

in Guangzhou, China. The government is “taking responsibility for people’s lives, so will not change or relax the current prevention and control strategy”, he says.

Exit strategy

China’s large domestic economy has made a zero-COVID strategy more sustainable than it has been in places with smaller populations, such as New Zealand and Singapore. But it can’t last forever. The stock market index is falling, suggesting that China’s economy is suffering, and Cowling says that disruptive outbreaks will become more frequent as the virus circulates freely elsewhere.

Boosting vaccination rates in older people will be a priority, but many live in rural areas, so this will take time. Lu says that China will probably wait until the vaccination rate reaches

80% in that group before easing restrictions further.

Chen says that, at the moment, there are few family doctors in China, which means people rely on hospitals as their first port of call. He suspects that most COVID-19 restrictions will be in place for another year. This would allow the government to build up a fledgling family-doctor network as well as dedicated isolation facilities to treat people with mild or asymptomatic COVID-19 and ease pressure on the hospital system. If the country isn’t prepared, re-opening could be “a disaster in terms of the health-care system”, says Chen.

Chinese authorities also need to prepare the public for what’s to come, says Chen. Many people rely on the government’s willingness to use all means necessary to control the virus at the expense of the economy, he says.

avoid the cycle of panic and neglect that often follows health emergencies, Kates says.

More than one-third of the preparedness funds are slated for the US Centers for Disease Control and Prevention (CDC). On top of the normal budget increase proposed for the agency, this would mean a whopping 171% boost in funds for the CDC compared with 2021. (The White House has not yet released its official budget numbers for 2022.) The budget request for the agency includes funds earmarked for coronavirus sequencing and surveillance, for efforts to modernize public-health data collection and for the CDC’s new Center for Forecasting and Outbreak Analytics, where disease-modelling specialists will analyse data that can help to guide public-health decisions.

Under Biden’s plan, the National Institutes of Health (NIH) would also receive a dramatic increase in funds, with much of the jump related to pandemic preparedness. The biomedical agency would get a total of \$62.5 billion, representing a 46% increase from 2021. Of that, \$12.1 billion would go towards researching and developing vaccines, diagnostics and therapeutics against pathogens of pandemic concern, and to expanding laboratory and clinical-trial infrastructure.

Another \$5 billion of the NIH’s proposed budget would go to ARPA-H in 2023. Although ARPA-H is included in the NIH’s budget request, policymakers continue to spar over whether the health-innovations agency should be housed in the NIH, or whether it should be a separate branch of the Department of Health and Human Services. Some think that the NIH is too bureaucratic and conservative in its approach to biomedical research.

However, without the sums budgeted for pandemic preparedness and ARPA-H, the NIH would actually receive only \$275 million more than Congress allocated for the agency in 2022, says Jennifer Zeitzer, the director of public affairs at the Federation of American Societies for Experimental Biology in Rockville, Maryland. Because the NIH is the largest public funder of biomedical research in the world, Zeitzer says, this level of funding is inadequate. “It would be very unusual for a Democratic president – or any president – to not propose [a more substantive] baseline increase for NIH,” she adds.

Even so, the Biden administration proposed modest increases to several research areas, including those related to mental and maternal health, health disparities and inequities, and sexual orientation and gender identity. The request also proposes more funding for the Cancer Moonshot initiative, a programme that is attempting to reduce the cancer death rate by at least 50% over the next 25 years.

The request would also boost the Food and Drug Administration’s budget by nearly 39% compared with 2021 – to \$8.4 billion

JOE BIDEN BIDS AGAIN TO BOOST US SCIENCE SPENDING

But the president faces a divided Congress, which might not go along with the plan.

By Jeff Tollefson, Max Kozlov, Amy Maxmen & Alexandra Witze

US President Joe Biden released his latest budget request to Congress on 28 March, calling for significant new investments in clean energy and public health. The proposal for fiscal year 2023 includes roughly US\$200 billion for research and development programmes, according to the American Association for the Advancement of Science in Washington DC. It comes just weeks after Congress finalized a spending package for the current fiscal year that cut back considerably on the science funds that Biden had requested – signalling more challenges ahead.

Although Congress modestly increased funding for most science agencies in 2022, it heavily scaled back some of the administration’s most ambitious proposals. For instance, the Advanced Research Projects Agency–Health (ARPA-H), a new high-risk, high-reward agency meant to accelerate innovations in health and medicine, received \$1 billion rather than the \$6.5 billion the president requested last year.

“The president’s request is certainly very solid, and the increases for science go right across the board,” says Michael Lubell, a physicist at the City College of New York who tracks

federal science-policy issues. But Lubell says concerns about the rising cost of living owing to inflation, as well as economic uncertainty around Russia’s invasion of Ukraine, could make it hard for Biden’s party, the Democrats, to boost government spending on anything without also putting new taxes in place to increase revenue. “Science is one of the least contentious issues,” Lubell adds, “but it’s not something that puts food on the table tomorrow.”

Health priorities

A standout in Biden’s budget proposal is the request for a mandatory \$81.7 billion over five years to prepare the United States for future pandemics and other biological threats. “This new pandemic-preparedness effort is designed to address the deficiencies with our public-health system that we have witnessed” in the past few years, says Jennifer Kates, director of global health and HIV policy at KFF, a non-profit health-policy organization headquartered in San Francisco, California. Kates, however, notes that the pitch will probably struggle to get approval in Congress, both because it’s a large financial demand and because the funds would be mandatory until 2027, as opposed to being at the discretion of policymakers each year. In making the budget mandatory, the administration is hoping to



US President Joe Biden asked for big bumps for clean energy and public health in 2023.

— largely owing to a \$1.6-billion boost from the pandemic-preparedness fund that would allow the agency to modernize regulatory capacity, speed development of diagnostics and strengthen the supply chain for personal protective equipment.

Energy and climate spending

Biden has made climate change a top priority of his administration, and proposed historic government investments in clean-energy innovation, but Republicans and some Democrats have stymied much of that agenda on Capitol Hill. In this year's budget proposal, the president is once again seeking significant increases for energy, environment and climate science across the federal government.

The Environmental Protection Agency (EPA) would receive \$11.9 billion, an increase of 29% compared with 2021. The National Oceanic and Atmospheric Administration would see its budget increase by more than 25% compared with 2021, to \$6.9 billion, which includes \$2.3 billion for weather satellites.

But the biggest energy and climate investments are at the Department of Energy (DoE), which runs a suite of applied-energy research and technology demonstration programmes. The department received a one-time boost of \$21.5 billion as part of a larger infrastructure package enacted by Congress last November; that money is dedicated to commercial demonstration programmes focused on a range of energy sources, from hydrogen to nuclear power. Coming on top of that, the latest budget proposal would provide \$48.2 billion for the agency, a 15% increase compared with 2021 levels, with broad increases for research and development into renewable energy sources such as solar

and wind power, as well as carbon capture and other low-carbon technologies.

All told, the president's budget would provide a record \$19.1 billion for the DoE's main clean-energy programmes over the coming year, says David Hart, who heads the Center for Clean Energy Innovation at the Information Technology and Innovation Foundation, a think tank based in Washington DC. Around half of that money is already locked in through the infrastructure law, which also allows the DoE to spread its spending over five years.

In the end, Hart says, the DoE might even struggle to spend all of the money it has received. "It's going to be a challenge for them to spend it wisely," he says.

"Science is one of the least contentious issues, but it's not something that puts food on the table tomorrow."

In parallel, the administration is still pushing for an estimated \$550 billion in funding for climate and energy initiatives that were included in a \$2-trillion piece of legislation called the Build Back Better bill. That hit a wall in the US Senate, however, because of united opposition from Republicans and broken ranks among Biden's fellow Democrats. The question now is whether Democrats and the administration will be able to revive the climate provisions, which had broad support in the party.

Other science investments

Biden's proposal also includes a request to increase the budget of the National Science Foundation (NSF) by 23.6% compared with

2021, to a total of around \$10.5 billion. The NSF funds a significant chunk of US academic research, and is considered by many researchers to be underfinanced. Last year, Biden requested a 20% increase to the NSF budget, but it was cut down by Congress to about a 4.1% increase.

Biden's latest request falls in line with the administration's broader priorities. Of the additional \$2 billion the agency would receive, around \$1.6 billion is allocated to climate-resilience research. The request also sets aside \$880 million for the NSF's technology directorate — the agency's first new directorate in around 30 years. The Technology, Innovations and Partnerships Directorate was established in early March in an effort to sharpen the United States' competitive edge globally, in economically important technologies such as superconductors and artificial intelligence.

The Senate and House of Representatives are continuing to nail down the details of the directorate with duelling bills, slated to be reconciled sometime in the coming months. Still, this is an indication that Congress has renewed interest in scientific research, says Zeitzer, adding that a 4.1% increase is "not terrible" for the NSF's budget. But others worry that Biden's 2023 request is still too low.

"In most years, a 20-plus per cent increase would be considered a very good budget" request, says David Cheney, a managing partner at Technology Policy International in Los Osos, California. "But it's a little bit disappointing to people who have looked at the House and Senate authorization bills, which envisioned larger increases."

For NASA, the White House requests \$26 billion, which would be an 11.6% increase from 2021. Much of that is focused on the agency's Artemis initiative to return humans to the surface of the Moon no earlier than 2025. Science budgets at NASA would rise by more than 9% over 2021 levels, but much of that increase would be concentrated in the Earth-science division. The agency's astrophysics division would see a 12% drop, even as it gears up to work on ambitious space-based missions laid out in a community road map late last year.

One notable space-related item, in the Department of Commerce request, is that Biden is asking Congress for \$88 million, a \$78 million increase over 2021, for the fledgling Office of Space Commerce, which is intended to track the locations of active satellites and space debris. Thousands of satellites have been launched in the past few years, and space analysts have been calling for the United States to respond more effectively to the growing congestion in low Earth orbit.

Congress will now consider Biden's requests and hammer out the details of how much to allocate to each agency.