MATRIX MONITOR

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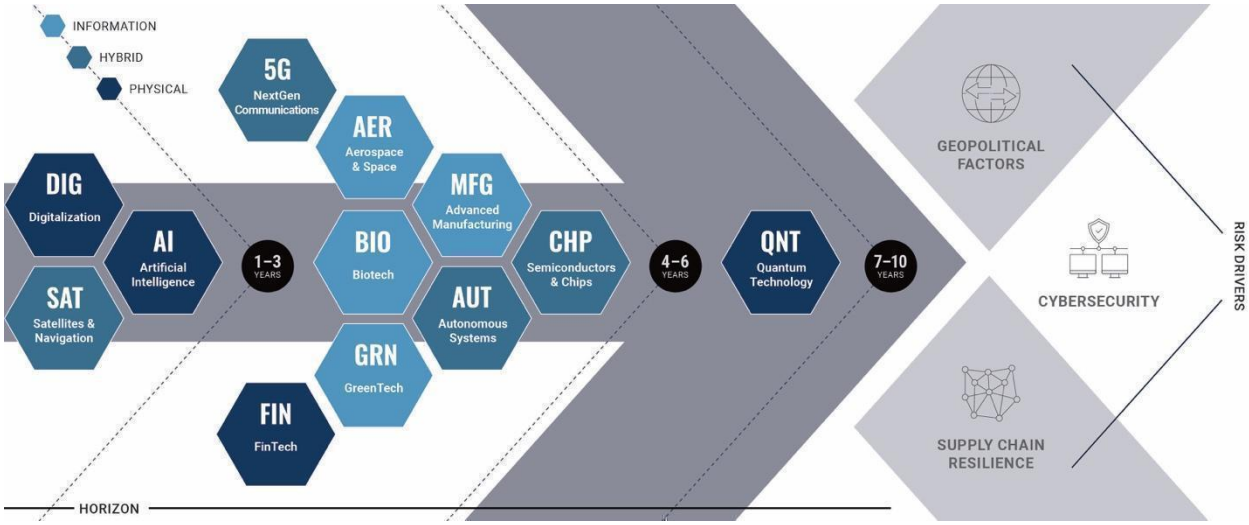
The only source dedicated exclusively to the emerging technologies shaping the future of business and national security.



This week's Next5 Matrix Monitor features U.S. tech companies have quietly restored some services to Russians, miniature nuclear generators to power CubeSats, US colleges are responding to ChatGPT, the Chinese government nominated 6G as one of its priority projects for 2023, the digital yuan (e-CNY) has been used to buy securities for the first time, a potential global "quantum divide" according to the World Economic Forum (WEF), and a proposed cybersecurity policy that will empower U.S. agencies to hack into the networks of criminals and foreign governments led by NCIJTF.

NEXT5 EDITOR'S HIGHLIGHTS

→ **Apple has built a supply and manufacturing operation of such complexity, depth, and cost that its fortunes have become tied to China in a way that cannot easily be unwound.** Over the past decade and a half, Apple has been sending its top product designers and manufacturing design engineers to China, embedding them into suppliers' facilities for months at a time. These Apple employees have played integral roles co-designing new production processes, overseeing the minutiae of manufacturing until things were up and running, and keeping close tabs on suppliers to ensure compliance. Apple has also spent billions on custom machinery to build its devices, developing niche expertise its rivals couldn't compete with. It has transformed the company and the country leading some to assess that all of China's tech competence is the product of Apple's work in the country. At the same time, Apple's dependence on China has become its greatest vulnerability. More than 95% of iPhones, AirPods, Macs, and iPads are made in China, where Apple also earns a fifth of its revenue - $74B last year. Despite competition between Washington and Beijing, Apple continues to invest in China, and there appears to be few paths and little progress to offshore its supply chains and operations from China. #SCRM #Geopolitics #USA #CHN Financial Times

→ **China's economy posted its slowest annual growth since 1976. China's National Bureau of Statistics showed its economy expanded by just 3% for the full year, down from 8.1% in 2021.** They also showed that China's population shrank for the first time since the 1960s as deaths outpace births. Goldman Sachs says the Chinese government's official numbers are likely rosier than they are accurate. Analysts tie the country's recent economic ills to its harsh "Zero Covid" lockdown policies, but its economic problems go well beyond the virus. Years of a speculative frenzy in housing have caught up with the country. The government's sudden confrontation with its tech giants have spooked global investors. And the impact of the virus on global supply chains is driving diversification away from Chinese supply chains. Since the early 1990s, China's economy has been a central driver of business decisions in virtually every part of the world economy. However; the combination of geopolitical tensions, domestic disarray, and demographic decline mean China's economy may not regain its previous vigor. #SCRM #CHN Axios

→ **American tech companies Intel and Microsoft - who loudly withdrew from Russia after its invasion of Ukraine - have quietly restored some services to Russians.** Intel's website is still closed to users visiting from Russia, but if those people can reach Intel's download portal from a search engine, for example, they can use the site even if they are in Russia. Essentially, the front door is still closed but other entrances are now available. Microsoft is now also allowing some downloads to users in Russia, even though the country's citizens and companies were prohibited from downloading Windows distributions, software updates, or security patches from its websites. Russian media is saying that some of these restrictions were lifted as early as the end of 2022. It is possible Micorosft is now only banning sales of new products and services while making software updates available again. A month into the war, Intel stopped all sales in Russia, and in April 2022, temporarily halted all business operations in the country. Microsoft

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also shut down its operations in Russia, laying off hundreds of employees after the invasion. Microsoft has also disbursed Ukraines' digital infrastructure to the public cloud, hence supporting critical services through data centers across Europe. #Geopolitics #DIG #CHP #Cybersecurity #SCRM Cyber News

DIGITALIZATION

→ **According to the World Economic Forum, digitalization will drive post pandemic recovery for small businesses**. First, the adoption of mobile devices has made it easier for people to experience the benefits of digitalization. The digital shift will only accelerate in the coming years, as the number of mobile device users in the world is expected to increase from 6.38B in 2021 to 7.52B in 2026. Second, the way people shop has been changing for years and the future of shopping is increasingly online. In June, Morgan Stanely forecast that the global e-commerce market would grow from $3.3T today to $5.4T in 2026, a more than 60% increase in four years. According to OECD (Organization for Economic Cooperation and Development), businesses that invested in their digital futures experienced a number of long-term benefits, including better communications and a smoother entry into global markets. #DIG #Geopolitics #SCRM WEF

→ **Asia's strong economic rebound from the pandemic is losing steam and, according to the International Monetary Fund (IMF), could use a boost from digitalization.** Digital technologies can increase the efficiency of the public and private sectors, expand financial inclusion, improve access to education, and open new markets by allowing companies to serve distant customers. Asia's digital landscape in particular has swelled in recent years, encompassing a broad range of innovations, from manufacturing automation to e-commerce platforms, to digital payments. The region accounted for 60% of patents in digital and computer technologies right before the pandemic, up from 40% two decades earlier. And it has led the world in installing robots with China as the single biggest robot user. Japan's Rakuten, China's Alibaba, and Indonesia's GoTo Group are major e-commerce players with revenues that rival Amazon and Walmart. Despite success, the region's digital divides constrain productivity growth. Access to cutting edge digital technologies is highly uneven within countries, and across firms. IMF suggests the following priorities for the region:

- Enhance countries' digital infrastructure to improve access to information and technology.
- Upgrade digital literacy and upskilling the young workforce to meet employers' demand.
- Alleviate financing constraints faced by SMEs to help them adopt new technologies. Greater access to finance would help innovators introduce new products.
- Facilitate adoption of new technologies by streamlining regulations in line with the evolving digital industry, enhance the legal environment, including on data and intellectual property rights protection, and facilitate digital trade.

#DIG #FIN IMF

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→ **Recent FAA and Southwest troubles are advancing arguments for modernizing the industry with cloud-based systems that allow crucial operations data to flow more freely.** Tools offered by many startups offer the potential to make airline systems more automated and less dependent on older technologies that can require manual updates and are increasingly expensive to maintain, airline industry consultants said. The snafus at Southwest and the FAA - just weeks apart - were caused by weaknesses in systems scheduled for upgrades, underscoring the urgent need to give priority to modernization, and highlighting the consequences of failing to do so. Newer, cloud-based infrastructure and databases can scale horizontally. This design allows information to flow more freely, reducing the likelihood of glitches that cascade into systemwide shutdowns. Older, legacy systems, on the other hand, are limited to the amount of computing power available. The FAA estimated that the cost of U.S. flight delays totaled $33B in 2019, the latest year for which data is available. Digital solutions can reduce costs of irregular operations by about half, according to market research and consulting firm Frost & Sullivan. #DIG #USA WSJ

SATELLITES & NAVIGATION

→ **According to Quilty Analytics, the war in Ukraine has made the world aware of the geopolitical, social, and military impacts of satellite imagery as the space industry introduces new capabilities to augment commercial spy satellites.** The report emphasizes the significance of the transformation in the domain of very high-resolution imagery as operators launch next-generation fleets, improving their imaging capacity, pointing accuracy, and revisit rates. Meanwhile, new players that started with low-resolution satellites are scaling up to increasingly sharper resolutions. According to Quilty Analytics, these advances will also benefit customers with large budgets such as U.S. defense and intelligence agencies. Besides Ukraine, vulnerable regions like Taiwan and North Korea are fueling government demand for regular imagery in the event conflict starts, the report says. Most of the future satellites are small, and their imaging capacity will be limited, but their sheer numbers will result in much more rapid revisits. The study identifies four established global players in very high-resolution imagery: Airbus, Imagesat International, Maxar Technologies, and SI Imaging Services. Emerging players mentioned in the study include BlackSky, Planet, and Satellogic. Meanwhile, a new sector of the industry is looking to deploy satellites closer to Earth than existing constellations, in very low Earth orbits below 250 miles. Quilty says this presents opportunities for some of the sharpest commercial imagery resolutions of 10 to 35 centimeters. None of these satellites are yet in orbit but could be deployed in the next several years by three startups – Albedo, Earth Observant, and Skeyeon. #SAT #USA #RUS #UKR #TWN #PRK Space News

→ **A SpaceX Falcon Heavy launched from Kennedy Space Center, Florida, on January 15 carrying the US Space Force USSF-67 mission to geostationary orbit.** The launch marks Falcon Heavy's fifth flight since its 2018 debut, as well as its second national security space launch following the November 1 launch of USSF-44. The primary payload was the US Space Force's Continuous Broadcast Augmenting SATCOM (CBAS)-2 communications satellite, used to relay data from existing satellites. The second spacecraft was the Long Duration Propulsive

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ESPA, or LDPE-3A – made by Northrop Grumman – a bus carrying five small military payloads. Two of the five are U.S. Space Systems Command smallsats. One called Catcher, is a prototype space domain awareness sensor. The other, named WASSAT, is a prototype wide-area sensor to track other spacecraft and debris objects in geosynchronous orbit. The other three smallsat payloads were developed by the Space Rapid Capabilities Office, a Space Force organization that performs mostly classified projects. According to an official, two of the payloads are operational prototypes for space situational awareness missions and the third one is a data-encryption payload to secure space-to-ground data transmissions. #SAT #USA Space News

→ **NASA has greenlighted a project by the Rochester Institute of Technology to develop a nuclear power source that is a tenth the size of those in current use for planetary missions – a move that could see a new generation of deep-space CubeSats.** Most satellites in service are powered by solar panels that turn sunlight into electricity. But in deep space beyond the orbit of Mars or in harsh conditions, sunlight cannot produce the needed energy. If this new technology can be made practical, it would enable future missions to Jupiter and beyond, or to the shadowed craters of the lunar polar regions using spacecraft the size of CubeSats powered by small generators. The Flagship Uranus mission, for example, could be accompanied by a small fleet of CubeSats that could aid in exploration by providing more points of view or acting as communication relays with atmospheric probes. #SAT #USA New Atlas

ARTIFICIAL INTELLIGENCE

→ **With the rise of the popular new chatbot ChatGPT, colleges across the U.S. are restructuring some courses and taking preventive measures against cheating.** OpenAI's ChatGPT generates articulate and nuanced text in response to short prompts. That has upended some middle and high schools, with teachers and administrators trying to discern whether students are using the chatbot to do their schoolwork. Some professors are redesigning courses entirely, making changes that include more oral exams, group work, and handwritten assessments instead of typed ones. As we previously reported, some public school systems, including in New York City and Seattle, have banned the tool on school Wi-Fi networks and devices to prevent cheating, though students can easily find workarounds to access ChatGPT. OpenAI is expected to soon release another tool, GPT-4, which is better at generating text than previous versions. Google has built LaMDA, a rival chatbot, and Microsoft is discussing a $10B investment in OpenAI. Furthermore, Silicon Valley startups, including Stability AI and Character.AI, are also working on generative AI tools. An OpenAI spokeswoman said the lab recognized its programs could be used to mislead people and was developing technology to help people identify text generated by ChatGPT. More than 6k teachers from Harvard University, Yale University, the University of Rhode Island, and others have also signed up to use GPTZero, a program that promises to quickly detect A.I.-generated text. #AI #USA NY Times

→ **Microsoft researchers announced a new text-to-speech AI model called VALL-E that can closely simulate a person's voice when given a three-second audio sample.** Once it learns a specific voice, VALL-E can synthesize audio of that person speaking in a way that

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attempts to preserve the speaker's emotional tone. Its creators speculate that VALL-E could be used for high-quality text-to-speech applications, speech editing, and audio content creation when combined with other generative AI models like GPT-3. Unlike other text-to-speech methods that typically synthesize speech by manipulating waveforms, VALL-E generates discrete audio codec codes from text and acoustic prompts. It analyzes how a person sounds, breaks that information into discrete components called "tokens," and uses training data to match what it "knows" about how that voice would sound if it spoke other phrases outside of the three-second sample. Microsoft trained VALL-E's speech-synthesis capabilities on an audio library, assembled by Meta, called LibriLight. It contains 60k hours of English language speech from more than 7k speakers, mostly pulled from LibriVox public domain audiobooks. For VALL-E to generate a good result, the voice in the three-second sample must closely match a voice in the training data. #AI #USA Ars Technica

NEXT GENERATION COMMUNICATIONS

→ **In a speech on Tuesday January 17, FCC Chairwoman Jessica Rosenworcel said the U.S. and authoritarian regimes have different views on how to use 5G technology and warned that the expansion of 5G creates a broader attack surface for cyber attacks.** Citing the International Telecommunications Union's recent election of the U.S. candidate Doreen Bodgan-Martin as its next secretary general over a Russian nominee, the FCC Chair said the choice of priorities at the U.N. agency will matter. It will inform how networks are deployed and evolve around the world. She also noted that the deployment of these networks closer to home will involve big security challenges, saying the interconnectedness 5G will bring will also create a broader attack surface for cyber events. In her speech she also listed off a number of actions the FCC is taking to improve 5G security to include adding certain foreign firms to the Covered List created under a 2019 law, launching a rip and replace program for U.S. telecom providers, supporting the development of ORAN, and banning the import and sale of telecom and video surveillance hardware from Chinese firms. #5G #USA #CHN #RUS #SCRM #Cybersecurity #Geopolitics PC Mag

→ **T-Mobile remains the top American 5G contender during the fourth quarter of 2022.** T-Mobile has increased its lead, clocking in at 151.37Mbps overall and 216.56Mbps for 5G, breaking the 200Mbps barrier for median 5G speeds across all bands for the first time. AT&T and Verizon saw modest performance gains during the quarter. T-Mobile now covers 260M people and plans to expand to 300M (90% of the U.S. population) by the end of the year. T-Mobile also recently repurposed some older 1.9GHz spectrum for 5G that was once used by its predecessor for 2G and 3G services. Midband and near-midband spectrum remain the driving force behind the growth of cellular speeds across the U.S. While 4G/LTE speeds have been somewhat stagnant over the past few years, the expanded rollout of these faster 5G frequencies is pulling up the median speeds, especially as more customers upgrade to 5G capable phones. Verizon gained a considerable boost early last year when it was finally able to deploy its new midrange C-Band spectrum. However, the numbers show that things have mostly stabilized for the carrier since then. AT&T has also purchased a chunk of this spectrum but the

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carrier has been much more conservative in rolling it out to only a few cities. Meanwhile, T-Mobile's midband 5G network was up and running well ahead of the rest thanks to the 2.5GHz spectrum it acquired from its 2020 merger with Sprint. T-Mobile subsequently dropped $9.3B in the 2021 C-Band auction with the intent of using some of the 3.7-3.98GHz spectrum to supplement its 2.5GHz network to provide coverage in denser population centers. #5G #USA #SCRM Digital Trends

→ **Researchers have developed 3D-printed radio antennas that could help bring stronger mobile phone signals and faster internet connections to people living in remote communities.** The millimeter wave (mmWave) aerials, which have been designed, made, and tested by researchers at the University of Sheffield, have radio frequency performance that matches those produced using conventional manufacturing techniques. The 3D-printed antennas could speed up the development of new 5G and 6G infrastructure as well as help to open up access to the technologies for people living in remote areas around the world. Antennas currently used to build telecommunication networks are typically slow and costly to manufacture. This current practice is hindering innovation, delaying the development of prototypes and making it difficult to build new infrastructure. This new approach is cheaper and faster without compromising performance. #5G #MFG #GBR #SCRM TechXplore

→ **This week, the Chinese government nominated 6G as one of its priority projects for 2023.** At the end of last year, China Telecom issued a white paper setting out its vision for 6G**.** Written by the China Telecom Research Institute, the paper proposes a distributed and intelligent programmable RAN (P-RAN) network architecture and what it calls a "three layer and four-sided" framework. The white paper also reasons that because of the cost of building out the dense mmWave or terahertz-band networks, it will be essential to provide device-to-device connectivity. China's other 6G news is a call for proposals on potential key technologies from the national coordinating body. According to a statement, the main objectives are "to inspire university-academy-industry-association entities for technology innovations, gather and form a rich reserve of 6G potential key technologies, and support 6G research, standardization, and industrial R&D. #5G #CHN Light Reading

FINANCIAL TECHNOLOGY

→ **One hundred and fourteen countries are exploring digital currencies, and their collective economies represent more than 95% of the world's GDP, according to the Atlantic Council's Central Bank Digital Currency tracker.** Some countries, including China, India, Nigeria, and the Bahamas, have already rolled out digital currencies. Others, like Sweden and Japan, are preparing for possible rollouts. The US has run trials of various technologies to enable a digital currency, although the Fed has indicated the US central bank has no plans to create one and won't do so without direction from Congress. The rise of cryptocurrencies, and the potential of one nation's digital currency to eat away at the dominance of others', has driven interest in official digital currencies. According to economists, there is a risk that China may set the digital currency standards if the US or Europe doesn't launch one, putting the West at a disadvantage. What central bankers and policymakers fear is the potential of cryptocurrencies

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to wrest control of the creation and transfer of money from central banks, leaving them without the tools they currently have to respond to economic events. Another reason policymakers want to create digital currencies is inclusion. In the US, only about 5% of people don't have a bank account. But in other countries, such as the Bahamas, the figure is much higher – around 18%. Giving people access to accounts with their country's central bank would bring more people into the global financial system. However, a digital currency could allow governments to track all transactions, opening the door to new kinds of social control. Also, liabilities could exist in the code and systems that dictate how these currencies function and governments may not discover them until it's too late. #FIN #USA #CHN #IND #NGA #BHS #SWE #JPN WSJ

→ **The digital yuan (e-CNY), a digital token issued by the Bank of China, has been used to buy securities for the first time according to a local media outlet on Monday, January 16.** Now investors can use the e-CNY to buy securities using the Soochow Securities mobile application, China Securities Journal reported. China's development of its central bank digital currency (CBDC) has been further along than most other countries. Last week, the country included e-CNY in cash circulation for the first time. Around the same time, they also added a function to its e-CNY payment app that allowed users to make payments offline, according to media outlet Yicai Global. In October, e-CNY transactions reached $14B as uptake slowed down. #FIN #CHN Coin Desk

AEROSPACE & SPACE

→ **NASA is preparing to move into the next stage of planning for a future large space telescope that may take two decades to launch, building on lessons learned from past missions.** NASA officials outlined their approach to developing what the agency now calls the Habitable Worlds Observatory, a 6.5-meter space telescope operating at ultraviolet, visible, and near-infrared wavelengths. The development of the Habitable Worlds Observatory will be guided by six principles. The first is to build it to a schedule, rather than letting the mission stretch out because of technology or science requirements. Other principles include evolving technologies previously demonstrated, such as the segmented mirrors for the James Webb Space Telescope and a coronagraph instrument being developed for the Nancy Grace Roman Space Telescope; using next-generation launch vehicles with increased payload mass and volume; and making the telescope compatible with satellite servicing technologies so it can be refurbished and upgraded. Two other principles are robust scientific and technical margins for its design and maturing key technologies before going into full-scale development. The approach supports getting the Habitable Worlds Observatory ready for launch by the early 2040s. #AER #USA Space News

BIOTECHNOLOGY

→ **Pharma and biotech stocks moved in opposite directions last year, but biotech is poised for a recovery in 2023.** According to *The Wall Street Journal*, part of this pendulum effect is due to the macroeconomic environment. Just as rising rates helped drive money into

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defensive healthcare stocks - and away from growth areas such as biotech - stabilizing rates could see some of that money move elsewhere this year. There will probably be plenty of gyrations in 2023 as the economy looks likely to enter a recession. But fresh data showing inflation eased in December means the Federal Reserve may start slowing down its rate increases with traders actually pricing in a cut later this year. That means the biotech sector has a decent chance of staging a recovery. Pharma executives are also facing new pressures from the recently passed Inflation Reduction Act, which will allow the government to negotiate drug prices for the first time. One of big pharma's responses to such pressures is to join forces with biotech. Many of those deals contain contingent value rights - essentially an agreement to give shareholders in the acquired company rights to additional payments if certain drugs in development meet prespecified milestones. This helps soothe deal-making jitters with pharma reluctant to overpay companies while many biotechs hang onto their high valuation expectations of 2021. #BIO #USA WSJ

→ **According to the World Economic Forum, biotech can provide solutions to the global health crisis.** Current global food systems cannot provide a sustainable, healthy diet for the world's growing population. And people's dietary preferences for livestock-based food contributes to huge greenhouse gas emissions. As a consequence of population growth, the imbalance in the food systems will increase, straining the planetary boundaries further and putting even more people at risk of lacking access to safe and nutritious food, which in many cases will lead to malnourishment. Today's biotechnology however, offers society the possibility to shift to a more sustainable diet by providing plant-based proteins as an alternative to animal-based ones. If the world replaces meat-based proteins with alternative proteins, we can drastically reduce global warming, water use, and land use by over 80% in Europe alone. In Europe, both public and private investments in research and innovation have led to discoveries of sustainable solutions with great potential for accelerating the green transition in the agri-food system. These scientific discoveries face obstacles in getting to the market, like the pre-authorization process which is so lengthy companies are deterred from even applying. In the U.S. however, the FDA recently approved the use of cultivated meat produced from chickens' living cells for human consumption. In this regard, the U.S. follows the example of Singapore, which was the first country in the world to introduce cultivated meat to consumers. Europe is still years away from seeing such sustainable alternatives to meat being offered in supermarkets. #BIO #GRN #MFG WEF

GREEN TECHNOLOGY

→ **EV sales crossed a global milestone last year, achieving around 10% market share for the first time, driven mainly by strong growth in China and Europe.** While EVs still make up a fraction of car sales in the U.S., their share of the total market is becoming substantial in Europe and China, and they are increasingly influencing the fortunes of the car market there as the technology becomes mainstream. The surge in EV sales also contrasted with the broader car market that suffered from economic worries, inflation, and production disruptions. The U.S. lags behind China and Europe in the rollout of EVs, but last year automakers sold 807,180 fully electric vehicles in the US, a rise in the share of all-electric vehicles to 5.8% of all vehicles sold

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from 3.2% the year before. Tesla is still the world's dominant EV maker, but conventional automakers are shortening its lead with new electric-model launches. European automakers have focused their EV production and sales on home markets as they try to meet European Union emissions regulations. They also began last year to aggressively expand their EV business in other major markets, especially China and the U.S. In China, which accounted for around two-thirds of global sales of fully electric cars last year, domestic manufacturers are gaining ground on traditional Western automakers and are also beginning to expand into Europe and the U.S. #GRN #USA #CHN WSJ

→ **Researchers have developed a more compact flow battery cell configuration that reduces the size of the cell by 75%, and correspondingly reduces the size and cost of the entire flow battery.** The work could revolutionize how everything from major commercial buildings to residential homes are powered. Flow batteries get their name from the flow cell where electron exchange happens. Their conventional design requires bulky flow distributors and gaskets, increasing size and cost but decreasing overall performance. To reduce footprint and cost, the researchers focused on improving the flow cell's volumetric power density (W/L-of-cell). They turned to a configuration commonly used in chemical separation – a sub-millimeter, bundled microtubular (SBMT) membrane – made of a fiber-shaped filter membrane known as a hollow fiber. This innovation has a space-saving design that can mitigate pressure across the membranes that ions pass through without needing additional support infrastructure. The researchers developed an SMBT that reduces membrane-to-membrane distance by almost 100 times. The microtubular membrane in the design works as an electrolyte distributor at the same time without the need for large supporting materials. The bundled microtubes create a shorter distance between electrodes and membranes, increasing the volumetric power density. This bundling design is the key discovery for maximizing flow batteries' potential, and the researchers are already working on commercialization, focusing on developing batteries with different chemistries and scaling up their size. #GRN #USA Tech Xplore

→ **U.S. Army Garrison Presidio of Monterey has installed three solar-powered chargers for electric vehicles on post, beginning the garrison's mandated switch to electric vehicles.** The installation has two electric vehicles so far, but officials plan to bring in many more in fiscal years 2023 and 2024 to replace the installation's gas-powered fleet. The initiative comes in response to Executive Order 14057, "Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability," which requires the Department of Defense to transition its non-tactical vehicles to a 100% zero-emission vehicle fleet. That includes 100% of light-duty acquisitions by 2027, and 100% of medium- and heavy-duty acquisitions by 2035. The stations feature solar panels that charge batteries and the solar panels move throughout the day to maximize the amount of sunlight the panels receive. The system also uses a GPS device to determine where the sun is supposed to be located. #GRN #USA US Army

ADVANCED MANUFACTURING

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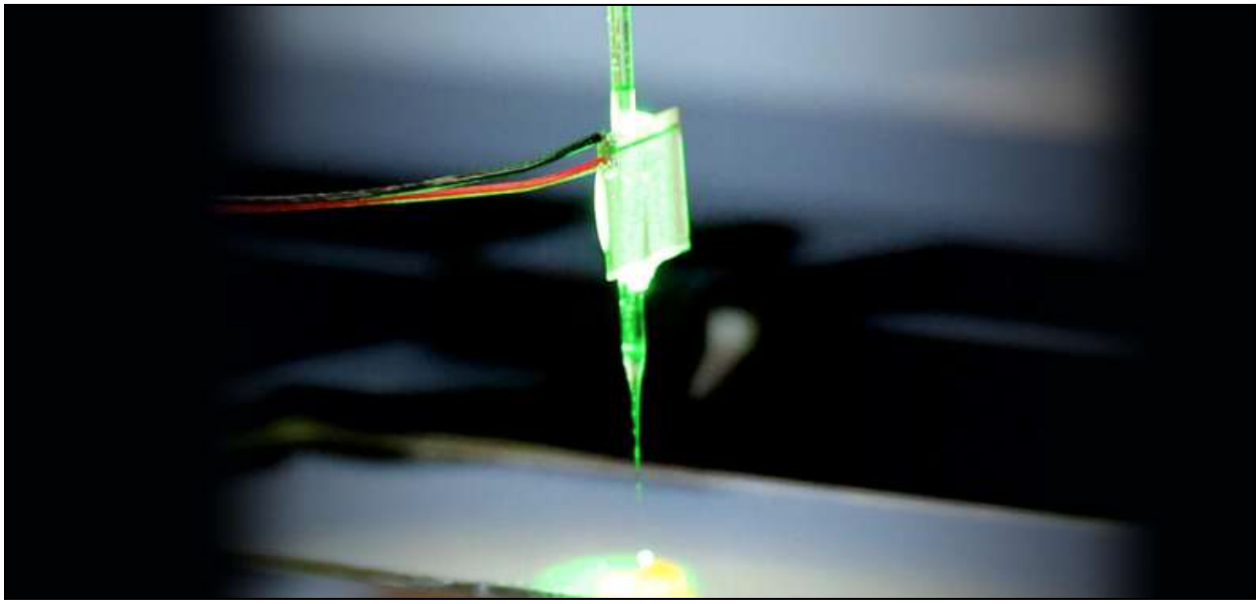
→ **Researchers have developed an ultrasonically actuated glass needle that can be attached to a robotic arm, letting them pump and mix minuscule amounts of liquid and trap particles.** The device comprises a thin, pointed glass needle and a piezoelectric transducer that causes the needle to oscillate. Similar transducers are used in loudspeakers, ultrasound imaging, and professional dental cleaning equipment. The researchers can vary the oscillation frequency of their glass needle. The arms could conceivably be used for applications such as sorting tiny objects and in biotechnology as a way of introducing DNA into individual cells. It should ultimately be possible to employ them in additive manufacturing and 3D printing.



#MFG #BIO #CHE Science Daily Tech Xplore

→ **According to a recent study, birds fly more efficiently by folding their wings during the upstroke, meaning that wing-folding may be the next step in increasing the propulsive and aerodynamic efficiency of drones.** A research team has constructed a robotic wing that can flap more like a bird than previous robots. Previous studies have shown that birds flap their wings more horizontally when flying slowly – the new study shows that birds probably do this, even though it requires more energy, because it is easier to create sufficiently large forces to stay aloft and propel themselves. This is something drones can emulate to increase the range of flight speeds. #MFG #SWE #CHE Science Daily

AUTONOMOUS SYSTEMS

→ **A 2016 video that Tesla used to promote its self-driving technology was staged to show capabilities – like stopping at a red light and accelerating at a green light – that the system did not have**, according to testimony by a senior engineer. The video, which remains archived on Tesla's website, was released in October 2016 and promoted on Twitter by Chief Executive Elon Musk as evidence that "Tesla drives itself." The video carries a tagline saying:

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“The person in the driver’s seat is only there for legal reasons. He is not doing anything. The car is driving itself.” But the Model X was not driving itself with the technology Tesla had deployed, according to the Tesla engineer. The statement was part of a transcript of a July deposition taken as evidence in a lawsuit against Tesla for a 2018 fatal crash involving a former Apple engineer. The previously unreported testimony represents the first time a Tesla employee has confirmed and detailed how the video was produced. To create the video, the Tesla used 3D mapping on a predetermined route from a house in Menlo Park, California, to Tesla’s then-headquarters in Palo Alto. Drivers intervened to take control in test runs. When trying to show the Model X could park itself with no driver, a test car crashed into a fence in Tesla’s parking lot. #AUT #USA Reuters

→ **According to a government report, motorists could be stuck in congestion nearly twice as bad as current levels if self-driving cars become mainstream.** Department for Transport (DfT) traffic projections for England and Wales show delays may rise by up to 85% from 2025 to 2060 in that scenario. The analysis is based on connected and autonomous vehicles making up half of the car fleet by 2047, and a 'fast uptake' of electric vehicles. This would lead to a rise in traffic volume and parking pressures by increasing the mobility of the elderly and those who do not currently hold a driver’s license, according to the report. Recent analysis by traffic information supplier Inrix found that UK drivers lost an average of 80 hours last year due to congestion, a seven-hour increase from 2021. London was found to be the world's most congested city in 2022, with drivers in the capital spending an average of 156 hours sitting in traffic. #AUT #GBR Daily Mail

SEMICONDUCTORS & CHIPS

→ **During a meeting with Dutch Prime Minister Mark Rutte at the White House, President Joe Biden said the U.S. and the Netherlands are in “lockstep” over their approach to China; however, some critics say there has not been much progress.** The Netherlands and Japan have agreed in principle to join the U.S. in tightening export controls on advanced chip-making equipment to China, though they likely won’t go as far as the sweeping rules the White House announced in October. The U.S. said the measures are aimed at preventing Beijing’s military from obtaining advanced semiconductors. The Dutch trip to the U.S. did not result in an announcement of any agreement. U.S. officials have also stressed that all countries make sovereign decisions and that any potential changes to the Netherlands’ export regime would not occur due to pressure from the Biden administration. ASML, producer of the world’s most advanced semiconductor lithography systems required to manufacture the most advanced chips is headquartered in Veldhoven, making the Netherlands key to Washington’s chips push against Beijing. 15% of ASML’s sales are in China. Last Week, Biden also hosted Japanese Prime Minister Fumio Kishida, who said he backs Biden’s attempt but did not agree to match the sweeping curbs targeting China’s semiconductor and supercomputing industries. #CHP #USA #NLD #CHN #JPN Bloomberg, Voa News

QUANTUM TECHNOLOGY

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→ **Quantum computing is a particularly precarious investment field.** The technology meant to accelerate computer processing by harnessing quantum mechanics to solve complex problems, will likely not be useful for years. Standards in pricing and business practices have yet to be solidified. And although companies are experimenting with quantum computing, products and demand are not yet well established. Quantum computing projects at giants like Alphabet and IBM can draw on revenues from their established businesses. But smaller ventures going all-in on quantum need other sources of cash to ensure their long-term survival. SPACs were an appealing money source, but some companies that tapped them may be caught in the fallout. Nevertheless, investments in quantum startups doubled from the prior year up from $700M to $1.4B according to McKinsey, with more than 70% of that coming from venture and private capital entities by the second half of the year. And governments are funding quantum development in China and the E.U. Other challenges in quantum include the talent shortage. Startups are racing to develop these technologies while also facing steep financial hurdles. Quantum is still widely believed to pay off when it reaches maturity. #QNT #USA #CHN #EUR Wired

→ **The world is heading for a "quantum divide" according to the World Economic Forum (WEF).** The impact of quantum technology will be far-reaching in fields ranging from cybersecurity to drug development. Currently, 17 countries have invested in a national program of quantum technology research and development, while more than 150 have not. Disparities in access to existing technologies have already created a digital divide: 2.9B people are still offline and do not benefit from the digital economy. Unequal access to quantum technology has negative geopolitical implications, putting those countries whose quantum programs are less developed in danger of falling further behind. WEF recommends countries with more developed quantum programs commit to inclusivity in quantum education. And, before any of the benefits of quantum technology can be realized, addressing the quantum threat to cybersecurity should be a first step to protect economic interests, critical infrastructure, and national security. From there, countries can focus on one or a few key specializations aligned to their strategic priorities that will place them in the overall quantum value chain. The National Quantum Blueprint initiative, guided by the Quantum Computing Governance Principles of the Forum, will provide a roadmap to build a quantum ecosystem, driving positive outcomes for society.

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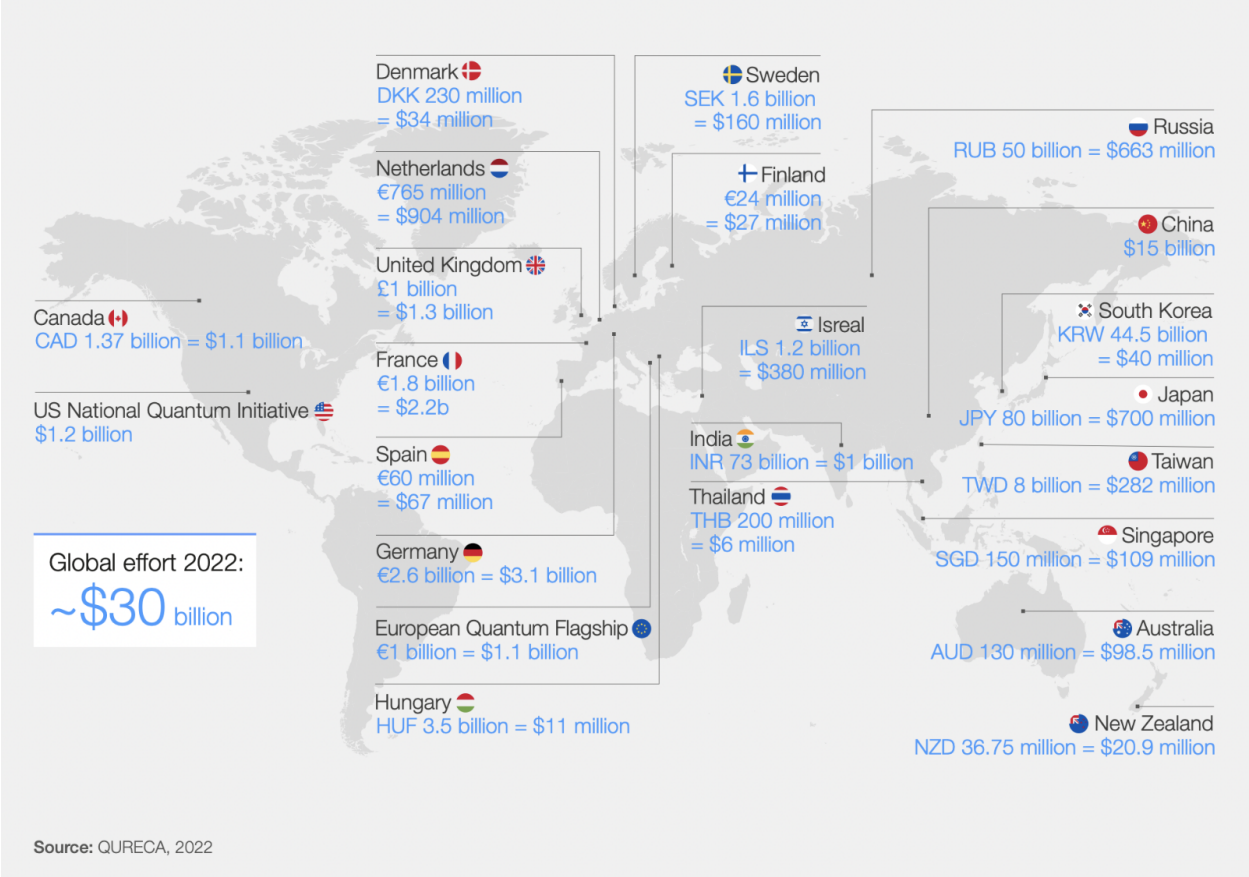

#QNT #Cybersecurity #Geopolitics WEF

GEOPOLITICS

→ **China should make more use of AI to strengthen its deterrence strategy against the U.S. over Taiwan, according to a Chinese expert on Taiwanese affairs.** The official stated in an article that the PLA should conduct blockade exercises around the island and use AI technology to deter US interference and Taiwanese independence forces. He suggested the PLA could become a leader in future intelligent warfare, drawing on capabilities in AI, cloud computing, big data, cyber offense and defense, and unmanned equipment. The official also called for the PLA to normalize military drills that cross the median line of the Taiwan Strait – the de facto sea border separating mainland China from Taiwan – and that approach the baseline of the island's territorial waters and cut off transport. Future PLA exercises could go beyond traditional amphibious landings and use intelligent warfare tactics for blockades and network disconnection. The official noted that both war games and virtual confrontation using unmanned systems could be used to achieve the goal of zero casualties and a fast seizure of an island. He said simulation exercises could be conducted on the Taiwanese-controlled island of Taiping – located in the contested Spratlys in the South China Sea – as well as Dongsha and Penghu in the future. According to a report released last year by the Center for Security and Emerging Technology at Georgetown University, the PLA has been using AI to simulate war games for

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invasion operations against Taiwan, as well as to identify undersea vehicles, track U.S. Navy ships, and deploy electronic countermeasures, among other tasks. Meanwhile, American think tank the Center for Strategic and International Studies warned that while Beijing would be unlikely to succeed in seizing Taiwan in a hypothetical invasion of the island in 2026, such a conflict would wreak havoc on both sides of the strait, as well as the US and Japan, with total casualties running into the tens of thousands. #Geopolitics #AI #DIG #USA #CHN #TWN SCMP Interesting Engineering

→ **The Russian space agency may be willing to return 36 satellites it's been keeping hostage in Kazakhstan in exchange for parts of its Soyuz rockets that are being held in French Guiana.** According to a report by Russian Space Web, French aerospace company Arianespace might be looking into a deal with Roscosmos to swap components of the Russian Soyuz rocket for 36 OneWeb satellites that have been held at its Kazakhstan launch site since March. Under the helm of former Roscosmos head Dmitry Rogozin, the space agency severed ties with Europe in retaliation for Western-imposed sanctions against Russia. That included an ongoing deal it had with British company OneWeb to launch its internet satellites to orbit aboard the Soyuz rockets. OneWeb refused to agree to a list of unreasonable demands put forward by Roscosmos in March, prompting Russia to hold on to the company's 36 satellites and store them indefinitely at its launch facility in Baikonur, Kazakhstan. OneWeb eventually forged new partnerships with SpaceX and India's space agency to launch its remaining satellites to orbit, but its 36 lonesome satellites remained out of reach. Roscosmos also halted its cooperation with Europe on Soyuz rocket launches from French Guiana and withdrew 87 employees from the launch site. But with Russian involvement in French Guiana terminated, the Soyuz rocket components were left abandoned. #Geopolitics #RUS #UKR #FRA #GBR #KAZ #IND #GUF Space News

CYBERSECURITY

→ **Dual hat commander of USCYBERCOM and NSA General Paul Nakasone made his case last week for lawmakers to retain a key NSA surveillance power ahead of a tough reauthorization battle this year.** Section 702 of the Foreign Intelligence Surveillance Act (FISA) is set to expire at the end of the year, jeopardizing a surveillance authority that allows intelligence agencies to collect warrantless online communications from foreign persons. This debate is set to take up a significant amount of the Hill's cybersecurity attention throughout the year. Nakasone said the surveillance power has allowed the U.S. to stop active terrorist plots, foreign ransomware attacks, and planned cyber espionage schemes. Civil liberties and privacy advocates have long argued that Section 702 sweeps up far too many Americans' electronic communications, such as emails and text messages, when they talk with people in other countries. Some Republican lawmakers are likely to argue for either letting 702 expire, or limiting its scope as their party grows more critical of the intelligence agencies. #Cybersecurity #USA Axios

→ **President Biden is set to approve a new cybersecurity policy that will empower U.S. agencies to hack into the networks of criminals and foreign governments, among other**

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changes. The 35-page document (obtained exclusively by Slate) goes much further than similar policies from previous administrations in two significant ways: First, it imposes mandatory regulations on a wide swath of American industries. Second, it authorizes U.S. defense, intelligence, and law enforcement agencies to go on the offensive, hacking into the computer networks of criminals and foreign governments, in retaliation to - or preempting - their attacks on American networks. Under the new strategy, the U.S. will disrupt and dismantle hostile networks as part of a persistent, continuous campaign which will be coordinated by NCIJTF (the FBI's National Cyber Investigative Joint Task Force). NCIJTF will work in tandem with all relevant U.S. agencies. Private companies - both firms that are frequent targets of cyberattacks and firms that specialize in cybersecurity methods - will be full partners in this effort, both to alert the USG of intrusions and to help repel them. This strategy is driven by two major factors: First, mere guidelines on cybersecurity have largely failed to block major instructions, and second, purely defensive measures have had limited impact. #Cybersecurity #Geopolitics #USA Slate

→ **China plans to significantly shore up data security across major industries ranging from telecommunications to finance, as Beijing seeks to unlock the economic potential of the massive amount of data generated by its digital economy while protecting national security.** The government also plans to build five provincial and state-level data security labs to achieve breakthroughs in key technologies and products. It also wants to establish five national data security industrial estates and develop several "little giants" - smaller businesses with special products and know-how in the sector - that are globally competitive. By 2035, China's data security sector is expected to mature and "enter a prosperous period" bolstering the national digital economy. Chinese policymakers added data as a new production factor back in April 2020, putting it in the same category as land, capital, and human labor. #Cybersecurity #Geopolitics #CHN SCMP

→ **A lesser known provision in the 2023 NDAA called for a study of cybersecurity and national security threats posed by foreign-manufactured cranes at U.S. ports**. Under this provision, the Maritime Administrator, working with Homeland Security, the Pentagon, and CISA, is required to conduct a study to assess whether foreign manufactured cranes at U.S. ports pose cybersecurity or national security threats. Little information is publicly available regarding why this study was included in the legislation. However, the study could be a concession to Rep Carlos Gimenez (R-FL) who introduced a bill last year that would limit the operation at U.S. ports of foreign cranes made by U.S. adversaries. It died in a committee. The bill required CISA to inspect foreign cranes before they are placed into operation for potential security vulnerabilities and assess the threat posed by security vulnerabilities on existing or newly constructed foreign cranes. And, as far back as 2013, a Brookings study concluded that the cybersecurity awareness and culture level in U.S. port facilities was low and that basic cybersecurity hygiene measures were missing in most ports. Further, in 2021, FBI counterintelligence agents conducted a search of a Chinese merchant ship that delivered four "Neo-Panamax" port container cranes to Baltimore harbor. The agents reportedly uncovered intelligence-gathering equipment on the ship. Shanghai Zhenhua Heavy Industries Company (ZPMC) manufactured the four cranes and is responsible for 80% of global market share. While the reasons for the provision in the NDAA are not well known, it is possible due to the

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digitization of cranes, policymakers are concerned about vulnerabilities, embedded malware, or surveillance threats by foreign made cranes, or supply chain risks. #Cybersecurity #SCRM #Geopolitics #USA #CHN

→ **The U.S. Marine Corps officially activated the Marine Corps Information Command (MCIC), designed to tightly link the service's information forces including cyber, intelligence, and space**. The command will be led by Major General Ryan Heritage, the commander of Marine Corps Forces Cyberspace Command and Marine Corps Forces Space Command. The need for such an integrator stems from not only the increased need for information forces against sophisticated adversaries, but the sometimes complicated authorities involved. The MCIC will act as the linkage across commands that conduct operational level planning and will enable commanders to provide task-organized detachments authorities across the range of military operations and in support of campaigning objectives. #Cybersecurity #AER #USA Defense Scoop

SUPPLY CHAINS

→ **According to the World Economic Forum, governments should take three immediate steps to stimulate and sustain supply chain resilience for their local economies**:

1. **Support the World Trade Organization**: Strengthening trade governance, led by the World Trade Organization (WTO), is needed to counter protectionism – and any weakening of the WTO would only increase uncertainty for firms worldwide. While this discussion must occur among governments, in most cases, the private sector holds the most knowledge on the global obstacles and opportunities for imports and exports. It must focus more on communicating business needs and advancing multilateral trade negotiations.
2. **Boost digital accountability**: The 21st century brings pioneering advanced technologies from robotics to the metaverse, yet the logistics industry often relies on paperwork and other outdated systems. This increases the risk for businesses, with many operating with blind spots on the location of their cargo worldwide. Governments should step in as a catalyst to drive better public-private data-sharing mechanisms that offer better visibility in understanding, evaluating, and optimizing trade flows.
3. **Modernize Trade Infrastructure**: Governments must ensure that physical infrastructure can accommodate supply. Certain communities and countries may be excluded from trade unless urgent action is taken to expedite the freight flow through developing markets. Africa is one example; the proper physical infrastructure must underpin its new digital trading corridors.

#SCRM WEF

→ **U.S. importers are shipping more to the U.S. east coast – to New York and New Jersey instead of Los Angeles – as U.S. imports from China decline.** Other Asian countries are sending more by comparison as Covid-related uncertainties hit Chinese manufacturing and as U.S. efforts to diversify supply chains away from China intensify. China's customs data shows

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that exports to the U.S. plunged by 25% in November from a year earlier after tallying a year-on-year decline of 13% in October. And the number of U.S.-bound shipments from China fell 21% between August and November, according to Project44, a supply-chain logistics company. In contrast, shipments from members of the Association of Southeast Asian Nations (ASEAN) rose 23% and 22% in September and October, respectively, according to the Japan Maritime Centre. While China's container export declined 4.7% on a cumulative basis for January-November, those of Vietnam and India increased by 13.3% and 14.9%, respectively. Meanwhile, recent polls suggest U.S. consumers have begun to care about where products are made and if consumer brands align with their core values on issues like the environment and human rights. While it is difficult to estimate the extent of future U.S./China decoupling, experts anticipate that about 20-30% of manufacturing will move out of China over the next decade. #SCRM #Geopolitics #USA #CHN #VNM #IND SCMP

→ **A new law on supply chain due diligence came into effect in Germany on January 1st, compelling businesses with more than 3k employees to monitor whether their suppliers meet human rights and environmental standards.** From 2024 the law will extend to firms with 1k German workers. Misbehavior by suppliers could lead to fines of up to $8.6M or 2% of the German firms' global sales, whichever is higher. Bosses warn this puts their firms at a disadvantage, creates more red tape in a highly regulated country, and could harm, not help, workers in emerging markets. Germany is not the first member of the E.U. to enact such a law. But the German statute is more stringent and applies to more companies than, for example, its French or Dutch equivalents. The government's own estimates of the law's direct cost to the country's firms – ~$119M this year and ~$47M a year thereafter – are unrealistically low, businesses say. Separately, tougher E.U. rules in the works would require firms with 500 employees or more and annual sales of $162M to monitor environmental and labor standards across their supply chains and to ensure their business is compatible with the decarbonization path envisaged by the Paris agreement on climate change. In industries such as farming or textiles, where mistreatment of workers is more common, the E.U. law would apply to companies with just 250 employees and sales of $43M. It is likely to go before the European Parliament and the European Council this year. German firms would then need to comply with both domestic and E.U. rules, adding a layer of cost and complexity. #SCRM #DEU #FRA #NLD The Economist

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