology chief, as deputy CEO—and Mr Kaeser's heir-apparent. As the man overseeing the digital and automation businesses, Mr Busch has the experience to steer a streamlined Siemens into the next era. Mr Kaeser had a good run until 2017, then a so-so one. It may be time to pass the baton. Perhaps he can try his hand—and his Twitter-adept thumbs—at politics. ■


A China-Europe Railway Express train from Hamburg, Germany, arrives at Wuhan, capital of central China's Hubei Province, on August 26, 2018

XINHUA

# Linked Destinies

## Express freight trains bring Wuhan and Europe closer

By Wei Hongchen

Liu Xingliang, a 38-year-old native of Wuhan in Hubei Province, is an amateur wine connoisseur. French red wine is his favorite, next only to spicy dry noodles, the signature local dish. One of his pastimes is to scour the city or surf the Internet for new wine varieties. In the last two years, to his delight, he has discovered several exotic wines right in Wuhan.

"One day in 2017, I spotted many bottles of French wine on the shelves of a supermarket near my home. They are not only rich in varieties and authentic in taste, but also affordable," Liu told *Beijing Review*.

As an increasing number of China-Europe Railway Express trains shuttle between the city and France, wine has become more accessible and affordable in Wuhan, currently at the same price level as in Europe. The shipping time via railway is only one third of water routes, and its cost is about one fifth of that by air, said Wang Lei, Vice General Manager of Wuhan Asia-Europe Logistics Co. Ltd. (WAE), the operator of the trains running between Wuhan and Europe.

However, things weren't always so smooth. "During the transportation process, extreme weather is often encountered. Sometimes, the temperature in containers can rise above 50 degrees Celsius in summer or drop below minus 20 degrees Celsius in winter," Wang Lijun, WAE Chairman, said. "Since food, wine and medicine need to be preserved at certain temperatures, cold chain technology is necessary for their transportation."

In 2016, a China-Europe Railway Express research team developed cutting-edge cold chain containers. These containers can be tracked 24 hours a day so that the entire transportation process is visible and controllable.

With these containers, French wine, German and Polish beer, Kazakhstan's cooking oil, and other daily consumer products are now shipped from Europe and Central Asia to China, while local agricultural products such as oranges from Hubei are shipped to European markets.

Wuhan was a historical bustling commercial hub. It was once the world's largest tea distribution center, with the tea trade fueling the city's prosperity. Centuries ago, tea and other products from Wuhan were transported abroad along the ancient Silk Road, the Maritime Silk Road and other routes. In the mid-19th century, tea from Wuhan reached Russia's St. Petersburg.

Now, railways have brought Wuhan and Europe much closer. In addition, a large French wine bonded warehouse opened in Wuhan on July 10.

"The bonded warehouse can speed up customs clearance and capital turnover, and reduce trade cost; at the same time, consumers can purchase quality products at affordable prices," said Wang.

### Transport arteries

The first China-Europe express freight train was launched in Chongqing on March 19, 2011, and headed to Duisburg, Germany via northwest China's Xinjiang Uygur Autonomous

Region. Carrying locally produced electronic products, the train covered a distance of about 11,000 km in 15 days.

In the ensuing two years, freight trains to Europe were launched in more inland Chinese cities such as Chengdu in Sichuan Province, Zhengzhou in Henan Province, Changsha in Hunan Province and Xi'an in Shaanxi Province. A total of 62 Chinese cities and 51 European cities had launched China-Europe Railway Express trains as of April 2019, according to the Ministry of Commerce (MOFCOM).

Since the Belt and Road Initiative was initiated in 2013, the development of China-Europe rail services has been put on a faster track.

On October 24, 2012, the first China-Europe Railway Express train from Wuhan embarked on its maiden journey to the Pardubice Region in the Czech Republic, which lies 10,863 km away. In March 2014, the Wuhan Municipal Government founded the WAE to operate trains traveling between Wuhan and Europe. Over the years, more routes and trains have been added.

Wuhan trains are mainly destined for Germany, France, Russia and Belarus, running along either a southern route that passes through Xinjiang or a northern route that passes through Inner Mongolia Autonomous Region. In the beginning, the freight trains mainly provided customized services to large manufacturing enterprises in Hubei. However, the problem with that operation model was that the cargo loading rate was not high, especially on return trips.

To solve this issue, the WAE changed the model by accepting cargo from small and medium-sized enterprises in 2015. This has not only increased the cargo loading rate and railway revenue, but also reduced the shipping cost for enterprises and helped small and medium-sized enterprises access overseas market.

In 2018, China-Europe Railway Express freight trains made a total of 173 trips from Wuhan to Europe and 245 from Europe to Wuhan, with an average cargo loading rate of 96.3 percent, ranking first in the country, according to data from the WAE.

Moreover, the quantity of return cargo shipped by the trains between Wuhan and Europe ranks first among China-Europe Railway Express trains between Chinese cities and Europe, according to MOFCOM.

**Driving development**

These trains have strengthened economic and trade ties between Wuhan and Europe. They have also boosted imports and exports and spurred the industrial development of Hubei.

The province is home to many wood processing enterprises. However, the shortage of raw materials hampers the development of local companies such as Fuhan Wood Industry Co. Ltd. Thus, the WAE turned its attention to the Russian Far East, which is rich in timber. In April 2015, the WAE launched the first express railway to transport timber from Russia to China, which runs from Tomsk in Russia to Wuhan through the Manzhouli land port in north China's Inner Mongolia Autonomous Region.

Timber shipped from Russia has also attracted enterprises in the downstream industrial chain from Guangdong and Fujian provinces and Inner Mongolia to relocate to Wuhan, boosting the development of the paper industry in China's central region.

The WAE also offers customized shipping services for retail enterprises. On October 28, 2017, the first train chartered by Decathlon, the French sporting goods retail giant, transported items it produced and purchased in China to Dourges in France. Benefiting from the customized shipping service, Decathlon decided to bring orders that had been transferred to Viet Nam and other Southeast Asian countries back to Wuhan and neighboring areas, and established its China distribution center in Wuhan.

In Wuhan, French retailer Decathlon has six stores, a textile mill and a logistics center covering about 80,000 square meters.

Freight transport to Europe does not only cover companies in Hubei. Electronics, fruit, seafood and other products from the Pearl River Delta in south China and the Yangtze River Delta in east China, and even products from Southeast Asian countries are shipped to Wuhan and then loaded onto China-Europe Railway Express trains bound for Europe, said Zheng Li, deputy head of the Freight Department of the China Railway Wuhan Group.

The trains have also benefited companies in other countries. International freight railway transport has not only become a competitive edge for China, but also greatly enhanced the competitiveness of European enterprises cooperating with China, said Xavier Wanderpepen, an employee of the French National Railway Co. in charge of promoting trade with China. He said that in France, large retail chains and automotive groups, among others, need these logistics solutions, and more and more small businesses need this type of fast transport.

**Cultural bridge**

The express freight trains have also become a bridge for cultural exchanges between China and other countries.

Walking into the WAE office, visitors are greeted by an enormous painting on the wall depicting a China-Europe Railway Express train whizzing by a backdrop featuring landmark structures in Wuhan such as the ancient Yellow Crane Tower. The painting was created by a German girl named Nadine Maassen, said Li Jie, a WAE executive.

When Maassen was 11 years old, she learned that oranges and tangerines were shipped to Russia through an express freight train from Wuhan. That's what inspired her to paint the watercolor, hoping that the citrus fruits would someday be shipped to Germany.

In Hubei, ancient chimes are a famous art form, which the express freight trains are now helping to introduce to a global audience. The heavy chimes used to be shipped abroad by sea, but the cost was high and the shipping time long, and the chimes risked getting rusty in the humid maritime environment. With express trains, shipping has become much more convenient.

The China-Europe Railway Express trains are mobile greeting cards that present Chinese culture and convey Wuhan people's best wishes to people in countries along the railway lines, Wang concluded.

# Schumpeter | The lessons of Stephen Schwarzman

*How to build a legacy*


As a child growing up in Philadelphia, Stephen Schwarzman had a part-time job selling handkerchiefs to old ladies at his father's shop, Schwarzman's Curtains and Linens. He hated it. His main consolation was imagining how the firm could expand across post-war America, like Sears. But his father was not interested. He was happy with a house, two cars and some money. He was no entrepreneur. The younger Mr Schwarzman, who went on to co-found Blackstone, the world's largest alternative-asset manager, and become an Olympian of modern-day capitalism worth $18bn, recounts that story at the start of his memoir, "What It Takes". It is one of the few times a mere mortal appears in his account—only to be swiftly shunted aside.

Mr Schwarzman has little time in the book for the little guy. Other financiers wring their hands over the wealth gap between bosses and workers. Not him. He was a rare executive in America's Business Roundtable not to sign a charter last month calling for an end to the shareholder-led model of capitalism. His private life appears to be one of lavish parties and glamorous schmoozing. Acknowledgments in the book stretch to 14 pages and he name-drops five American presidents, four French ones and China's Xi Jinping.

Yet Mr Schwarzman avoids footling with life's foot-soldiers for a reason. The book has a higher purpose. Many will read it for insights on how to become a master of the universe. The subtext is how to build a legacy: a quest that at 72, he looks hellbent on. That means giving away chunks of his fortune so that the Schwarzman name is inscribed, Rockefeller-like, on libraries, universities and scholarship programmes. It also means building a firm that outlasts him as J.P. Morgan has outlasted John Pierpont. Indeed, Mr Schwarzman's 25 "Rules for Work and Life" can be boiled down to one: how to create a corporate culture that persists.

Contrary to its barbarian image, the world of finance is not culture-free. Yes, employees at Lehman Brothers, where Mr Schwarzman once worked, famously had a reputation for not stabbing people in the back—but walking right up and stabbing them in the front. And Blackstone is sometimes similarly portrayed as a deal-making war machine, with Mr Schwarzman as the merciless field-marshal; not for him hard-to-measure pieties about the purpose of business. But his company does have purpose, he feels: to generate healthy profits for investors, which include pension funds, while providing 500,000 jobs in the firms in which Blackstone invests.

Peer beneath Blackstone's armour and clear values emerge. The interplay between three in particular—ruthless ambition, unexpected humility and fierce loyalty—is the backbone of Mr Schwarzman's book. It also lies at the core of his company.

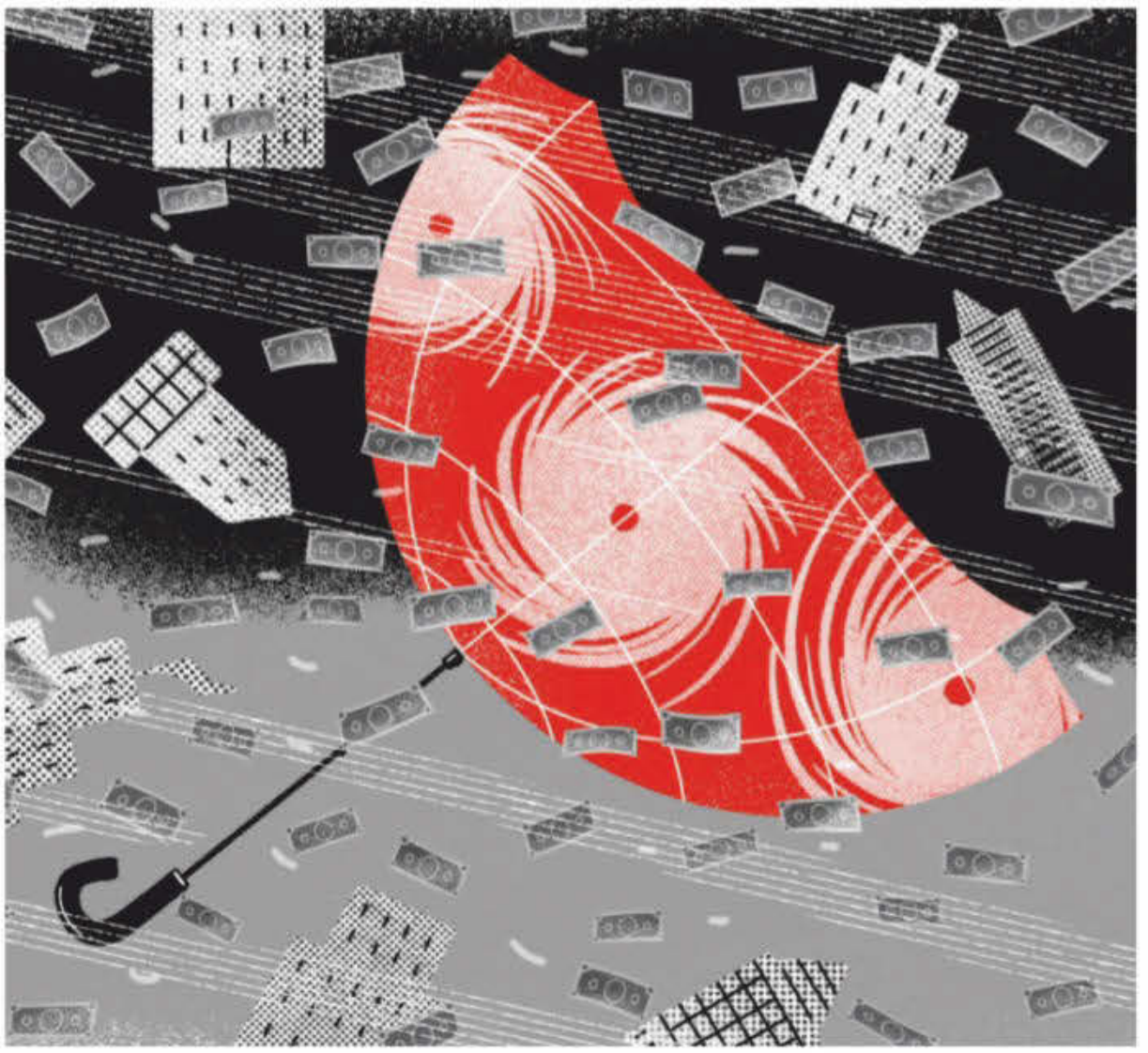
Start with ambition. Blackstone is steeped in unabashed elitism. Mr Schwarzman makes no bones about his own desire to be bigger than the rest. After he co-founded Blackstone with $400,000 in 1985, he set out to raise more money from investors than any upstart fund before it. Now it has $545bn under management—this year it has raised the world's biggest-ever private-equity and property funds. When he launched Blackstone's initial public offering in 2007, he wanted it to be the first private-equity IPO. Blackstone was pipped to the post by a smaller rival but it was still one of Wall Street's landmark listings. This year it scrapped its partnership structure to become a corporation, raising its market value above $60bn—not far from that of BlackRock, which split from Blackstone in the mid-1990s to become a powerhouse in its own right, and with which Mr Schwarzman has a respectful rivalry. When hiring, he aims to recruit only "tens". As he puts it: "You have two options: either run a middling company going nowhere or clear out the mediocrity." His philanthropy focuses on the elites of tomorrow—by sending American scholars to China, for instance.

This competitive streak is balanced by surprising humbleness. Blackstone readily learns from its mistakes. Mr Schwarzman owns up to several. The most painful came in 1989, when he backed a new employee's gamble on a steel firm, Edgcomb, despite opposition from more experienced colleagues. It went spectacularly wrong. Since then, he ordained, investment decisions must always be made collectively. The meetings, robust affairs where participants compete to pick holes in each other's ideas, reflect the premium Blackstone affords ambition. But focusing on downside risks rather than upside potential promotes prudence. When Blackstone bought Equity Office Properties, a real-estate trust, for $39bn on the eve of the financial crisis in 2007, it recouped more than half what it had paid at a profit within a day in order to turn a huge risk into a manageable one.

The third value is loyalty. When Blackstone's share price tumbled during the financial crisis, Mr Schwarzman listened to board members urging him to maintain its dividend, to spare the blushes of the Chinese sovereign-wealth fund, which had taken a huge punt on the IPO. As he told Jimmy Cayne, the boss of Bear Stearns, as the investment bank stared into the abyss: "There are times when you just have to stand up and write a cheque." In other words, safeguard your reputation by making good those whose money you are responsible for. Mr Cayne did not listen.

**Sweat equity**

The book has flaws, as does its author. He describes his early career in humorous detail: as a fresh-faced financier, "I must have been the biggest buyer of antiperspirant on the East Side of Manhattan." By the end, he mainly brags. Blackstone is less prudent than he lets on. Buying Hilton, a hotel chain, for $26bn amid the financial crisis turned a huge profit—but was reckless in the extreme at the time. He glosses over the incestuous relationship between Wall Street and Washington. That said, his defence of capitalism at its red-blooded best is refreshing. If Blackstone's mix of dynamism and integrity lives up to this paragon, Mr Schwarzman's firm deserves to last. ■





Insurance and climate change

# Blown cover

GRAVESEND, NEW YORK AND ZURICH

**Why climate change could push insurance firms to the brink**

THE PILOTS of the Port of London Authority are the cabbies of the Thames estuary. Based in Gravesend, 33km from the capital, they navigate some 10,000 ships into London terminals every year. Dispatched offshore on fast patrol boats, they use rope ladders to board ships as tall as buildings. Much like London's black-cab drivers, who know its 25,000 streets by heart, they must recall every sandbank and wind farm at the mouth of the river.

They are essential links in supply lines relied on by south-east England for everything from food to fuel. But when winds are too strong, pilots cannot board ships. If delays accumulate, terminals get clogged. The fiercer storms that could soon come to British shores could paralyse trade for days. Such a chain reaction is an example of the costs carbon emissions may bring.

Insurance companies are uniquely exposed to these sorts of changes. Tens of millions of businesses buy policies every year to protect themselves from risks. Last year the premiums paid for property and casualty insurance worldwide reached $2.4trn, according to Swiss Re, one of the big reinsurance firms on to which consumer-facing insurers pass the risk of mega-losses. Extreme events becoming the norm could force insurers to fork out ever greater payouts to policyholders, and lower the value of the assets they hold. The best case is that insurers reinvent themselves, helping the world cope—managing risk is, after all, how they make their money. The worst is that some fail and that swathes of the global economy become uninsurable.

Already, insurers are seeing disasters of unprecedented scale. Earlier this month Hurricane Dorian, one of the two largest storms ever known to have made landfall in the Atlantic, battered the Bahamas and then the Carolinas. In July Hurricane Barry brought the heaviest rainfall ever measured to Arkansas. The Indian Ocean basin has seen three huge cyclones so far this year. Last November California saw wildfires over the largest area ever recorded.

Very costly disasters are becoming more frequent. Between 1980 and 2015 America saw an average of five events each year causing over $1bn in damage (in current prices). Between 2016 and 2018 the yearly average was 15. In the 20th century, according to AIR Worldwide, a climate-modelling firm, a hurricane on the scale of Harvey, America's costliest ever, would have been regarded as a one-in-2,000-year event. By 2017, when Harvey blew in, that frequency was estimated at once in 300 years. By 2100, says Peter Sousounis of AIR, it will be once a century, and tidal surges that used to be classed as once-a-millennium events will be expected every 30 years.

Catastrophes are also getting harder to predict. Though newer models are starting to take account of climate change, most still rely on data from the previous few decades, which are already obsolete. And insurers struggle to handle "compounding effects"—the mutually reinforcing impact on each other of events associated with global warming. Working out when droughts cause wildfires, for example, is tricky because lower rainfall not only makes vegetation drier and hence more flammable, but also slows its growth. Effects tend not to be linear. Above 100km per hour, a 10% increase in wind speed usually causes 50-60% more damage, says Pete Dailey of RMS, a modelling firm.

Adding to the losses is the growing ▸▸

number of properties being built on flood plains and coasts. Annual insured losses from catastrophic events have grown 20 times, adjusted for inflation, since the 1970s, to an average of $65bn this decade. That excludes knock-on effects such as business disruption. Last year the global figure totalled $85bn, even though it was a year with no mega-disaster.

Climate losses can also come from the other side of insurers' balance-sheets: the investments they hold to cover payouts and park any spare funds. Insurers (including life and health as well as property and casualty) are the world's second-largest institutional investors, with $25trn under management. They often place chunky bets on multinational firms, infrastructure and property—which are becoming riskier propositions as the climate changes. Moreover, structural changes in the economy, such as the move away from fossil fuels, could leave insurers' portfolios exposed.

In the face of these threats, insurers are seeking to future-proof their businesses. Part of this is about financial resilience. Most general policies are renewed annually, meaning firms can raise premiums promptly (within regulatory limits). Since a spate of mega-disasters caught them off-guard in the 1990s they have fortified their capital reserves. According to McKinsey, the policyholder surplus (crudely, the excess of assets over liabilities) available to pay claims in America's property and casualty sector doubled in real terms over the past 20 years. In 1992 Hurricane Andrew sent 11 insurers to the wall. All survived the record hurricane season of 2017-18.

Regulators are doing more to prod insurers to hold sufficient capital—typically the aim is to ensure they can withstand losses caused by the worst imaginable year in 200. But putting a figure on this is hard, because nobody has thousands of years of data. And the worst possible year is getting worse every year. The risks will keep rising long into the future, says Paul Fisher, a former supervisor at the Bank of England. A cataclysmic year could also hit markets, hurting insurers' investments just when they need them most. Some could be forced to sell assets to cover giant payouts, pushing asset prices down further.

Most probably, payouts will continue to rise without capsizing insurers. But that still creates a problem. To absorb bigger losses, they must charge higher premiums. According to Marsh, a broker, global commercial-insurance prices rose by 6% in the second quarter of this year, compared with the previous quarter. That was the largest increase since records began. In America property rates jumped 10%; in the Pacific region they soared by nearly 18%. The rise is to meet the demands of reinsurers. Average reinsurance rates are set to rise by 5% next year, according to S&P Global, a rating agency—and in California, after the huge recent wildfires, by 30-70%.

A few calm quarters could see some of those increases unwound. But there is no doubt about the trend. And it cannot continue for ever without some customers rethinking whether to buy insurance at all. Insurers may seek to keep rates lower by adding exclusion clauses or capping payouts. Or regulators may set maximum premiums—which could mean some insurers quitting altogether. Swathes of the economy are likely to become uninsurable, leaving a growing number of people, firms and states exposed to catastrophic losses.

The global gap between total losses and insured losses is already wide and growing. The research arm of Swiss Re estimates that it more than doubled in real terms between 2000 and 2018, to $1.2trn. Half of last year's losses from natural disasters were uninsured. Nine out of ten American homeowners have no flood insurance despite half of the population living near water, says Erwann Michel-Kerjan of McKinsey.

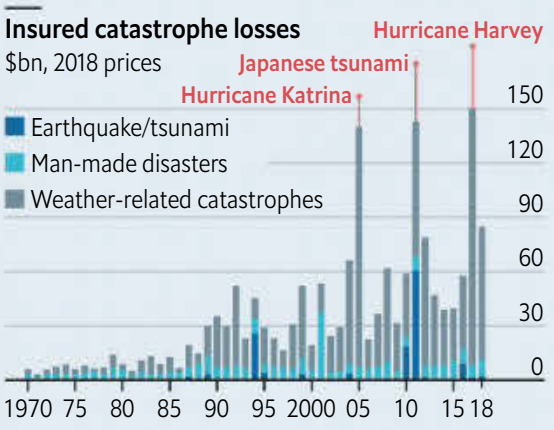
Insurers are trying various ways to stop this "protection gap" growing. They are digitising their operations and automating claims to cut costs. They are deploying new technologies, for example tackling fraud by gathering data through sensors and sending drones to disaster areas, notes Seth Rachlin of Capgemini, a consultancy. Innovations such as parametric policies help with cost-cutting and fraud prevention. Rather than compensating reported losses ex post, these pay a lump sum when an observable parameter, such as rainfall, passes an agreed threshold.

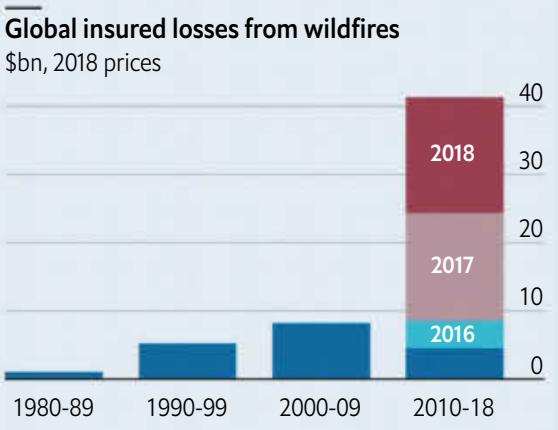
Where risks become uninsurable, states and firms may work hand-in-hand. In Britain, where a sixth of homes are at risk of flooding, government and insurers have set up Flood Re, a reinsurer that enables insurers to offer affordable premiums on 350,000 homes in flood plains.

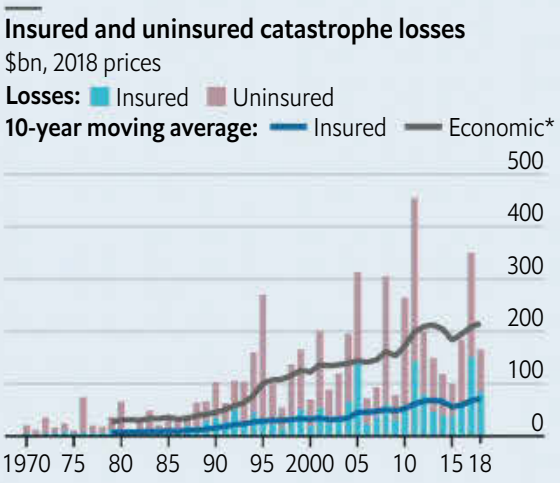
Many insurers already offer discounted premiums when preventive measures are taken, such as building flood walls. They should consider lending to clients willing to undertake more substantial protective work, says David Bresch of the Swiss Federal Institute of Technology, for example reinforcing embankments. The short-term nature of most insurance contracts complicates matters: an insurer that invests in a project one year can lose its customer to someone offering lower premiums the next. But long-term policies could work for public infrastructure projects.

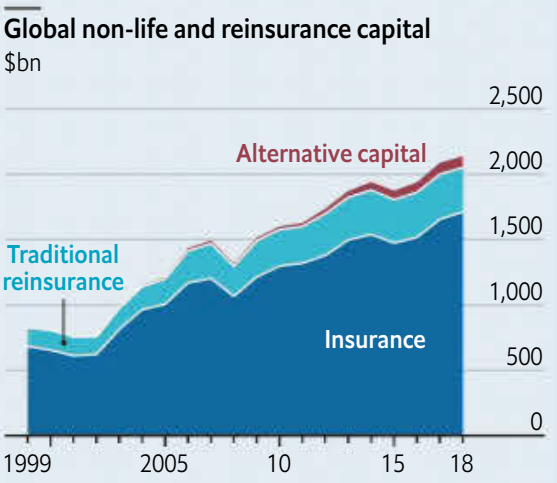
Developing countries are underinsured partly because the risks they face are poorly understood. More research would help, as would making models publicly accessible in order to allow officials and financiers to evaluate mitigation measures. Above all, insurers need to publicise the risks posed by climate change, and the need for cover. Often people do not take out insurance because they think the worst will not happen, says Alison Martin of Zurich Insurance. Talking of one-in-2,000-year events is not very helpful, "because many people would think we're safe for another 1,999". ■

## Battening down




Source: Swiss Re

*Insured and uninsured losses

Money markets and the Fed

# Hitting the ceiling

NEW YORK AND WASHINGTON, DC

**The Fed intervenes in short-term money markets for the first time in a decade**

THE FEDERAL RESERVE had plenty to fret about as it prepared to discuss policy interest rates on September 17th and 18th. Trade tensions and wilting global growth have seen businesses cut back investment in the second quarter of the year. In manufacturing, production and capacity utilisation have been falling since the end of 2018. Though the Fed has described jobs growth as "solid", some analysts worry that the labour market is wobbling. As expected, these concerns prompted the central bank to lower rates for the second time this year, by 0.25 percentage points, to a target of 1.75-2%. But the meeting was overshadowed by turmoil in money markets.

On September 17th, for the first time in a decade, the Fed injected cash into the short-term money market. The intervention was needed after the federal funds rate, at which banks can borrow from each other, climbed above the Fed's target. It rose as the "repo" rate—the price at which high-quality securities such as American government bonds can be temporarily swapped for cash—hit an intra-day peak of over 10%. On September 17th the Fed offered $75bn-worth of overnight funding, of which banks took up $53bn. The following two days it again offered $75bn-worth. Banks gobbled it up.

That sent shivers down spines. A spiking repo rate was an early warning sign before the financial crisis. In 2007, as market participants began to doubt the quality of collateral backed by mortgage lending, repo rates jumped as lenders hoarded cash.

The latest jump was unlikely to have been caused by such doubts. Most collateral is now high-quality American Treasury bonds or bills. Even so, there are reasons to worry. America's banks and companies seem to be short of cash. And during the turmoil the repo rate stopped tracking the federal funds rate. This link is the main way monetary policy influences the economy. A gap opening between the two deprives the Fed of its most important policy tool.

Fortunately, the Fed's interventions seemed to work. The repo rate returned to its usual level, close to the federal funds rate, which in turn is within the range targeted by the Fed. Even so, the turmoil raised questions about how it plans to handle future cash shortages. The mere prospect of them marks an important shift for America's financial system. Before the financial crisis the Fed controlled the federal funds rate using a "corridor", with a ceiling and a floor. Banks with too little cash could borrow at the ceiling rate. But there was no compensation for extra cash held at the Fed (the floor interest rate was zero). To keep interest rates precisely on target the Fed used "open market operations", swapping Treasuries and cash to control liquidity in the banking system.

Six years of quantitative easing changed all that. To push down long-term interest rates, the Fed bought vast quantities of long-dated Treasury bonds. Its balance-sheet ballooned to $4.5trn. The holders—mainly banks—ended up with mountains of cash. To keep market interest rates at or above the policy rate, the Fed was authorised by Congress to raise the floor from zero, compensating banks for their cash that it held. The ceiling became redundant, as did open market operations. Only the floor mattered.

But banks' cash piles have dwindled of late. Since late 2017 the Fed has been reducing its balance-sheet by not reinvesting all the proceeds when its assets mature. The balance-sheet shrank from $4.5trn in 2017 to $3.8trn in June this year. Moreover, a wider budget deficit means the Treasury has had to issue more bills and bonds. So far this year it has issued an average of $63.9bn-worth per month, net of repayments. During the same period in 2017 the monthly figure was just $19.6bn. As banks buy Treasuries, their cash piles fall. The surplus reserves banks hold in their deposit accounts at the Fed fell from $2.2trn in 2017 to $1.4trn now.

No one knows how much surplus cash banks need to feel comfortable. That depends partly on regulations, which have increased the amount of cash banks must hold as a buffer, but also on business sentiment. Banks' near-death experience in 2008-09 has left them with a strong desire to hold plenty of extra cash. Economists have attempted to estimate the level at which banks would start to squirm, most coming up with estimates of $1.2trn-1.5trn.

Usually banks have at least this much on hand. But they may not have had on September 16th, for quite benign reasons. That was the deadline for quarterly corporate-tax payments, meaning companies asked banks for more cash than usual. The Treasury had issued $77bn-worth of bills the previous week. The buyers, mostly banks, also had to pay on September 16th. The Fed expected these events, said Jerome Powell, its chairman, but not such an extreme reaction. As banks' cash piles shrank, they grew reluctant to lend to companies and other counterparties. The repo rate spiked. Some banks stepped in, lending to companies at elevated rates. But then those banks tried to borrow from other banks in the federal funds market, pushing up the rate. This prompted the Fed to intervene.

Cash would have become scarce sooner or later, says Bill English of Yale University. In a growing economy—especially one with a rising government deficit—the demand for bank cash increases over time.

The Fed now faces a choice. It could return to conducting frequent open market operations to pin down interest rates, as before the crisis. Or it could keep the current system and avert future cash shortages by expanding its balance-sheet enough to keep the banking system permanently saturated with liquidity, even as demand for cash grows. On September 18th Mr Powell suggested that the Fed would opt for the latter, saying it wanted reserves to be ample enough to avoid operations of the sort carried out in recent days. He also announced technical tweaks that will mean banks are compensated a little less handsomely for cash deposited at the Fed, which might encourage them to lend a little more in the repo market instead.

It is unclear how quickly balance-sheet expansion might be resumed. This week's events suggest it may be soon. As Mr Powell said after the Fed's meeting, "I think we'll learn quite a lot in the next six weeks." ■

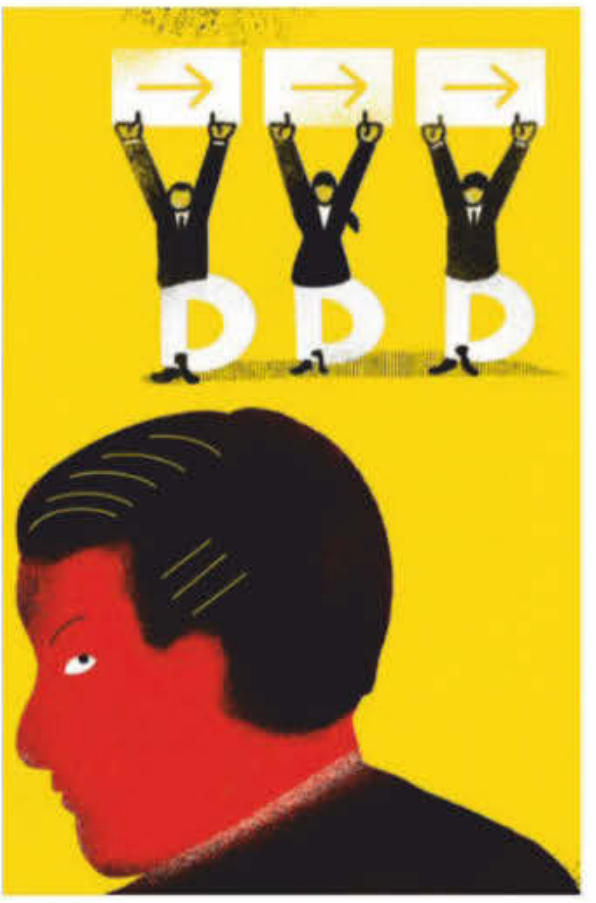
**Up against it**


Sources: Federal Reserve Bank of St. Louis; Federal Reserve Bank of New York; Datastream from Refinitiv

*Treasury inflation-protected securities

China's statist model

# Got your number



SHANGHAI

**The World Bank tries its hand at subtle persuasion in China**

CHINA LOVES political slogans expressed as numbered lists. There are, to name a few, the Two Centenaries, the Three Represents and the Four Comprehensives (not to be confused with the Four Modernisations or, heaven forfend, the Four Olds). In a new report the World Bank has made its own contribution to Chinese numerology, introducing the "three Ds". These, it says, refer to what China must do to become more productive and innovative: remove economic distortions, diffuse technology and foster discovery. That might sound hokey, but it highlights a basic challenge for any external actor in China today: how to convey new ideas and criticism to a government that is increasingly set in its ways.

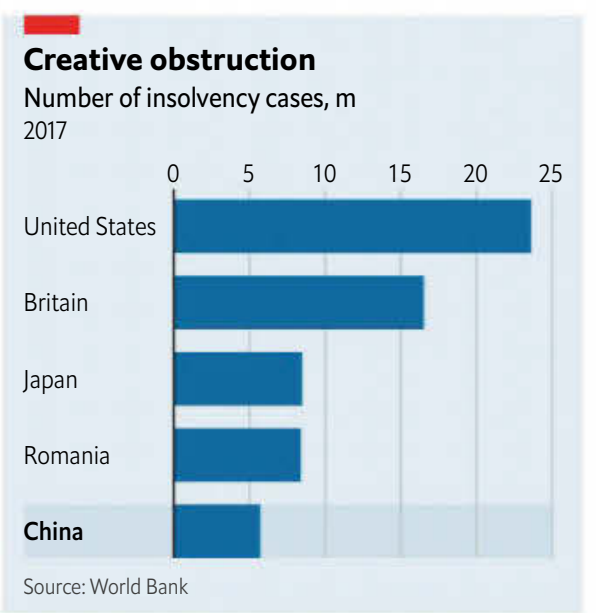
The World Bank has more experience than most in this, having loaned cash (more than $60bn) and expertise to China over nearly four decades. Its report, "Innovative China", published on September 17th, reflects a slightly different approach. It is the third time since 2012 that it has jointly written a policy blueprint with the Development Research Centre, a think-tank under the State Council. It is, in theory, a way to put recommendations into the prime minister's hands, and perhaps into the next five-year plan.

This report came with more controversy than the previous two. In March the *Washington Post* reported that it had been ready for a year, but that Chinese authorities had blocked its release because they objected to some of its contents, notably a section on reforming state-owned enterprises. People involved have disputed that account, saying that there were indeed debates but that these are normal for any report with high-level involvement.

A closer look does reveal a striking change in tone. The first report, published in 2012, spoke of "the need to accelerate reforms in the state-owned sector". The latest reads in parts as a restatement of Chinese policy: "state-owned enterprises are at the core of the co-existence between the state and the market." The 2012 report recommended a big change to SASAC, the agency overseeing state firms, calling for it to be limited to regulation rather than asset management. The latest mentions SASAC only once, in the acknowledgments.

But despite its cautious wording, "Innovative China" still has much to offer. It presents plenty of evidence of flaws in the Chinese economic model: a much-puffed rise in business creation has probably been overstated; the allocation of capital has become less efficient in recent years; and the number of bankruptcies is tiny—lower than in Romania (see chart), leaving China with zombie firms. In formulating its "three Ds" the Bank is trying, gently, to warn the government that it is focusing too much on shiny new inventions at the expense of basic policy settings that ought to yield more productive growth.

As for the fraught question of the state's role in the economy, the Bank is making a subtle point when it echoes official language. Over the past five years China has laid out plans to limit subsidies to state firms and help private-sector rivals fight them on a level terrain. "If China were actually implementing official policy, such as on fair competition, we would be making a lot of progress," says Martin Raiser, the World Bank's director for China. Perhaps a fourth D would help: China must deliver on its promises. ■




Cum-ex deals in court

# 12-step programme

BONN

**Two British bankers are on trial in Germany's biggest tax case**

OCCASIONALLY MARTIN SHIELDS slips into the jargon of financial markets: OTC (over-the-counter), for trades between banks and private customers); kd-1-11, a code for payments, which confuses his translator. But on September 18th, the first of two days' testimony at a court in Bonn, the British investment banker does his best, with slides and a laser pointer, to explain to the judge the complexities of dividend arbitrage in general and "cum-ex" deals in particular. Even the most basic cum-ex deal, he says, involves 12 steps and a web of bankers, brokers, investors, asset managers, lawyers and consultants.

Mr Shields and Nicholas Diable, another British banker, are the main defendants in Germany's biggest post-war tax-fraud trial. They are accused of "aggravated tax evasion" for helping engineer 33 deals that cost taxpayers almost €450m ($494m) between 2006 and 2011. The charge sheet runs to 651 pages. Cum-ex trades are share transactions done at high speed on or just before the day dividend payments are recorded. Before payment, shares come with (cum) dividends, which are reflected in their prices; after, they come without (ex). A flurry of deals may allow two or more investors to reclaim tax on dividends, even though it has been paid just once.

Mr Shields describes the pressure on traders in London's investment banks 15 years ago to make juicy profits, in part by exploiting tax loopholes. He refers frequently to Paul Mora, his boss when he started, aged 23, at Merrill Lynch, an American investment bank. The pair then worked together at HypoVereinsbank, a German bank, and Ballance Capital, a fund they set up. Also mentioned is Hanno Berger, a tax lawyer known in Germany as "Mr Cum-Ex", who wrote legal opinions in support of reimbursements for tax never paid. Mr Mora is thought to be in his native New Zealand and has not been charged with any offence. Mr Berger awaits trial in a German court at his home in Switzerland. All deny any wrongdoing.

Also in the courtroom were representatives of M.M. Warburg, Warburg Invest, Hansainvest Hanseatische, BNY Mellon and Société Generale. All five banks played parts in cum-ex deals masterminded by Mr Shields, with Mr Diable in a supporting role. If the court rules that the tax reimbursements were fraudulent, they may be on the hook for tens of millions of euros. ▸▸

Estimates for the total cost of cum-ex trades in Germany vary wildly. At the low end the finance ministry, which has identified 499 suspected cases, puts the damage at €5.5bn, of which the taxman has recovered €2.4bn. The ministry says it closed the loophole in 2012. Critics say it should have done so much sooner.

Christoph Spengel of Mannheim University reckons the bill is far higher: €31.8bn between 2001 and 2016. And a team of investigative journalists gathered by Correctiv, an investigative-journalism group, from newspapers in several countries, including *Die Zeit* in Germany, *Le Monde* in France and *Politiken* in Denmark, concluded in a report published last October that the trade is still flourishing. Correctiv estimates the losses to cum-ex trades across Europe to be as high as €55bn.

Whatever the correct figure, cum-ex deals were much more common than Germany's finance ministry thought when it was first warned of them a decade ago. About 100 financial firms have been linked to them, including Germany's DZ Bank and HypoVereinsbank, and JPMorgan Chase, Morgan Stanley and Bank of America Merrill Lynch. On September 10th investigators raided the headquarters of Commerzbank, another German lender, seeking evidence of involvement. A few weeks earlier they searched the offices of Clearstream, Germany's central share depository.

The trial of Mr Shields and Mr Diable is due to end on January 9th. The maximum penalty they face if convicted is ten years in prison. They have co-operated with investigators: Mr Shields says he attended more than 30 interviews. Bankers across Europe will await the verdict with bated breath. The case could be the first of many. ■

# Buttonwood Rich Pickens

*How T. Boone Pickens changed corporate finance in America*

In the early 1950s Thomas Boone Pickens worked as a geologist at Phillips, an oil firm based in Bartlesville, Oklahoma. He hated it. His working day was regimented. His colleagues lacked ambition. He found the waste and inefficiency sickening. "At Phillips, I met the monster: Big Oil," he wrote. Mr Pickens left to form his own firm, Mesa Petroleum. Impatient with its progress, he devised an audacious plan. He would slay the monster by using Mesa to buy out larger, badly managed firms.

Against the odds Mesa's first big bid, for Hugoton, a far larger natural-gas firm, succeeded in 1969. But Mr Pickens, who died on September 11th, is best remembered for the daring takeover bids he made in the 1980s, not least for his old employer, Phillips. These failed, but not before driving the targets' shares up and making Mr Pickens a small fortune.

The one that had the most lasting impact on corporate America was his tilt at the Gulf Oil Company. Gulf was one of America's top six oil firms in 1984; Mesa was a minnow by comparison. So it was a gutsy move. But what set it apart was that it was the first big attempt at a hostile buyout to be backed by junk bonds. Drexel Burnham Lambert, an upstart investment bank, supplied the financial muscle; Mr Pickens provided the oil-industry know-how. Corporate finance would never be quite the same.

Leveraged buyouts (LBOs) were not entirely new. In the 1960s they were used as a way for small, family-owned firms to sell out to managers without the cost of a public listing. But by the early 1980s the financial landscape was changing. Specialist buyout firms were coming to prominence, including Kohlberg Kravis Roberts (KKR). Mergers were looked upon more kindly by trustbusters. And debt financing was on tap. Michael Milken, Drexel's junk-bond king, had cultivated a network of investors who were hungry for new issues. He boasted that he could raise $4bn-5bn for T. Boone's run at Gulf.

Ideas about corporate finance were changing, too. Decades previously, Franco Modigliani and Merton Miller proposed that a firm's capital structure—its mix of equity and debt finance—should not affect its value. It is firms' cashflows that matter, not the nature of the claims on them. But the theory does not work well in the real world, with its bankruptcy costs and tax-deductible interest payments. The ideal capital structure came to be seen as a trade-off between the penalty for holding too much debt (bankruptcy) and the penalty for holding too little (forgone tax benefits). A paper in 1976 by Michael Jensen and William Meckling said that even this theory was incomplete. Debt, they argued, was a device used by shareholders to keep a firm's management honest. Bosses feel greater pressure to cut costs and raise revenues if they are faced with a hefty interest burden each quarter.

The debt-is-good doctrine appealed to a new breed of corporate raider. Mr Pickens dusted off the Hugoton blueprint. He would seek out a big, undervalued energy firm, take a large stake in it and then seek to take it over—or at least push the management to improve returns. Gulf Oil met his criteria. His bid failed, but a competing bid by Chevron, another oil giant, succeeded. Mesa made hundreds of millions of dollars on its stake. And Mr Pickens's run at Gulf became the model for many successful LBOs.

The legacy of the Mesa-Gulf bid is all around today. High-yield (junk) bonds are no longer the shameful offspring of the fixed-income family; they are an established asset class. The median credit rating for an American corporate has fallen to BBB, a notch above junk. That is largely because of corporate-finance strategy: lots of established firms have chosen to load up on debt to boost shareholder returns. If a firm declines to "optimise" its balance-sheet by taking on more debt, a band of capital-rich buyout firms stand ready to do the job.

Trends in finance tend to go too far before reversing. But there is already a sense of the forces that might eventually make debt finance less attractive. Tax reforms, in America and elsewhere, have sought to limit the tax breaks on debt. Another catalyst is the changing nature of firms. With the advent of the Internet of Things, the leading digital companies need to demonstrate that they are sure to stay in business for decades in order to persuade customers to sign up with them. Firms that hold a lot of debt will be seen as riskier counterparties. Who knows? Perhaps a future T. Boone Pickens will make the case for a bigger buffer of equity as the essential element of an optimal capital structure.

# Free exchange | Learning to live with it

*People will adapt to climate change. That is no reason to give up on stopping it*

After destructive storms like Hurricane Dorian, those affected have decisions to make. Should they invest in cellar pumps and better drainage? Should they rebuild with more robust design and materials? Should they move? These judgments are informed by a harsh reality: the weather will get worse. Seas will be higher, rain more diluvial and storms fiercer. People with means will naturally adjust—as they should. Adaptation is essential to reduce the human and economic costs of climate change. But spending on adaptation may further complicate already-confounding politics.

Efforts to slow global warming must overcome devilish political obstacles. The benefits to reduced warming accrue over decades and centuries, whereas the cost of cutting emissions must be paid upfront by taxpayers who cannot expect to see much return in their lifetimes. And mitigation (as efforts to curb emissions are called) is subject to a vicious collective-action problem. Climate harms are determined much more by what everyone else does than by what you do. Each actor has an incentive to free-ride on the sacrifices of others. Cutting emissions requires every large country saddling voters with expense and inconvenience that will mostly help people elsewhere, or not yet born.

Adaptation, by contrast, can pay off even when a person acts alone, out of pure self-interest. Homeowners who invest in air-conditioning or flood defences do so in the expectation of capturing most of the returns in the form of reduced harm to themselves, or perhaps higher property values. There are no political-economy problems to untangle (though without investment in green energy, air-conditioning adds to the general problem while mitigating it for individuals). Government actions are only slightly more complicated. It requires political consensus to spend public money on reinforcing infrastructure or building seawalls. But the benefits will mostly be felt in the place where the funds are raised. And at most a few governments and agencies will be required to co-operate, rather than tens or hundreds.

All this means that adaptation is likely to play a large role in humanity's response to climate change. Indeed, research suggests that the price of agricultural land already incorporates the expected impact of climate change. Consumers already react to extreme weather events. Purchases of air-conditioning systems rise after heatwaves, for example. Some adaptation plans are explicitly labelled as such—New York City's proposal to construct a "Big U" of raised flood-control berms around the southern end of Manhattan, for example. Others are not, such as individual decisions to take a job in a place less prone to extreme weather.

As demand rises for ways to ease the pain of climate change, supply will respond. A growing market for goods prompts producers to innovate—and work by Matthew Kahn of Johns Hopkins University and Daxuan Zhao of Renmin University suggests that the same logic applies to adaptation. Firms researching zero-emission energy and carbon sequestration hope to create a market (or are betting that governments will eventually do the job for them by getting serious about emissions). By contrast the market for better means of coping with climate change is already growing daily.

That is in many ways a good thing. Predictions of the costs of climate change are often far higher when analysts rule out the possibility of adaptive behaviour. A study published last year considering the global costs of coastal flooding, for example, estimated that floods will reduce real global GDP in 2200 by 4.5%—unless the effects of adaptive investments and migration are considered, in which case the loss works out as just 0.11%. A new report by the Global Commission on Adaptation, a group convened by 20 advanced and emerging economies, identifies $1.8trn in potential adaptation investments which, if realised between 2020 and 2030, would yield estimated net benefits of $7.1trn.

## The ark of history

But the march to adaptation is not an unalloyed good. Just as better safety features in cars may make for less careful drivers, investments in adaptation that blunt the effects of climate change could reduce the appetite for spending on mitigation. Serious decarbonisation will impose significant cost and inconvenience on nearly everyone. People will be persuaded that it is in their interests only if there are tangible harms in the not-too-distant future that might reasonably be averted. Investments in adaptation that reduce the likelihood or severity of those looming harms undercut the case for accepting the hardship of decarbonisation. The longer governments fail to act to curb warming, the more people and firms will spend to safeguard themselves, and the less troubled they may be by governments' failures to decarbonise.

But even if some people can adapt to a warmer world, it is still a big problem. Unmitigated global warming could result in catastrophic scenarios that outstrip any capacity to adapt. Moreover, the ability to adapt varies dramatically from place to place. Rich people in North America and mainland Europe, both of which have relatively temperate climates, have money to spend on adaptation and can move from the worst-hit spots with relative ease. Poor people have little spare cash, mostly live in hotter places and face far more obstacles when they try to migrate. Indeed, some research suggests they may even migrate less when temperatures rise, because hotter, drier conditions harm agricultural yields, thus depriving them of the capital they would need to move.

Part of the attraction of mitigation as a primary response is that the steps rich countries take to help themselves also help poorer ones, which are both less responsible for global warming and more vulnerable to its effects. Residents of advanced economies must recognise that spending to shield themselves increases, rather than decreases, their obligations to others. ■

The uncertainties of climate change

# Throwing the dice

**Predicting how the climate will evolve is fiendishly difficult. The greatest source of uncertainty comes not from science but from human behaviour**

The world's climate scientists are charged with a difficult task: to create a crystal ball with which to skry a future that promises to be hotter than today. But exactly how much hotter depends on innumerable factors, both natural and human. Creating the crystal ball is thus a two-stage process. First, you have to build a simulacrum of how Earth's climate works. Then, you try to perturb this simulacrum with plausible future human actions, to see what picture appears.

Modern magic being what it is, the crystal balls are actually supercomputers running programs with 1m or more lines of code. These programs are models that divide the planet's atmosphere, ocean and land surface into grids of cells—many millions of them. Land cells are flat. Atmosphere and ocean cells are three-dimensional and are stacked in columns to account for the effects of altitude and depth. A model calculates what is going on, physically and chemically, inside each cell, and how this will affect that cell's neighbours, both sideways and, if appropriate, above and below. Then it does it again. And again. And again.

That is a complicated process. A model's code has to represent everything from the laws of thermodynamics to the intricacies of how air molecules interact with one another. Running it means performing quadrillions of mathematical operations a second—hence the need for supercomputers. And using it to make predictions means doing this thousands of times, with slightly different inputs on each run, to get a sense of which outcomes are likely, which unlikely but possible, and which implausible in the extreme.

Even so, such models are crude. Millions of grid cells might sound a lot, but it means that an individual cell's area, seen from above, is about 10,000 square kilometres, while an air or ocean cell may have a volume of as much as 100,000km$^3$. Treating these enormous areas and volumes as points misses much detail. Clouds, for instance, present a particular challenge to modellers. Depending on how they form and where, they can either warm or cool the climate. But a cloud is far smaller than even the smallest grid-cells, so its individual effect cannot be captured. The same is true of regional effects caused by things like topographic features or islands.

→ Also in this section

84 Studying ancient climates

## Uncertainty principals

Building models is also made hard by lack of knowledge about the ways that carbon—the central atom in molecules of carbon dioxide and methane, the main heat-capturing greenhouse gases other than water vapour—moves through the environment. Understanding Earth's carbon cycles is crucial to understanding climate change. But much of that element's movement is facilitated by living organisms, and these are even more difficult to understand than physical processes.

Plants absorb carbon from the air during photosynthesis and then return it during respiration. Animals that eat those plants also respire. Bacteria and fungi similarly break down dead plants and animals to pillage materials and energy from them, releasing carbon dioxide and methane into ▸▸

the atmosphere as they do so. Some organic matter, nevertheless, gets buried rather than broken down, and is thus removed from climatic consideration. But, over time, this buried material is transformed by heat and pressure into oil, gas and coal—substances pertinent to the climate in the context of one particular biological agent, *Homo sapiens*. This species uses them to power its civilisation, taking mere decades to fill the air with carbon that took hundreds of millions of years to accumulate underground.

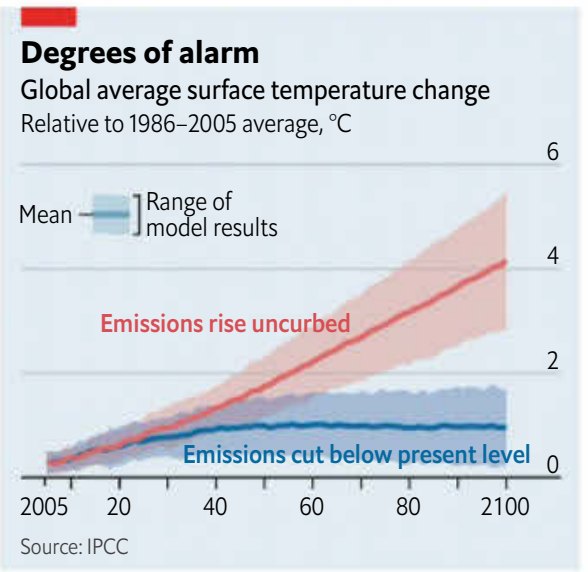
Organic matter may also be trapped in ice: on land in areas of permafrost, and at the bottom of the sea in molecular structures called clathrates. On top of all this, the oceans themselves contain vast amounts of dissolved carbon dioxide, and many sea creatures draw on that reserve to build themselves shells and carapaces out of calcium carbonate. Not all of this material is recycled. Some ends up on the seabed and eventually turns into limestone.

Changes in temperature are also a consideration. The relationship between warmth and carbon-dioxide concentration in the atmosphere is a two-way street. Warm water holds less of the gas than cold water. During past ice ages, oceans therefore drew carbon dioxide out of the atmosphere as they cooled, amplifying the process of cooling. Today's warmer oceans still act in aggregate as sinks for $CO_2$. The warmer they get, however, the less that will continue to be true.

**Sensitive information**

A further problem in model building is that uncertainties about feedback loops like the one between ocean temperature and $CO_2$ absorption also underpin uncertainties about a parameter called climate sensitivity, which is crucial to models' predictions. This is a measure of how responsive the climate is to changes in $CO_2$ concentrations in the atmosphere. Basic physics suggests the air should warm by approximately 1°C for a doubling of $CO_2$ levels relative to pre-industrial times. (So far, $CO_2$ levels have risen by about 50%.) Add feedback loops and estimates of temperature increase range from 1.5°C to 4.5°C. There have, moreover, been suggestions that climate sensitivity may itself be subject to a feedback loop, causing the climate to become yet more sensitive to $CO_2$ as it warms, thus promoting warming still further.

To test predictions such as these against reality and adjust models accordingly requires better data for, until recently, most parts of the globe lacked decent observations. Satellite records of the area covered by ice in the Arctic, for instance, stretch back only to 1979, and it was not until 2002 that researchers were able, courtesy of some new satellites, to estimate how the thickness of that ice varies over time and




from place to place. Applied to land-covering ice sheets as well as the floating ice of the Arctic Ocean, this revealed that Greenland was losing more than 200 cubic kilometres of ice (though only 0.007% of its total volume) a year—three times previous estimates.

Other parts of the globe suffer from a similar lack of observations. The oceans, for example, are reckoned to absorb more than 90% of the heat trapped by man-made greenhouse-gas emissions. But serious collection of data on the marine processes that underpin this, using networks of autonomous buoys, began only in the early 2000s. Swathes of the Southern Ocean, which plays an important role in storing both heat and $CO_2$, are still not monitored, and there are parts of the Arctic Ocean where no man has ever dipped a toe, nor machine a sensor.

Data from even inhabited parts of the world can be sparse, with unfortunate consequences. West Africa's monsoon, the failure of which in the 1970s and 1980s led to drought and famine, is poorly simulated by models, leading to fuzzy predictions for how it will change as the world continues to warm. Parts of east Africa where models had predicted an increase in rainfall have instead experienced a decrease. And heatwaves are rarely recorded on that continent, even though they would be expected to occur there.

A further source of uncertainty is what scientists refer to as non-linear effects. These are big, rapid shifts that occur in re-

Palaeoclimatology

## Prophetic waters

**Ancient climates, too, are under study**

THROUGHOUT HISTORY, people have viewed springs as mystical. From the warm pools of Roman Bath, whence sheets of lead inscribed with prayers have been recovered, to the gassy waters beneath the Oracle of Delphi that are thought to have stimulated the visions experienced by Apollo's sacred priestesses, these sites have been sought out for purposes of divination. With a modern twist, this is still happening, for Jason Ricketts of the University of Texas at El Paso thinks the remnants of ancient springs can be used to help monitor climates of the past by dating when warm and cold periods occurred.

Dr Rickett's starting point is his assumption that, as ice ages end and the world warms up, underground water flows will increase simultaneously all around the planet. Moreover, as water travels through the ground it dissolves and picks up minerals, particularly calcium carbonate. When it subsequently bubbles to the surface, it deposits these minerals as a type of limestone called travertine, which has bands in it that reveal by their thickness approximately how long the water which created them was flowing. The age of a band can be determined by analysis of the radioactive isotopes within it, particularly those of uranium and its decay products. Dr Rickett therefore predicted that the thicknesses of bands of travertine of the same age from all around the world would be correlated, and that those thicknesses would decrease and increase with the coming and going of ice ages.

To test this idea he and his colleagues searched the scientific literature for all the previous studies of travertine they could find. By doing so, as they report in the *Journal of Quaternary Science*, they discovered the ages of 1,649 deposits of the rock, scattered across every continent except Antarctica. To his delight, when Dr Rickett plotted these ages against the thickness of the bands reported, he found that those thicknesses did indeed rise and fall in step.

To his further delight, the dates he deduced for warm and cold periods matched those from the existing way of dating them, which measures the ratio of isotopes of oxygen in fossil teeth—for this ratio is temperature dependent. That different dating methods have arrived at the same conclusion in this way is a useful confirmation that palaeoclimatologists' dates for events in the past few hundred thousand years are correct.

sponse to small changes, and may be irreversible, at least in the short term. Many involve ice changing into liquid water. The collapse of ice sheets on parts of Greenland and Antarctica could happen with mere decades of warming, but would take millennia of cooling to reverse. The melting of permafrost might be worse: not only irreversible, but releasing vast amounts of carbon dioxide and methane to boost temperatures further.

Ocean currents also look susceptible to non-linear effects. These currents are propelled by a phenomenon called thermohaline circulation that depends, as its name suggests, on the salinity and temperature of seawater, and thus its density. Cold or saline water sinks, while warm or fresher water rises, and large bodies of sinking or rising water provide the engine that drives currents around the world. There are signs that the North Atlantic conveyor belt, which drives the circulation of water through the depths of the world's oceans, is slowing down—probably as a result of melting ice from Greenland freshening the water. Since the ocean's currents are all connected, this local slowdown could also have effects far from north-west Europe (an area it has long been known to warm), such as on the Intertropical Convergence Zone, a weather belt that brings to the tropics.

In spite of all this uncertainty, climate models have done a pretty good job of predicting what has happened so far. But they also have to cope with the biggest uncertainties of all: how rapidly, and in what ways, human beings respond to the threat they face (see chart on previous page).

The most important human uncertainty is how quickly and completely people will stop using fossil fuels, and thus stop transferring carbon from Earth's crust to the air. This transition will be driven by a mixture of economics, politics and technological change. Already, some countries (such as Britain) have more or less abandoned using coal, the most carbon-intensive fuel, to generate electricity. It helps that natural gas, which is less carbon-intensive, is also often cheaper. But zero-carbon power generation by wind and sun is competitive with coal, too, in a growing number of places. Add electrically powered vehicles to the mix and an optimist might say, "problem solved".

**The human touch**

Well, not exactly. Though profitable technological change can happen fast (in America, the shift from horse-drawn carts to engine-driven vehicles took place within a decade, between 1903 and 1913), it would be going some to convert all the world's electricity production (which would mean scrapping vast amounts of installed capacity) by the deadline of 2050 that has been proposed, by the Intergovernmental Panel on Climate Change, for the elimination of man-made greenhouse-gas emissions. Other means will be needed as well.

Most routes to the goal of avoiding 1.5°C of warming, the target agreed at a UN climate-change meeting in Paris in 2015, involve some amount of "negative emissions", whereby carbon dioxide is removed from the atmosphere. This can be as low-tech as reforesting land, or as high-tech as using chemical engineering to purge the air of undesirable substances. There are also ideas around to capture at source the $CO_2$ released by processes such as cement-making, of which the gas is an inevitable chemical by-product, and then bury it somehow underground—a plan known as carbon capture and storage.

Both negative emissions and carbon capture and storage could work in principle. But, unlike alternative ways of generating electricity, which, once mastered, will be profitable, they offers little prospect of turning a profit without subsidy. Given the threat, asking for such subsidies is perfectly reasonable. Taxpayers are called on to pay for wars against human enemies, so might be expected to stump up for one against a less tangible foe. But predicting how rapidly and in what quantity cash for such a war will arrive is a mug's game.

Other human-induced uncertainties could be even greater. Some, for instance, talk of solar geoengineering—intercepting a portion of the incoming energy from the sun and returning it to space before it has had a chance to warm the atmosphere. There are several ways this might be done, from deploying fine mists of particles in the stratosphere to building mirrors in space. Such methods might conceivably stop warming within a few years, or even cool things down. That might look attractive to some, if emissions are not drastically reduced soon.

As to the political will needed to jolly the process along, and arrange payment for those parts of the programme that will not pay for themselves, this can push both ways. America's approach to climate policy and regulation has see-sawed from George W. Bush's obstructionism to Barack Obama's efforts to work with China and introduce domestic policy and regulations, and now Donald Trump's roll-back from those positions. Some countries, however, seem to have arrived at more of an internal consensus. Earlier this year, for example, Britain adopted what it says is a legally binding target to reach "net-zero" emissions by 2050 (though what "legally binding" actually amounts to is not exactly clear). Britain's current contribution to greenhouse-gas emissions is about 1%, so this will, by itself, make little difference. But it may encourage the others.

France, a country with an economy about the same size as Britain's, is also aiming for net-zero by the middle of the century, and it, too, says this target is legally binding. Denmark has joined in as well. Germany and Chile are considering doing so. And California and Sweden have pledged to outdo the others by reaching net zero by 2045. How important all this is, is hard to guess, and almost impossible to model. Some game theorists are, nevertheless, trying to do so. Their games suggest that in international climate negotiations a small group of nations could create a "tipping set" that has the power, perhaps through financial sanctions, to induce other governments to join them on a path to net zero.

Ultimately, tackling climate change will require all of these pieces—the political, the economic, the technological and the social—to come together. But if they do, a solution may yet be possible. Earlier this year, Britain's Committee on Climate Change published the results of its own crystal-ball gazing, a report on what a net-zero United Kingdom might look like. Homes in this paradise would be heated by decarbonised electricity. Ships would be powered by ammonia. People would eat more vegetables and less meat. Parts of the country would once again be covered by forests. And there would be a new programme to capture and store $CO_2$.

As an objective, this all sounds quite attractive—reminiscent, perhaps, of William Blake's vision of a New Jerusalem taking over from a land of dark, satanic mills. But whether such promised lands will, in the end, be built remains the biggest uncertainty of all. ■



Climate change and art

# Food for thought

ISLE OF SKYE

**Just like politics, sometimes art is most effective when it is local**

WHAT TO WEAR to dine on the ocean floor? The invitation warned of the "changing weathers" of Scotland's west coast. Oilskins and a sou'wester might have been appropriate. Or wellies. Or perhaps just bare feet. Over ten days in September 2017, Alon Schwabe and Daniel Fernández Pascual, the former an Israeli-born dancer and performance artist, the latter a Spanish architect, served meals with a message to anyone who, at low tide, was prepared to walk out into Bayfield Bay, off Portree, the capital of the Isle of Skye, to eat at their "oyster table".

The tabletops and benches that were the set for their performance were actually metal cages filled with oysters (pictured). At high tide they were completely submerged, and drew in seaweed and assorted molluscs. When the tide went out, the mesh became a dining room. Surrounded by their guests, the two artists, who work under the name Cooking Sections and call themselves "spatial practitioners", set to work shucking shellfish and handing round kelp lasagne, nori crackers and scones made from sea lettuce and seaweed butter, all the while keeping up a practised storytelling routine.

Their theme was how diets should be updated in response to climate change. Instead of herbivores or carnivores, the pair say, people should consider becoming "climavores"—eating more locally sourced food and changing menus according to the season. Their interest in the idea began with a project among the Inuit in Alaska in 2014. Later this year they will perform at the Venice Biennale; next year they will set out their stall at Tate Britain in London.

## Ice and fire

For centuries artists generally saw nature as the work of God. Today many discern the hand of man behind polluted seashores and vanishing species. But making art out of climate change, rather than from nature itself, has not proved straightforward. While it is useful material for apocalyptic films, climate change makes a tough subject for painting and sculpture. The scale and complexity mean that depicting it in visual terms is hard—as the bedraggled rubber squid and limp flora on show at Venice inadvertently attest. Equally challenging, for those whose aim is didactic, is finding the most fitting artistic way to raise awareness of the crisis.

The world's best known climate-change artist is Olafur Eliasson. He began his career at 15, selling gouaches of landscapes he had encountered on walks with his Icelandic father, a painter. Later he photographed shrinking glaciers and polluted rivers. But it was his experiments with geometry and architecture, beginning in his late 20s, that led Mr Eliasson to make big conceptual pieces that use light, water and varying temperatures to create sensory experiences for his audiences. The "Weather Project" (2003) employed a vast "sun" to flood the Turbine Hall at Tate Modern in London with yellow light, hinting at a future of ever higher temperatures. Audiences threw themselves into the performance. They lay on the floor, made star shapes with their bodies and took endless selfies—forms of engagement that have since become the norm at exhibitions around the world.

The "Weather Project" was the first large-scale effort to deal with climate change in contemporary art. Fifteen years later, Mr Eliasson brought 24 massive chunks of ice from Greenland to the banks of the Thames in a work called "Ice Watch London". As the ice melted outside Tate Modern, performance and protest fused. "I believe in challenging people's perspectives and the numbness of the political sphere," Mr Eliasson says. He notes that far more people saw the installation in London than would have done in Greenland—but some critics pointed out the cost in energy of transporting the ice across the Atlantic (there were installations in ▸▸

Copenhagen and Paris, too).

Less well known, but in their own, quieter way as effective, are the growing cadre of artists who are developing pieces that engage directly with communities. "Climate-change art doesn't have to be shouty," says Aaron Cezar, director of the Delfina Foundation in London, which has arranged the performance-art programme in Venice this year. "It's about making complex ideas simple, and about connecting."

**You are what you eat**

Consider, for example, "The Edible Hut" in Detroit, Michigan. The hut is a community and performance space with an edible roof made of plants, erected by Mira Burack, who works under the name Matterology. Or Renzo Martens, a Dutch film-maker and conceptual artist, who works in Congo, drawing attention to the ecological impact of the palm-oil industry. Or Vivien Sansour, a film-maker and storyteller who has collaborated with farmers in Honduras, Uruguay and the West Bank. Through her narratives she encourages them to grow heritage varieties of vegetables and share their seeds, thereby earning the nickname, the "Seed Queen of Palestine".

This is the expanding niche—between big-time pyrotechnics and the struggle of figurative art to capture the scope and peril of climate change—in which Cooking Sections operate. Their climavore project was commissioned by Atlas Arts, a Scottish cultural agency, which stumped up £150,000 ($186,000) of public subsidy. The artists wanted to draw attention to the particular problems of the seas around Skye: increasing acidification and toxic algae blooms caused by rising temperatures, as well as the harm done to the ocean floor around the island by intense salmon farming that continues to grow.

As part of the performance, they asked Ben Oakes, a local scallop-diver, to give talks focused on the damage inflicted by scallop-dredging. A seaweed forager spoke of the many possible uses for kelp, including flavouring gin. Three of the island's best-known chefs undertook to stop serving farmed salmon, creating special "climavore" menus instead. Cooking Sections themselves gave a number of workshops in the local high school about cooking with foraged ingredients; three school-leavers are being offered "climavore" apprenticeships each year in nearby restaurants.

The project has succeeded, the artists believe, because it has engaged with locals, as well as with some of Skye's 500,000 visitors a year. "It has injected a real energy into the conversation, about how people might do things differently in the future," Mr Schwabe says. Mr Eliasson's verdict on climate activism in art is more oracular. "The madman of yesterday", he says, "will be the visionary of tomorrow." ■

Booksellers and the law

# There she blows

**A controversial book about 1MDB is published at last in Britain**

It is a dry name for what may prove the heist of the century. The 1MDB affair, involving the alleged theft of $4.5bn from the Malaysian state development fund of that name, has felled a Malaysian prime minister, ensnared Goldman Sachs and embarrassed Hollywood bigwigs. An impeccably researched book on the scandal—by Tom Wright and Bradley Hope of the *Wall Street Journal*—came out last year. But not in Britain, thanks to its strict libel laws and the efforts of its fearsome "reputation-management" industry. That omission was rectified on September 12th with the delayed publication of the British edition, even as legal threats continued to fly.

"Billion Dollar Whale" focuses on the role of Jho Low (pictured), a baby-faced Malaysian playboy who American prosecutors allege was the mastermind of the misappropriation. Mr Low, a fugitive sought by Interpol (and believed to be in China), has been charged with money-laundering-related offences in America and Malaysia. He maintains his innocence. His spokesman says the book is "trial-by-media at its worst" and "guilt by lifestyle". Among other extravagances, Mr Low threw lavish parties for bankers and celebrities, showering them with gifts, including a Picasso (since returned) for Leonardo DiCaprio.

The problems for the book's British release began when the local arm of its publisher, Hachette, declined to distribute it on behalf of the company's American division because of legal threats from several people it mentioned. Scribe, a plucky independent house that also published an unflattering portrayal of the billionaire Koch brothers, later picked up the baton.

The other source of discouragement was a campaign led by Schillings, a British law firm acting for Mr Low. In a move unusually aggressive even by British standards, Schillings bombarded not only the publisher but also distributors, in Britain and elsewhere, with threatening letters. Several booksellers received reams of missives, some hand-delivered, which advised that suggesting Mr Low was guilty of fraud was "outrageously defamatory". Selling the book would potentially interfere "in the proper administration of justice in the United States". Some vendors were warned against categorising the book as "true crime". Many distributors were spooked. Amazon decided against selling the book in Britain (and some other European countries) after Hachette refused to indemnify it against legal action.

Free-speech campaigners have bemoaned this assault on bookshops, not least because Schillings's threats appear to rest on shaky legal foundations, even in Britain. The Defamation Act of 2013 states, in effect, that distributors cannot be targeted unless it is impossible to go after the publisher, author or editor. For all the bombast, Mr Low is not believed to have sued or tried to sue Hachette, Scribe, Messrs Wright and Hope, or anyone else involved. Schillings declined to comment. But this is the only known case of lawyers in Britain targeting book distributors on defamation grounds since the law of 2013 was passed.

In the run-up to the British release, Scribe issued a statement reassuring British booksellers that they are on safe legal ground. Most, including Amazon, are now willing to stock "Billion Dollar Whale". (A few brave shops have done so already, using copies ordered from America.) Sarah Braybrooke of Scribe says orders from British outlets are "excellent".

Publication in the spiritual home of the libel complaint does not, however, mean Mr Low will necessarily consider his efforts wasted. "Knocking a few stockists out of the loop for a time by maximising pressure on them may be the best he could have hoped for," says one media lawyer. The campaign, he reckons, was probably always more about damage limitation than legal redress. "It's not clear to me how someone on the run, facing criminal charges and wanted by Interpol, is able to do this," Ms Braybrooke observes.

The fight goes on. Schillings continues to fire off letters, recently sending another batch to bookshops around the world to coincide with an updated edition. Scribe has received ten letters in the past six weeks, mostly demanding that it comply with data-protection laws by handing over all personal information it holds on Mr Low. "It's intimidating," says Mr Hope; "but it's also good publicity for our book." ■

American diplomacy

# Absolute Power

**The Education of an Idealist.** By Samantha Power. *Dey Street Books; 592 pages; $29.99. William Collins; £20*

In August 2013 a devastating chemical-weapons attack on the Damascus suburbs killed some 1,400 people. Faced with a clear breach of the red line he drew a year earlier, President Barack Obama had to decide what to do. He blinked. Rather than ordering reprisals against the regime of Syria's president, Bashar al-Assad, he opted to ask for Congress's permission first. And Congress, it turned out, was not keen.

Samantha Power, Mr Obama's new ambassador to the United Nations, faced a choice, too. She had spent her professional life arguing for a more assertive American response to atrocities. She believed her boss should punish this horrendous crime, and indeed earlier ones, with air strikes. Now her idealism confronted the complexities of government. Should she resign, as some critics urged her to do?

She opted to stay on. Yet she also rejected the choice once put to her at the UN by Mexico's ambassador there: that she had to decide whether she was a diplomat or an activist. Instead, as she describes in this engaging memoir, she tried (at times uneasily) to be both. Although her time at the UN was quite recent, from mid-2013 to early 2017, her account of her hyperactive global engagement is a fascinating description of a different era of diplomacy. President Donald Trump sets little store by the UN, allowing most of this year to pass with only an acting American ambassador there.

During the courtesy calls she made to all her fellow UN ambassadors (except North Korea's), Ms Power was keen to learn about their personal histories. Her own is as unlikely as any. She was born in Ireland. Her gifted but alcoholic father used to take her to a grubby Dublin pub; he died when she was 14. By then she had already left for America with her ambitious mother and supportive stepfather, both doctors. She loved sports; while helping out on a baseball broadcast at a local station in Atlanta in 1989, she saw the raw video feed of events in Tiananmen Square, where Chinese forces attacked protesters. She found herself wondering what America's government would do in the face of such brutality.

An ambassador at large

The same question returned with a vengeance when, after Yale and an internship at a Washington think-tank, Ms Power became absorbed by the deepening crisis in the Balkans. She chronicled its horrors as a freelance journalist in Bosnia, for this newspaper among others. In 1995, back in America and on her way to Harvard Law School, she cried with relief on hearing that NATO was launching the air strikes that would break the siege of Sarajevo.

### Friends like these

One killing spree was over, but not Ms Power's obsession with the subject. Friends joked that she was "all genocide, all the time". Her book, "A Problem from Hell", won a Pulitzer. She coined the word "upstanders" (as opposed to "bystanders") to describe those who tried to take a stand against genocide; it found its way into the Oxford English Dictionary. And, after meeting Mr Obama over dinner in 2005, she found her way onto the staff of the young senator from Illinois.

Her friendship with Mr Obama survived the embarrassment she caused during his presidential run when, in an unguarded moment, she called his rival, Hillary Clinton, a "monster". Through the campaign she met her husband, Cass Sunstein, a law professor and author. After Mr Obama's victory she got the chance to apply her activism in government, first handling UN-related matters at the National Security Council, then at the UN itself in New York.

The second half of Ms Power's memoir is an insider's account of foreign-policy-making, and an intensely personal one. Her own life as a diplomat involved juggling the demands of her job and those of her two young children. She thought John Kerry, as secretary of state, surprisingly warm, and was distressed to find Aung San Suu Kyi, Myanmar's heroine, a bad listener. Her most intriguing relationship was with Vitaly Churkin, Russia's veteran ambassador at the UN (who died shortly after her time there). It developed into "something resembling a genuine friendship". After one argument, she told him she knew he had mixed motives, half sincere and half ulterior; no, he shot back, "we are fully sincere about achieving our ulterior motive." Not surprisingly, given the growing antagonism between Russia and the West, the near-friendship yielded limited results.

Despite the frustrations, Ms Power can claim that her wins mounted up. Many were low-key, such as a hands-on campaign to free a number of women political prisoners or the successful defence of benefits for UN employees in same-sex marriages. A bigger deal—though its impact is questionable—was the agreement she helped negotiate with Churkin to remove Syria's chemical-weapons stocks. Better, involvement in the Central African Republic "led some to claim that we helped avert a genocide". Mobilisation of efforts to combat Ebola in west Africa was "an example of why the world needed the United Nations, because no one country...could have slayed the epidemic on its own."

The activist-turned-diplomat regrets that America did not do more on Syria. But she firmly believes in the power of American diplomacy to do good: "On issue after issue, either the United States brought a game plan to the table or else the problem worsened." Through it all is her abiding sense of wonder: that this girl from Dublin could be sitting behind the "United States" sign at the UN, speaking for America. ■

Families in fiction

# Kids these days

**Akin.** By Emma Donoghue. *Little, Brown; 352 pages; $28. Picador; £16.99*

Emma Donoghue specialises in odd couples. Even before her international bestseller, "Room" (2010), in which a sociopath keeps a mother and her young son prisoner in a soundproof shack, Ms Donoghue was writing short stories and novels (set in her native Dublin) about relationships and households that defy conventional definitions of family. "Akin", her spirited, highly accomplished new book, indicates, by its title at least, that although this time her characters inhabit a different milieu, her theme is a familiar—and familial—one.

Noah Selvaggio, a widower and retired scientist, is nearing his 80th birthday. He lives in an Upper West Side apartment crammed with works by his French grandfather, a world-renowned photographer who practised under the pseudonym Père Sonne ("No One"). Memories of Noah's late wife, Joan, and his younger sister, Fernande, crowd in. Noah is childless; his only nephew, Victor, died of an overdose at 26. ▸▸

Still mentally and physically active, he is terrified of extreme old age. An unusual bequest from Fernande of old photos taken by their mother, Margot, during the Nazi occupation of Nice, leads him to plan a trip to the city of his birth to uncover their provenance—and learn more about his family's wartime past.

Into this grand scheme is rudely thrust a hitherto unknown great-nephew, Michael. Sparky and vulnerable, the 11-year-old is the offspring of the deceased Victor and Amber, who is in jail for alleged drug-dealing. The relative with whom Michael had been living in a gritty part of Brooklyn has died, and his options are stark: Noah or the social services. Reluctantly, Noah agrees to take him in temporarily—which will mean Michael going with him to Nice.

The pair bicker from the start. Michael is potty-mouthed, a seemingly endless consumer of junk food and addicted to violent video games. He is also bright, witty, endearing—and scared. He wets the bed at night, and scoffs at Noah's vain attempts to inject some culture, and vegetables, into his mind and body.

"How could anyone bear to be a parent?" Noah marvels. "Like contracting to love a werewolf." The two become unlikely detectives as Michael's technological nous, and Noah's learning, lead to the slow revelation of Margot's role in the real-life Marcel Network—an underground movement that saved hundreds of Jewish children in 1943-45. Whether Margot was a collaborator or resistance heroine is not revealed until the end of the novel. As well as this fascinating slice of European history, "Akin" offers a subtle, entertaining portrait of the relationship—and friction—between age and youth. ■

# Johnson First among equals

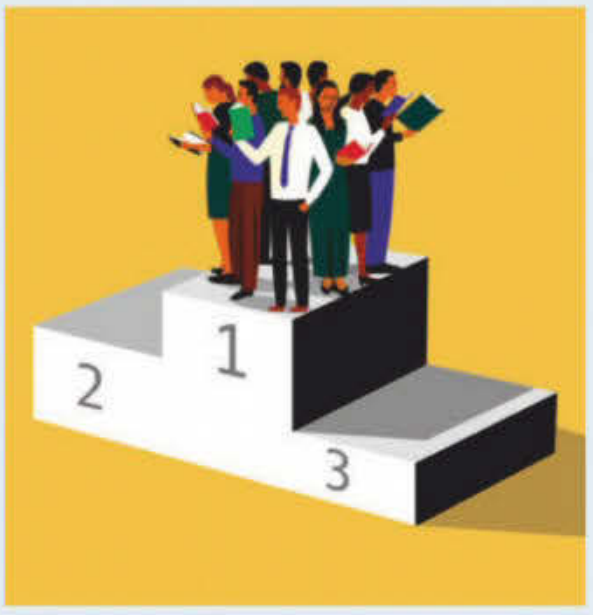
*Which is the best language? You decide*

MAURICE DRUON of the French Academy once proposed that French should be made the principal legal language of the European Union. He argued that its logic and precision rendered it the judicial language *par excellence*. Others chortled. How very French of him!

The French are hardly alone in believing that their language is especially poetic, emotional, logical, precise, accessible or rich. But it turns out that the things people prize in their own languages can often be the same things foreign learners hate. Take the formal-informal distinction in words for "you". German and French have *du* and *tu* for friends and family, and *Sie* and *vous* for unknown adults and formal speech. Natives of those languages miss that distinction when speaking English. Those whose languages (like English) don't make it in the first place often resent having this choice forced on them in French or German.

A dictum among linguists is that languages differ not in what they can express, but in what they must. Given the time and willingness to explain or coin basic terms, any language could be used to talk about anything. But they vary wildly in what they insist speakers say, with the *tu-vous* distinction just the tip of an iceberg. Washo, a native language of Nevada, has four past and three future tenses, depending on how distant an event is in time. Tariana, from Brazil, has "evidentiality": speakers choose one of five verb-endings to show how they know what they aver to be true. Jarawara, also from Brazil, distinguishes "we (including you)" and "we (without you)".

The many different things a language can and must do are the subject of "Are Some Languages Better than Others?", a book from 2016 by R.M.W. Dixon of James Cook University in Australia. Mr Dixon dispels old colonialist prejudices that European languages are sophisticated and indigenous ones primitive. Indeed, many of the most nuanced discriminations are required not by French or German but among isolated traditional communities.




In answering his title's provocative question, Mr Dixon finds that requiring distinctions (formal or informal "you", inclusive or exclusive "we", evidentiality), is useful. The more information, the better. But not every language can require every distinction: a language that had them all would be too hard for members of the community to learn, to say nothing of outsiders. There may be an outer limit to how complex languages can get, constrained by the brain's processing power.

Into the argument about whether some languages are superior comes a recent paper on information density in speech, by François Pellegrino and his colleagues at the University of Lyon. Some languages, like Japanese, have few distinct sounds and tight rules on how syllables may be structured, so that the number of possible syllables is low (think *ka*, *ru*, *to*, etc). Other languages (like English) have fewer constraints, so that a single syllable may be as complicated as *strengths*. All things being equal, one syllable chosen among English's thousands will carry more information than one picked from Japanese's dozens. But the study finds that this imbalance is counteracted by speech rate: speakers of Japanese get in many of their simple syllables more quickly than English-speakers do their complicated ones. Overall information density turns out to be the same across hugely different tongues.

In short, languages are governed by trade-offs. One that avoids making certain information mandatory may be easy to speak, but leaves the listener to fill in the gaps. It may be simple to learn but less expressive. Some languages have lots of redundant elements: in *los tres gatos negros están mojados* ("the three black cats are wet" in Spanish), all six words indicate a plural. Marking the plural just once (as Chinese does) would be enough. But redundancy has a virtue: emphatic communication is more likely to survive a noisy environment.

Languages, Mr Dixon says, are like a Western-style house. There are a few rooms you must have (kitchen, bedroom, living room, bathroom), and some discretionary options (office, guest room). On a fixed budget, you can't have all the extras. He does not crown a "best" language. In the end, he says, readers should make their own list of desirable features, and then closely examine a few languages to decide whether one has more of them than another. But the list of advantages, he concedes, is itself a matter of judgment. For all his scientific criteria, in the end the verdict is in the ear of the beholder.

## REPUBLIC OF TOGO - Ministry of Economy and Finance

### International pre-qualification notice as part of the privatisation of BTCI and UTB banks

The Government of the Republic of Togo (the "*Government*") represented by the Ministry of Economy and Finance, has decided to proceed with the pre-qualification of investors for the privatisation of the Banque Togolaise pour le Commerce et l'Industrie ("*BTCI*") and the Union Togolaise de Banque ("*UTB*") as part of its divestment policy from the banking sector.

BTCI and UTB banks, with respective total balance sheets of FCFA 198 billion and FCFA 281 billion as at December 31, 2018, have extensive networks throughout the territory. They offer to their respective customers (individuals and businesses) efficient products and services, allowing them to be presented as Togolese reference banks.

The Government intends to sell its shareholdings and/or open up the majority of the capital of these two banks to strategic investors with strong banking and financial experience that allows such banks to achieve their full potential and continue their ongoing development.

To this end, the Government by this notice calls for a pre-qualification from strategic investors (the "*Bidders*") who might be interested by the pre-qualification process as part of the privatisation of BTCI and UTB banks.

The selection of Bidders will take place in two stages through a tender process. Bidders are invited, first, to pre-qualify in order to participate in the final tender process. Only pre-qualified Bidders may participate in this second stage. The list of pre-qualifying criteria, required statements and necessary documents to be provided to the Government, is included in the two pre-qualification documents to which this notice is subject to.

Candidates may obtain the pre-qualification documents which are available from September 30, 2019 from one of the below listed persons:

Mr. **Ekpao Adjabo**
Director General of the Treasury and Public Accounting
Ministry of Economy and Finance
Immeuble CASEF
BP 3521 Lomé
Togo
Tel. : + 228 22 21 27 54
Email : ekpao.adjabo@finances.gouv.tg

Mr. **Stéphane de Vaucelles**
Managing Partner
Compagnie Financière CADMOS
Rond Point Schuman 11
1040 Brussels
Belgium
Tel. : + 32 2 256 75 57
Fax : + 32 2 256 75 03
Email : stephanedevaucelles@cadmos.eu

Mr. **Toussaint de Souza**
Partner
KPMG Côte d'Ivoire
Immeuble Woodin Center, Avenue Noguès Plateau
01 BP 3172 – Abidjan 01
Côte d'Ivoire
Tel. : + 225 20 22 57 53
Fax : + 225 20 21 42 97
Email : odesouza@kpmg.ci

The request shall be made by mail or by email and shall state that it is a "*Request for Pre-qualification Documents for BTCI and/or for UTB*". The documents will be sent in a sealed envelope and the sender shall in no event be liable for delays or loss suffered in its delivery.

Pre-qualification requests, to be made in a sealed envelope, must be filed no later than November 22, 2019 at 10 am (UT) to the Director General of the Treasury and Public Accounting, whose address is mentioned in the previous paragraph, with the following explicit mention: "*Request of pre-selection for the privatisation of BTCI and/or UTB*".

The Government reserves the right to accept or reject any request received after the deadline specified above.

The Bidders will be informed on the results of their application in accordance with the conditions and in the manner provided by the pre-qualification documents.

## Economic data

| | Gross domestic product, % change on year ago: latest | | quarter* | 2019† | Consumer prices, % change on year ago: latest | | 2019† | Unemployment rate, % | | Current-account balance, % of GDP, 2019† | Budget balance, % of GDP, 2019† | Interest rates, 10-yr gov't bonds: latest,% | | change on year ago, bp | Currency units: per $ Sep 18th | % change on year ago |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| United States | 2.3 | Q2 | 2.0 | 2.2 | 1.7 | Aug | 2.0 | 3.7 | Aug | -2.2 | -4.7 | 1.8 | | -114 | - | |
| China | 6.2 | Q2 | 6.6 | 6.1 | 2.8 | Aug | 2.8 | 3.6 | Q2§ | 0.7 | -4.5 | 3.0 | §§ | -55.0 | 7.09 | -3.2 |
| Japan | 1.0 | Q2 | 1.3 | 1.0 | 0.6 | Jul | 1.0 | 2.2 | Jul | 3.3 | -3.0 | -0.2 | | -26.0 | 108 | 3.8 |
| Britain | 1.2 | Q2 | -0.8 | 1.1 | 1.7 | Aug | 1.9 | 3.8 | Jun†† | -4.1 | -1.8 | 0.7 | | -80.0 | 0.80 | -5.0 |
| Canada | 1.6 | Q2 | 3.7 | 1.6 | 1.9 | Aug | 2.0 | 5.7 | Aug | -2.5 | -0.9 | 1.4 | | -95.0 | 1.33 | -2.3 |
| Euro area | 1.2 | Q2 | 0.8 | 1.3 | 1.0 | Aug | 1.4 | 7.5 | Jul | 2.9 | -1.1 | -0.5 | | -99.0 | 0.90 | -5.6 |
| Austria | 1.7 | Q2 | -0.9 | 1.4 | 1.5 | Aug | 1.6 | 4.4 | Jul | 2.0 | 0.1 | -0.3 | | -95.0 | 0.90 | -5.6 |
| Belgium | 1.2 | Q2 | 0.9 | 1.2 | 1.3 | Aug | 1.8 | 5.7 | Jul | 0.1 | -1.0 | -0.2 | | -96.0 | 0.90 | -5.6 |
| France | 1.4 | Q2 | 1.3 | 1.2 | 1.0 | Aug | 1.2 | 8.5 | Jul | -0.9 | -3.3 | -0.2 | | -97.0 | 0.90 | -5.6 |
| Germany | 0.4 | Q2 | -0.3 | 0.8 | 1.4 | Aug | 1.6 | 3.0 | Jul | 6.5 | 0.7 | -0.5 | | -99.0 | 0.90 | -5.6 |
| Greece | 1.9 | Q2 | 3.4 | 1.8 | -0.2 | Aug | 0.8 | 17.0 | Jun | -3.0 | 0.3 | 1.4 | | -268 | 0.90 | -5.6 |
| Italy | -0.1 | Q2 | 0.1 | 0.1 | 0.4 | Aug | 0.8 | 9.9 | Jul | 1.9 | -2.4 | 0.9 | | -193 | 0.90 | -5.6 |
| Netherlands | 2.0 | Q2 | 2.1 | 1.7 | 2.8 | Aug | 2.6 | 4.2 | Jul | 9.7 | 0.6 | -0.3 | | -83.0 | 0.90 | -5.6 |
| Spain | 2.3 | Q2 | 1.9 | 2.2 | 0.3 | Aug | 0.9 | 13.9 | Jul | 0.6 | -2.3 | 0.2 | | -119 | 0.90 | -5.6 |
| Czech Republic | 2.4 | Q2 | 2.6 | 2.6 | 2.9 | Aug | 2.7 | 2.2 | Jul‡ | 0.5 | 0.2 | 1.4 | | -74.0 | 23.4 | -7.2 |
| Denmark | 1.9 | Q2 | 3.2 | 1.8 | 0.4 | Aug | 0.9 | 3.8 | Jul | 6.8 | 1.0 | -0.5 | | -89.0 | 6.75 | -5.5 |
| Norway | -0.7 | Q2 | 1.0 | 1.5 | 1.6 | Aug | 2.3 | 3.6 | Jun‡‡ | 6.2 | 6.6 | 1.4 | | -58.0 | 8.93 | -8.7 |
| Poland | 4.2 | Q2 | 3.2 | 4.0 | 2.9 | Aug | 2.0 | 5.2 | Aug§ | -0.7 | -2.0 | 2.1 | | -116 | 3.93 | -6.6 |
| Russia | 0.9 | Q2 | na | 1.3 | 4.3 | Aug | 4.5 | 4.3 | Aug§ | 7.2 | 2.1 | 7.2 | | -179 | 64.2 | 5.1 |
| Sweden | 1.0 | Q2 | 0.5 | 1.6 | 1.4 | Aug | 1.8 | 7.1 | Aug§ | 4.4 | 0.6 | -0.2 | | -76.0 | 9.70 | -8.1 |
| Switzerland | 0.2 | Q2 | 1.1 | 1.6 | 0.3 | Aug | 0.5 | 2.3 | Aug | 9.6 | 0.5 | -0.7 | | -79.0 | 1.00 | -4.0 |
| Turkey | -1.5 | Q2 | na | -0.2 | 15.0 | Aug | 15.9 | 13.0 | Jun§ | -0.1 | -2.8 | 14.9 | | -419 | 5.67 | 12.0 |
| Australia | 1.4 | Q2 | 1.9 | 1.8 | 1.6 | Q2 | 1.5 | 5.3 | Aug | -0.1 | 0.1 | 1.1 | | -150 | 1.46 | -4.8 |
| Hong Kong | 0.5 | Q2 | -1.7 | 1.7 | 3.3 | Jul | 2.6 | 2.9 | Aug‡‡ | 4.0 | 0.4 | 1.3 | | -108 | 7.83 | 0.1 |
| India | 5.0 | Q2 | 2.9 | 5.2 | 3.2 | Aug | 3.6 | 8.2 | Aug | -1.5 | -3.5 | 6.6 | | -152 | 71.2 | 2.1 |
| Indonesia | 5.0 | Q2 | na | 5.1 | 3.5 | Aug | 3.1 | 5.0 | Q1§ | -2.8 | -2.0 | 7.2 | | -120 | 14,060 | 5.7 |
| Malaysia | 4.9 | Q2 | na | 4.4 | 1.4 | Jul | 0.8 | 3.3 | Jul§ | 2.5 | -3.5 | 3.4 | | -75.0 | 4.18 | -1.0 |
| Pakistan | 3.3 | 2019** | na | 3.3 | 11.6 | Aug | 9.1 | 5.8 | 2018 | -3.7 | -8.9 | 13.0 | ††† | 296 | 156 | -20.5 |
| Philippines | 5.5 | Q2 | 5.7 | 5.7 | 1.7 | Aug | 2.7 | 5.4 | Q3§ | -1.3 | -2.5 | 4.7 | | -287 | 52.2 | 3.5 |
| Singapore | 0.1 | Q2 | -3.3 | 0.9 | 0.4 | Jul | 0.6 | 2.2 | Q2 | 15.8 | -0.6 | 1.8 | | -72.0 | 1.37 | nil |
| South Korea | 2.1 | Q2 | 4.2 | 1.9 | nil | Aug | 0.7 | 3.0 | Aug§ | 4.0 | 0.6 | 1.5 | | -87.0 | 1,191 | -5.7 |
| Taiwan | 2.4 | Q2 | 2.7 | 2.4 | 0.4 | Aug | 0.5 | 3.7 | Jul | 12.0 | -1.0 | 0.7 | | -12.0 | 31.0 | -0.6 |
| Thailand | 2.3 | Q2 | 2.4 | 2.5 | 0.5 | Aug | 1.2 | 1.1 | Jul§ | 7.2 | -2.8 | 1.4 | | -122 | 30.5 | 6.7 |
| Argentina | -5.8 | Q1 | -0.9 | -2.9 | 54.5 | Aug‡ | 53.4 | 10.1 | Q1§ | -1.5 | -3.7 | 11.3 | | 562 | 56.5 | -29.7 |
| Brazil | 1.0 | Q2 | 1.8 | 0.8 | 3.4 | Aug | 3.8 | 11.8 | Jul§ | -1.1 | -5.8 | 5.3 | | -441 | 4.10 | 1.0 |
| Chile | 1.9 | Q2 | 3.4 | 2.6 | 2.3 | Aug | 2.3 | 7.2 | Jul§‡‡ | -2.6 | -1.3 | 2.8 | | -171 | 717 | -4.5 |
| Colombia | 3.4 | Q2 | 5.6 | 3.1 | 3.8 | Aug | 3.5 | 10.7 | Jul§ | -4.4 | -2.5 | 5.8 | | -107 | 3,381 | -11.1 |
| Mexico | -0.8 | Q2 | 0.1 | 0.3 | 3.2 | Aug | 3.6 | 3.6 | Jul | -1.7 | -2.5 | 7.2 | | -88.0 | 19.4 | -3.0 |
| Peru | 1.2 | Q2 | 4.1 | 3.0 | 2.0 | Aug | 2.2 | 4.6 | Jul§ | -1.9 | -2.0 | 5.6 | | 64.0 | 3.34 | -1.2 |
| Egypt | 5.7 | Q2 | na | 5.6 | 7.5 | Aug | 9.1 | 7.5 | Q2§ | -0.4 | -6.8 | na | | nil | 16.4 | 9.5 |
| Israel | 2.2 | Q2 | 1.0 | 3.5 | 0.6 | Aug | 0.9 | 3.7 | Jul | 2.3 | -4.0 | 1.0 | | -94.0 | 3.53 | 1.4 |
| Saudi Arabia | 2.4 | 2018 | na | 1.9 | -1.4 | Jul | -1.1 | 5.6 | Q2 | 2.9 | -5.9 | na | | nil | 3.75 | nil |
| South Africa | 0.9 | Q2 | 3.1 | 0.8 | 4.3 | Aug | 4.6 | 29.0 | Q2§ | -4.1 | -4.7 | 8.2 | | -99.0 | 14.6 | 1.3 |

Source: Haver Analytics. *% change on previous quarter, annual rate. †The Economist Intelligence Unit estimate/forecast. §Not seasonally adjusted. ‡New series. **Year ending June. ††Latest 3 months. ‡‡3-month moving average. §§5-year yield. †††Dollar-denominated bonds.

## Markets

| In local currency | Index Sep 18th | % change on: one week | Dec 31st 2018 |
|---|---|---|---|
| **United States** S&P 500 | 3,006.7 | 0.2 | 19.9 |
| **United States** NAScomp | 8,177.4 | 0.1 | 23.2 |
| **China** Shanghai Comp | 2,985.7 | -0.8 | 19.7 |
| **China** Shenzhen Comp | 1,655.6 | -1.0 | 30.6 |
| **Japan** Nikkei 225 | 21,960.7 | 1.7 | 9.7 |
| **Japan** Topix | 1,606.6 | 1.4 | 7.5 |
| **Britain** FTSE 100 | 7,314.1 | -0.3 | 8.7 |
| **Canada** S&P TSX | 16,800.3 | 1.1 | 17.3 |
| **Euro area** EURO STOXX 50 | 3,528.0 | 0.3 | 17.5 |
| **France** CAC 40 | 5,620.7 | nil | 18.8 |
| **Germany** DAX* | 12,389.6 | 0.2 | 17.3 |
| **Italy** FTSE/MIB | 21,947.7 | 0.3 | 19.8 |
| **Netherlands** AEX | 576.7 | 0.6 | 18.2 |
| **Spain** IBEX 35 | 9,031.7 | -0.3 | 5.8 |
| **Poland** WIG | 58,297.3 | 0.6 | 1.1 |
| **Russia** RTS, $ terms | 1,382.2 | 2.0 | 29.6 |
| **Switzerland** SMI | 10,018.8 | -0.8 | 18.9 |
| **Turkey** BIST | 101,930.1 | nil | 11.7 |
| **Australia** All Ord. | 6,791.2 | 0.6 | 18.9 |
| **Hong Kong** Hang Seng | 26,754.1 | -1.5 | 3.5 |
| **India** BSE | 36,563.9 | -1.9 | 1.4 |
| **Indonesia** IDX | 6,276.6 | -1.7 | 1.3 |
| **Malaysia** KLSE | 1,599.5 | -0.2 | -5.4 |

| | index Sep 18th | % change on: one week | Dec 31st 2018 |
|---|---|---|---|
| **Pakistan** KSE | 31,555.5 | 1.9 | -14.9 |
| **Singapore** STI | 3,166.8 | -1.2 | 3.2 |
| **South Korea** KOSPI | 2,070.7 | 1.1 | 1.5 |
| **Taiwan** TWI | 10,929.5 | 1.3 | 12.4 |
| **Thailand** SET | 1,654.1 | -1.2 | 5.8 |
| **Argentina** MERV | 30,071.1 | 5.1 | -0.7 |
| **Brazil** BVSP | 104,531.9 | 1.1 | 18.9 |
| **Mexico** IPC | 43,070.3 | 0.8 | 3.4 |
| **Egypt** EGX 30 | 14,745.1 | -1.8 | 13.1 |
| **Israel** TA-125 | 1,522.9 | 0.7 | 14.2 |
| **Saudi Arabia** Tadawul | 7,821.2 | -0.4 | -0.1 |
| **South Africa** JSE AS | 56,220.4 | nil | 6.6 |
| **World, dev'd** MSCI | 2,201.0 | 0.3 | 16.8 |
| **Emerging markets** MSCI | 1,021.4 | 0.4 | 5.8 |

**US corporate bonds,** spread over Treasuries

| Basis points | latest | Dec 31st 2018 |
|---|---|---|
| **Investment grade** | 164 | 190 |
| **High-yield** | 478 | 571 |

Sources: Datastream from Refinitiv; Standard & Poor's Global Fixed Income Research. *Total return index.

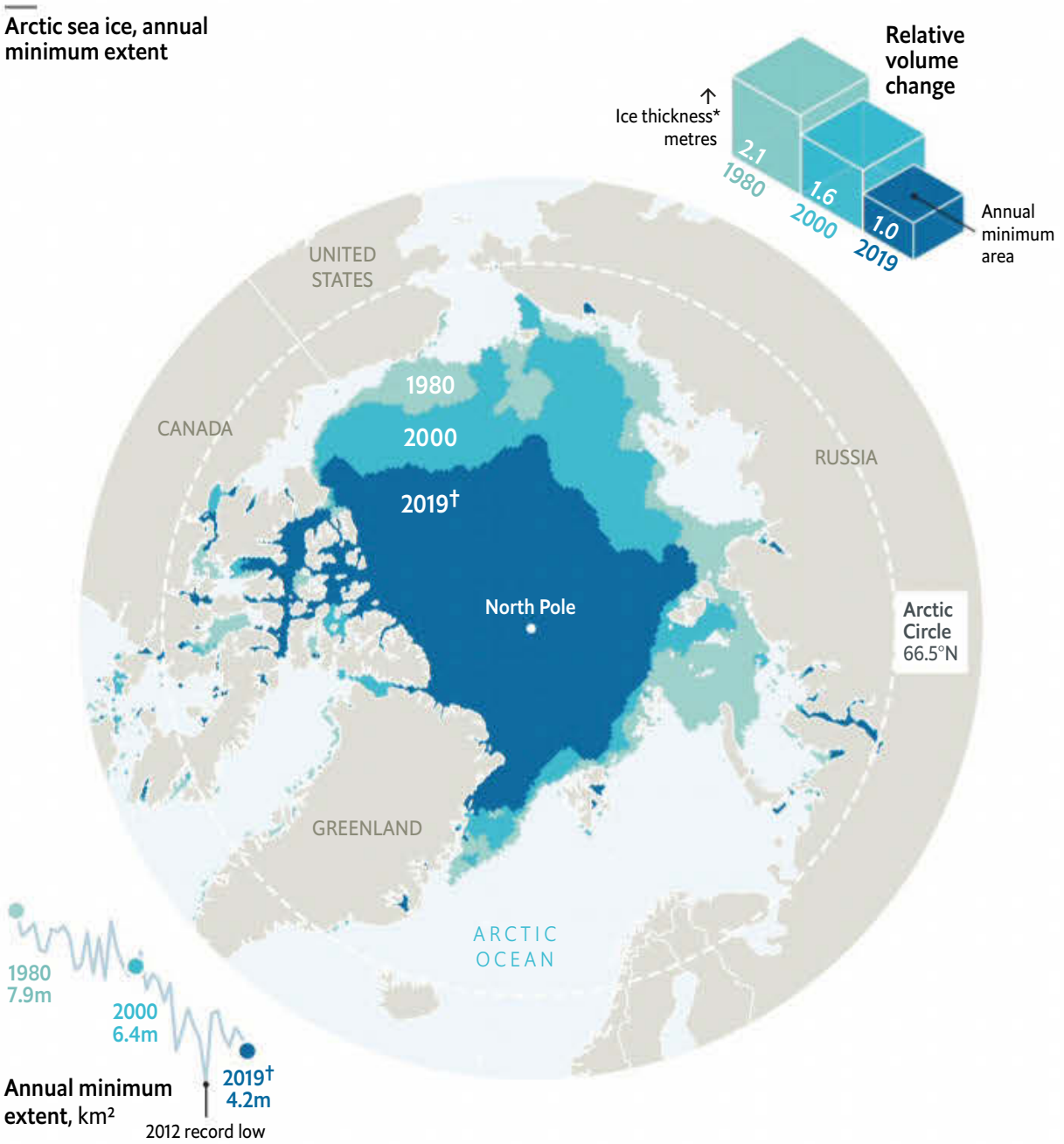
## Commodities

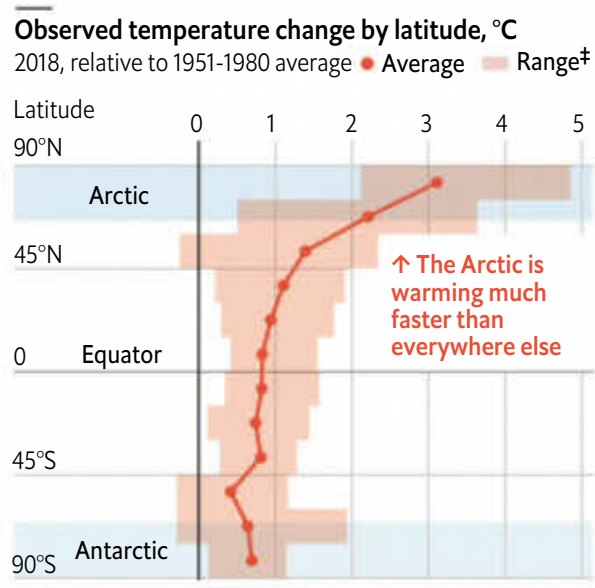
| ***The Economist*** **commodity-price index** 2005=100 | Sep 10th | Sep 17th* | % change on month | year |
|---|---|---|---|---|
| **Dollar Index** | | | | |
| All Items | 133.3 | 134.3 | 2.1 | -1.1 |
| Food | 141.3 | 143.7 | 2.2 | 3.2 |
| **Industrials** | | | | |
| All | 124.9 | 124.5 | 2.0 | -5.8 |
| Non-food agriculturals | 110.8 | 113.5 | 3.4 | -11.8 |
| Metals | 131.0 | 129.3 | 1.5 | -3.3 |
| **Sterling Index** | | | | |
| All items | 196.2 | 196.4 | -0.4 | 4.6 |
| **Euro Index** | | | | |
| All items | 150.1 | 151.2 | 2.5 | 4.7 |
| **Gold** | | | | |
| $ per oz | 1,496.5 | 1,504.2 | 0.1 | 25.4 |
| **West Texas Intermediate** | | | | |
| $ per barrel | 57.4 | 59.3 | 5.7 | -15.0 |

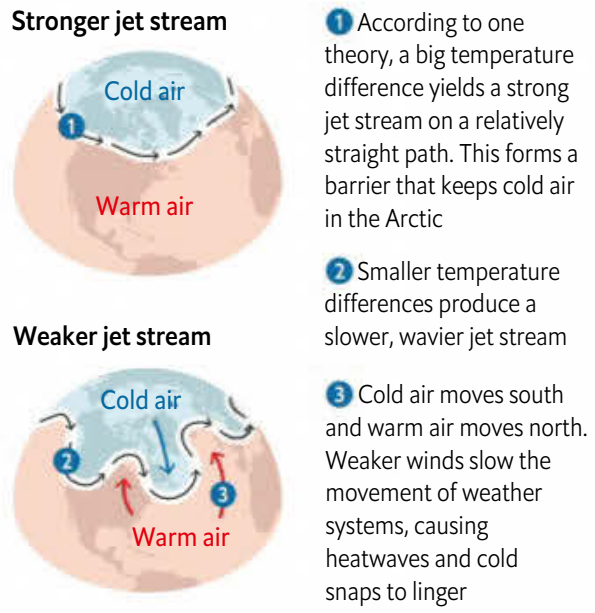
Sources: CME Group; Cotlook; Darmenn & Curl; Datastream from Refinitiv; FT; ICCO; ICO; ISO; Live Rice Index; LME; NZ Wool Services; Thompson Lloyd & Ewart; Urner Barry; WSJ. *Provisional.

For more countries and additional data, visit **Economist.com/indicators**

## The Arctic is the epicentre of global warming




Sources: NSIDC; PIOMAS; NASA; *Carbon Brief* *Average for ice thicker than 15cm, 2019 data from August †Minimum at Sept 16th ‡1st-99th percentile of values within each latitude band

# Ice would suffice

**The consequences of a rapidly warming Arctic will be felt far afield**

AROUND 320BC, a Greek merchant called Pytheas set off for a long journey north. He brought back reports of a land called Thule, six days north of Scotland, "where... there are no nights during the [summer] solstice...and also no days during the winter solstice". It is unclear if Pytheas made it there himself, or merely heard tales. But for this and his account of a "congealed sea", he is said to have been one of the first Arctic explorers. Were he to return today, he would find a very different landscape.

Temperatures in the Arctic are warming twice as fast as the global average. One driver is the melting of floating sea ice. When it vanishes, it exposes deep blue waters, which absorb more solar energy than white ice does. In turn, this speeds up melting: a classic positive-feedback loop. The ice recedes to an annual minimum extent every September. The record low was set in 2012; 2007 and 2016 are joint second. This year is expected to be level with them.

The best-known consequence of Arctic heating is rising sea levels. Melting sea ice does not raise the water level, for the same reason that melting ice cubes do not make a cup overflow. However, water trapped on land in Greenland's ice cap does increase the sea level when it melts into the ocean.

Greenland has 2.85m cubic kilometres of ice, enough to lift sea levels seven metres. For now, it is melting slowly. Sea levels are rising by an average of 3.3mm per year; owing to an unusually hot summer in 2019, Greenland will contribute about 1mm.

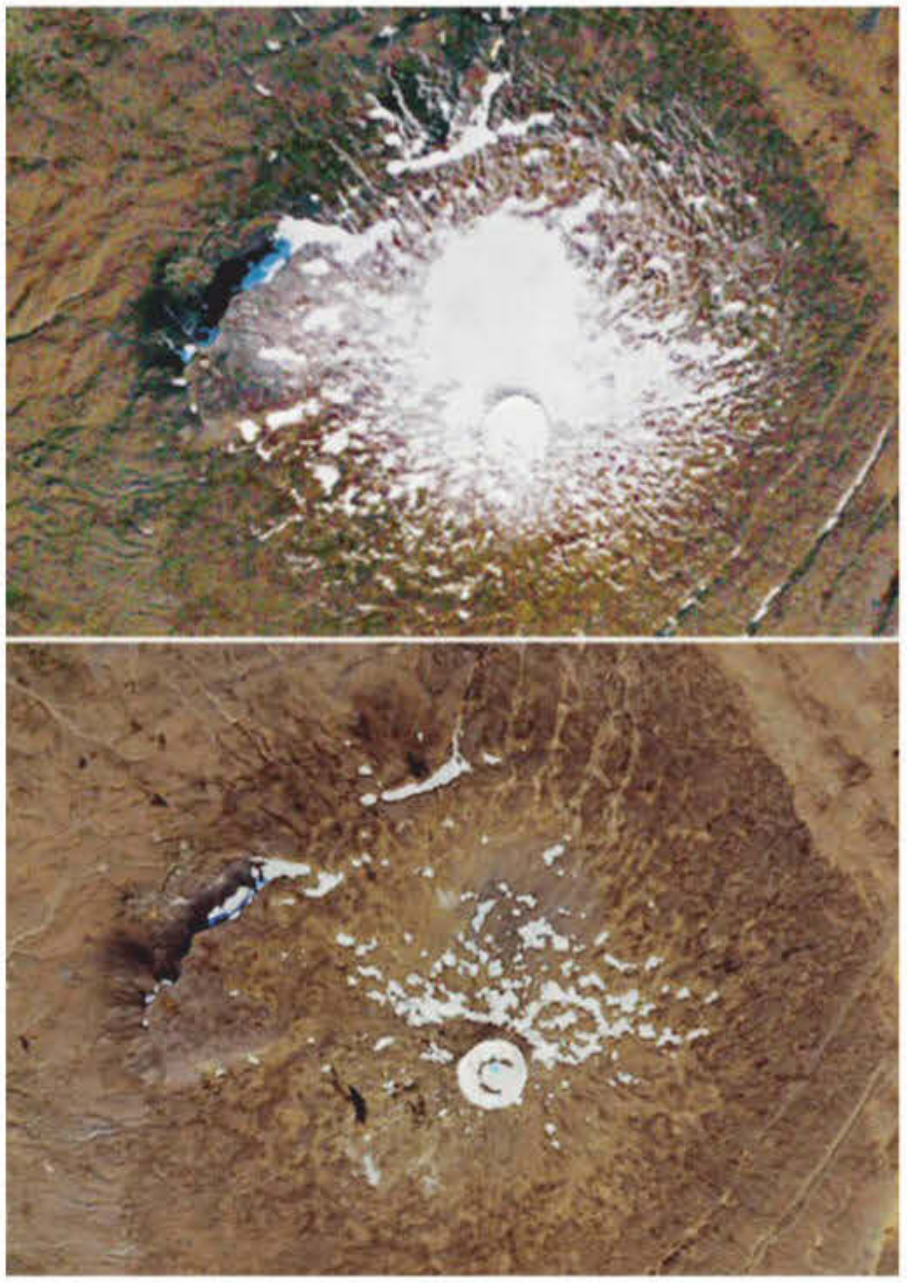
Another feedback loop involves frozen soil. Normal garden soil consists of 5% carbon; soil in Arctic permafrost regions, rich in organic matter, contains 20-50%. It is thought to hold a total of 1.1-1.5trn tonnes of carbon, more than the atmosphere and ten times as much as the Amazon.

As the Arctic warms, bacteria in the soil consume organic matter faster, releasing more carbon dioxide and methane. These gases can then speed up the greenhouse effect—heating the permafrost further and causing more emissions. This July the Siberian tundra warmed and dried enough to catch fire for weeks, a very unusual event.

The third threat posed by Arctic warming is less scientifically certain but more immediate. Higher Arctic temperatures are thought to affect weather patterns in the northern mid-latitudes, where weather systems form as a result of the temperature gap between the hot tropics and cool pole. The jet stream pushes them west to east.

Some evidence suggests that as the temperature difference shrinks, the jet stream weakens and its wavy pattern deepens. This allows "tongues" of frigid air to reach south, and warm pockets to approach the Arctic Circle. It may also cause both storms and clear skies to stay in place for longer, leading to extended floods and dry spells.

Climate-change sceptics point to cold snaps in North America as evidence that concern about global warming is overheated. In fact such days, caused by chilly air escaping polar latitudes, may be a consequence of Arctic warming. ■



# The last of ice

**Okjökull, in western Iceland, was officially declared dead in 2014, aged around 800**

IT WAS NOT the smallest glacier around, nor the most remote. You could see it from outlying parts of Reykjavík, Iceland's capital, and from a long section of the country's ring road. Nor was it striking. It had none of the beauty of its neighbour Snæfellsjökull, draping the perfect volcanic cone where Jules Verne found the tunnel that led to the centre of the Earth, nor the unearthly blueness of Svínafellsjökull, which played a background in "Game of Thrones". Among 300 or so other glaciers sprawling across Iceland, covering 11% of the land surface, it was easily ignored. It sat low above the valley it had helped hollow out, a white cloak across the flattened peak of a shield volcano called Ok. From this it drew its full name, Okjökull, "the yoke glacier". It remained "Ok" for short.

The writers of the Icelandic sagas noticed Ok only once, when a man crossing Iceland on horseback passed it by. The mountain was compared back then, when the sky was "the dwarf's helmet" and the earth "Odin's bride", to a dead female troll lying on her back. The snow, only starting then to compact into Okjökull, was the whiteness of her breast. How she came to be lying there was a mystery; the story had disappeared. An odd image and an odder name, which made Icelanders laugh—if they had heard of Ok at all.

The strange name also meant "burden" as if the glacier were a burden or yoke the dead volcano carried. If so, the burden grew, its weight and depth increasing over the centuries with every season's snow. At 40 or 50 metres deep, its ice layered as densely as tree rings under the microscope, it became a river, dynamic and alive, like the frozen rivers in Norse cosmology that had made the world in the beginning. It began to crawl slowly down the mountain, covering perhaps half a metre a year, carrying rocks in its belly that scarred the bedrock deep as it descended. It grew toes and arms. Though Ok was never big enough to have a proper gouging snout, it nonetheless did its small bit to carve out Iceland, a country where every feature of the landscape had history, and a tale, embedded in it. It stood as witness to that history, too.

At times it was a frightening companion. In spells of warmer weather its deepest meltwater, thickened to milky white with eroded bedrock, flooded and silted farmland. After the hardest winters it would swallow up sheep pastures. To walk on it was to risk immurement in crevasses cracked open for hundreds of metres down through blue and bluer ice. Yet it was also a regular friend. At evening, its western side glowed red to signal fine weather. When spring arrived, people thought the glacier announced it with a different smell. Some imagined its voice, stern and deep, leaving "chatter" in rough striations on the rocks.

It also held the water that fed local streams and sustained the local population, pouring it out as if from buckets balanced on the yoke of the mountain. Its water was very cold, very old, and pure. Icelanders might overlook Ok, but those who had drunk its water remembered with pleasure how it tasted, and imagined the little glacier would always go on giving.

In 1890 geologists estimated that Ok covered 1,600 hectares, or 6.2 square miles. (On one map of 1901 it seemed to spread even farther, to 3,800 hectares.) Gradually and quietly, through the 20th century, it dwindled away. In 1945, it covered only 500 hectares; in 1978, 300; in 2012, about 70. The next year Oddur Sigurðsson, a glacier expert at the Meteorological Office, paid his "good friend" a close visit. What he found was, by then, obvious: the snow on Ok was melting faster than it could be replaced. The ice had become so thin that "he" was no longer moving. Mr Sigurðsson later recorded the death on an official certificate, attributing it to "excessive summer heat caused by humans".

Not many of those humans seemed to notice, in Iceland or elsewhere. Ok had never drawn the tourists and the snowmobilers. So as it shrank yet more, to a patchy snowfield and a crater lake, there was no general outcry. It took Dominic Boyer and Cymene Howe, two anthropologists from Rice University in glacier-free Texas, to raise the alarm with a documentary film, "Not Ok", in 2018. That drew writers, politicians and schoolchildren to a memorial gathering on Ok this August for the glistening white-and-blue cloak of ice that was no longer there.

Around 100 people attended, including Iceland's prime minister, clambering for two hours over a landscape of black and brown rocks that now resembled the surface of the Moon. Though it was late summer, they wore parkas and ski-hats, and needed them in the freezing gusts. A high-school pupil read a poem to "Ok, the burdened glacier/which at last had had enough/of acts of terror from men who do not know/how to have both profits and morals". More children pressed a bronze plaque into a round boulder. This "Letter to the Future" recorded the death of Ok, noted that all Iceland's glaciers might follow in the next 200 years, and declared: "We know what is happening and what needs to be done. Only you know if we did it." The last part of the inscription was "415ppm $CO_2$", the record level of carbon dioxide in the atmosphere that was recorded in May. It stood as a monument to what human beings had done.

On their way down the mountain, several mourners broke off pieces of stray ice that clung in garlands to the rocks. They sucked them in the hope of tasting Okjökull for the last time. But it was only the dregs of winter snows, too fast disappearing. ■

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