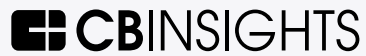




2023

11 Tech Trends

To Watch Closely in 2023



Where is all this data from?

The CB Insights platform has the underlying data included in this report

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Intro

Tech never stops moving.

Though large swaths of the tech world continue to reckon with the comedown from the heady funding bonanza of 2021, many spaces don't seem to have slowed down at all. In fact, buzzy advances will start to pile up in the coming year.

Generative AI has already made a big splash, but on the horizon are also startups promising significantly longer human lifespans and healthcare monitoring tools that keep tabs on patients without adding any burden. Improvements in digital smell tech will provide new ways to probe the world and allow for more confident predictions about what food and beauty products consumers will enjoy.

Meanwhile, virtual power plants are becoming popular as a way for homes decked out with glossy solar panels and battery packs to make money while also helping electricity grids become much more resilient. And as plastics once again become a hot topic for industries, next-gen alternatives are being strung together from bio-based materials like seaweed and mushrooms.

But lots of tech players will also be adapting to a landscape where economic uncertainty looms large.

Expansion into new markets will become paramount as companies look to build resilience. Expect to see startups in sectors experiencing turbulence from waning demand, like fintech, accelerate plans to launch new products and features while other companies will go after underserved markets to find new customers, such as menopause within the women's health space. In the background, seemingly every company above a certain size will try to build themselves a moat by becoming a do-it-all super app.

After 2022's countless shake-ups, many are hoping that the new year will usher in a renewed sense of dynamism in the tech world as "the new normal" shifts once again. But if nothing else, the coming year will prove that nothing in tech stays the same for long.

Immortality-as-a-service

Humans have fantasized about extreme lifespans for millennia, but the age-old pursuit is now attracting fresh interest from VCs and tech companies.

Imagine a world where age was truly but a number. Where centenarians are not just commonplace but nimble and healthy, maybe even still working. Society would be reshaped and many economic assumptions upended – for example, pensions and social security would face more pressure while industries would have a bigger workforce to draw upon and more consumers to sell to. How people lived and planned their lives would almost certainly change dramatically.

Such a world may not be so far away. Armed with increasingly powerful AI tools and a growing ability to analyze and manipulate genetics, more and more tech companies are taking a crack at selling longevity. Dreams of immortality aside, the prize for founders focused on providing services to live longer, healthier lives could be big – age-defying consumers would likely be a lucrative source of recurring revenue.

Increasing lifespans is becoming a hotter topic

Media mentions of longevity terms (as of 12/15/2022)



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Companies are coming at the longevity challenge from numerous different directions, including:

- Tinkering with cellular processes
- Regenerating body parts
- Drug discovery
- Anti-aging supplements (not cosmetic focused)

More investors are taking note as well: dedicated VC funds like Apollo Health Ventures and Life Extension Ventures have recently raised massive funds to pour into longevity companies. Saudi Arabia said in 2022 that it would spend \$1B a year on anti-aging research.

One startup that has drawn attention is [Altos Labs](#). The company, which is backed by Jeff Bezos and counts the Nobel Prize-winning co-inventor of gene-editing tool CRISPR Jennifer Doudna as a director, closed a mammoth \$3B funding deal in early 2022. Its stated aim is to “reverse disease” through what it calls “cellular rejuvenation programming” — in effect, hacking cellular processes to interrupt mechanisms associated with aging and tricking cells into re-entering a more youthful, healthier state.

Altos Labs isn't the only well-resourced biotech company with lofty longevity goals. [Alphabet](#) subsidiary [Calico](#) is also looking to disrupt aging by targeting cellular processes — the company's focus on longevity complements [Google's far broader strategy](#) to provide more healthcare services. The company, which was founded in 2013, has been [granted several patents](#) associated with cellular reprogramming and extended its partnership with pharma company [AbbVie](#) last year to focus on treatments for neurodegenerative diseases and cancer.

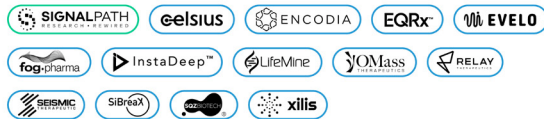
Google's Strategy Map In Pharma

We mined Google's acquisitions, investments, and partnerships since Q1'17 to discern its strategic priorities.

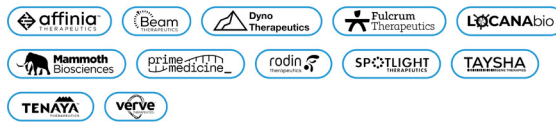
Categories listed are not exhaustive of all of Google's activity in this period.

Google

Drug R&D tech



Gene therapy



Genomics



Reproductive health



Supply chain



- Acquisition
- Investment
- Partnership

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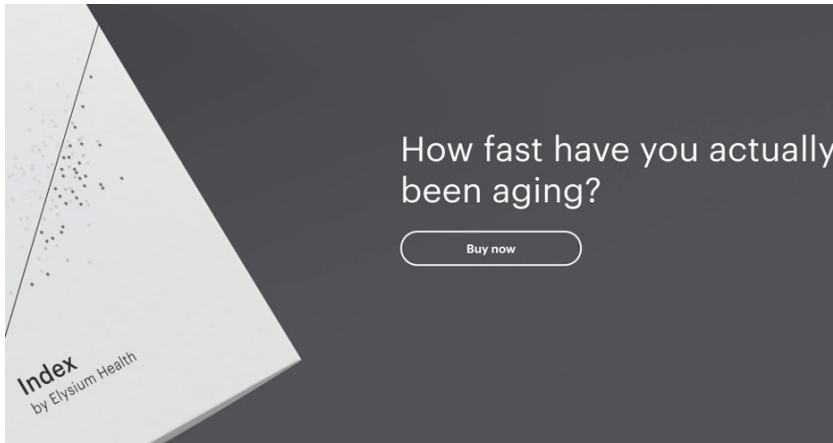
GOOGLE IS GOING AFTER LONGEVITY ALONGSIDE MANY OTHER HEALTHCARE MARKETS. CB INSIGHTS CLIENTS CAN DIG INTO OUR ANALYSIS OF ITS PHARMA STRATEGY IN [THIS REPORT](#).

Meanwhile, plenty of [early-stage regenerative medicine startups](#) targeting specific ailments are entering the scene — selling treatments that could significantly boost quality of life as people age, even if overall lifespans won't necessarily shift that much as a result. Companies like [Eyestem](#) (restoring eyesight), [Spiderwort](#) (repairing spines), [Hy2Care](#) (cartilage repair), [Mesentech](#) (reversing bone loss), and [Toregem BioPharma](#) (regenerating teeth), among others, have all raised early-stage funding rounds in 2022.

Some companies are even trying their hand at growing entirely new organs to extend lifespans. [LyGenesis](#) is testing technology that it says would compel a patient's body to grow new kidneys, livers, or pancreases on their lymph nodes. These mini-organs would act as an alternative to a full-blown transplant for people where this isn't an option – such as for those who are very ill or when a suitable donor can't be found. Meanwhile, [Satellite Bio](#) raised an \$82M Series A in 2022 to develop implantable tissues that it says can be programmed to replace dysfunctional organs.

Drug discovery is another key area where tech could affect how healthy people are as they age and how long they live. A recent success from an Alzheimer's drug trial demonstrates how finding better ways to design and test new drugs quickly could have a profound impact on aging. Advances in AI and quantum computing are already [being tested for new approaches to identify drug candidates](#) from massive databases of molecules and to simulate drug interactions to make it more likely that clinical trials are successful. For example, [Algorithmiq](#) raised a \$4M seed round in early 2022 to build a quantum computing-supported platform for drug simulations. Watch for the rate of drug candidates being tested for common, age-correlated diseases like dementia and cancer to shoot up as new drug discovery technologies mature.

Others are looking to help consumers measure their “biological age” with epigenetic clocks – the idea being that someone's body may exhibit aging characteristics which deviate significantly from what would be typical for their chronological age. For instance, [Elysium Health](#) offers an at-home test where consumers provide a DNA sample for genetic analysis. The company looks for epigenetic markers associated with aging from lifestyle factors like lack-of-sleep or stress and sells supplements that it claims help ward off some effects of aging.



SOURCE: ELYSIUM HEALTH

Despite the rapid growth of investor interest in the longevity sector, no company is likely to find a single fountain of youth. Instead, watch for near-term advances to be made in key areas like cellular reprogramming, regenerative medicine, and drug discovery. These developments, taken together with better aging insights from epigenetic clocks and technology like ambient health monitoring, hint that the ground is being set for holistic anti-aging platforms that will help people measure and maintain their general health and access treatments at the early stages of illness.

Our assumptions about age may or may not be completely upended over the coming years, but one thing is for sure: For the tech world, the dream of immortality will never die.

The secret invasion of super apps

The ground is being set for a massive clash of super app-level platforms vying to dominate consumers' online life.

Super apps are the Swiss Army Knives of consumer tech platforms.

From Tencent's [WeChat](#) in China to [Grab](#) in Southeast Asia, these all-in-one apps have evolved to bundle services like messaging, payments, shopping, gaming, and food delivery – creating digital ecosystems that users never need to leave.

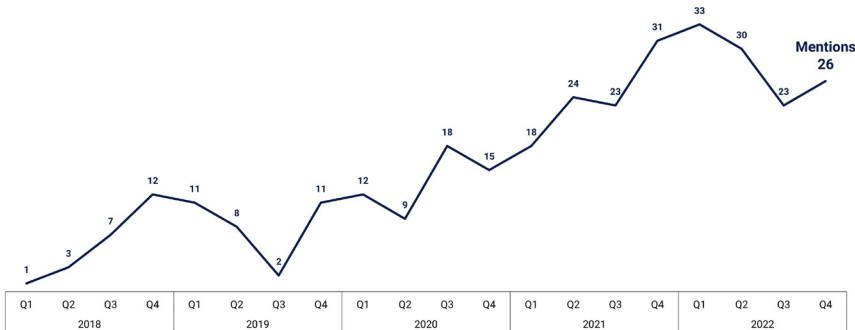
Now, companies like [Meta](#), [Microsoft](#), [Amazon](#), [Google](#), and [Apple](#) are looking to super apps as models to extend their reach with consumers – including in the US and Europe, where super apps have yet to take hold – and drive new sources of revenue.

And they're not alone: A diverse array of corporate players, from [Zillow](#) in housing to [Marks & Spencer](#) in retail to [PayPal](#) in finance, have recently signaled their intentions to build sector-specific super apps.

Soon, even Western consumers longing for the do-it-all convenience of super apps will be spoiled for choice.

Corporate interest in super apps is building

Earnings call mentions of "super app" (as of 12/19/2022)



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The prize is massive: Any company that can become a go-to combined platform for online activities like search, commerce, and digital identification could [gain a wide moat](#) and act as a gateway to the digital economy – with an abundance of monetization opportunities.

But big tech players' super app ambitions are not about making a WeChat clone. Instead, these companies are steadily sprawling out to control more aspects of consumers' online lives across the following areas:

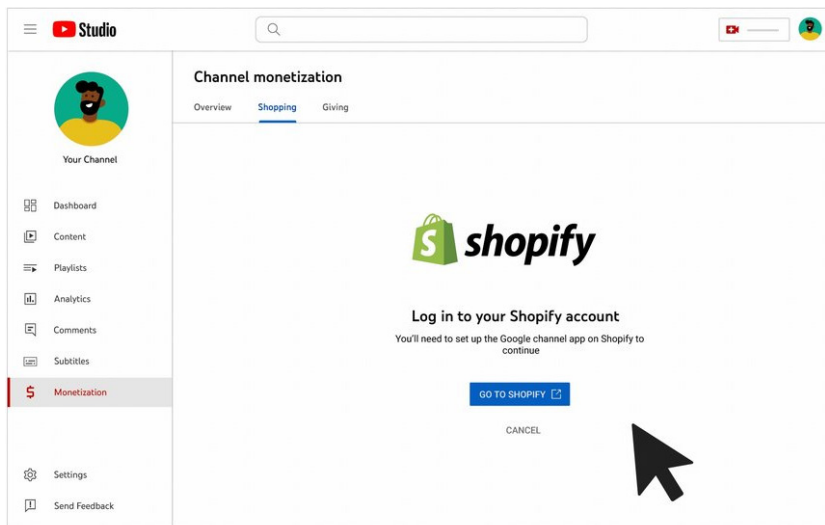
- Discovery (e.g., search, social media)
- Transactions and authentication (e.g., payments, messaging, digital IDs)
- Delivery (directly providing a product or service)

Tech companies' starting points and advantages here vary, but players are already converging on each other's territory – giving rise to effective super app-level platforms that will begin to compete more and more directly.

Search is a key battleground.

In December 2022, The Information reported that Microsoft is considering building a super app with its Bing search engine as the backbone. The company is looking to integrate features ranging from shopping to news feeds as it seeks to expand further into the consumer market and capture more advertising dollars.

Meanwhile, Google, which currently dominates global search volumes, is enhancing its search and product listing capabilities to keep users within its network. For example, it recently expanded its partnership with Shopify to YouTube (which it acquired in 2006) to enable merchants to showcase shoppable products directly on their YouTube channels. US-based creators have the option to enable onsite checkout, which allows viewers who have stumbled across a product video to complete their purchases without leaving YouTube.



SOURCE: YOUTUBE

Google has also launched features to make its search more visually engaging, such as enriching result previews with images, as it faces down competition from social players.

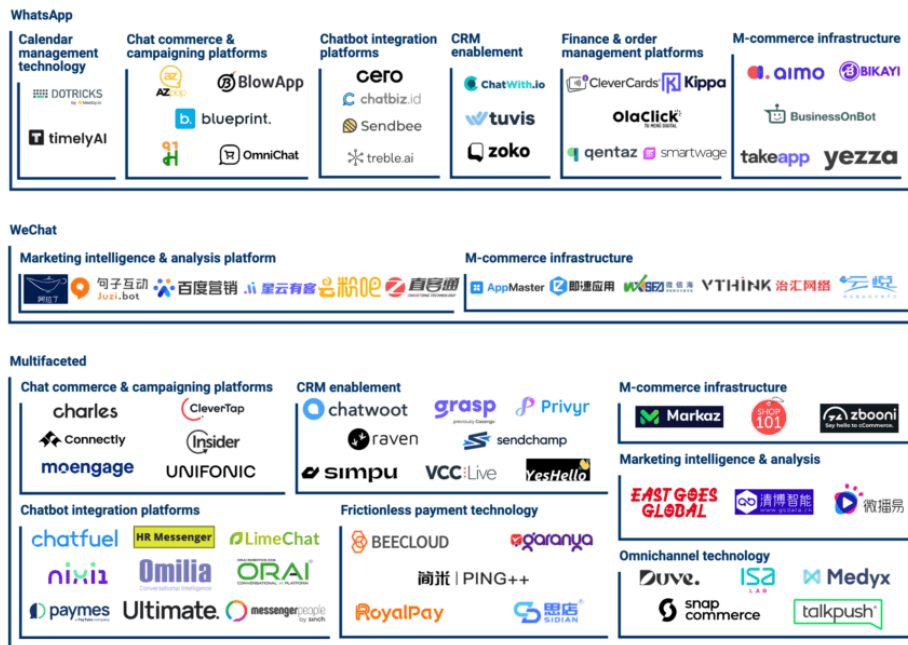
Roughly 40% of young people in the US are now using [TikTok](#) or Meta's Instagram to find a place for lunch instead of Google Search or Maps, according to comments made by Google SVP Prabhakar Raghavan in July 2022.

For their part, social media platforms are now layering on commerce features as more consumers use them as de facto search engines.

But even as search evolves, keeping consumers locked in beyond the discovery phase – and taking a bigger piece of the e-commerce pie – will be a key challenge for players with super app ambitions.

For example, Meta's super app goals may be clearest with [WhatsApp](#), the messaging service it purchased in 2014. In November 2022, the company announced its “vision for bringing the entire shopping experience directly to a WhatsApp chat.” To start, WhatsApp users in certain countries can now search for businesses within the app, message them directly, and make payments in the chat. Meta is charting a course to handle discovery, messaging, and payments for WhatsApp's more than 2B users globally.

74 companies enabling super apps like WhatsApp and WeChat



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AN EMERGING CROP OF COMPANIES ARE SUPPORTING BRANDS AND RETAILERS ON WHATSAPP BY OFFERING TOOLS FOR MARKETING, COMMERCE, AND MORE. SOURCE: CB INSIGHTS

Meanwhile, others are going after payments, a key enabler of super app functions. Apple Pay adoption has taken off in the US, with an estimated 75% of iPhones having the service activated. In May 2022, Google rolled out its digital wallet app for Android phones, which stores credit cards, transit documents, tickets, and more. Going a step further in owning the consumer journey end-to-end, Apple is reportedly looking to bring a variety of financial products in-house by developing its own tech for payment processing, fraud analysis, and more in a project dubbed "Breakout."

Apple and Google are also among the companies eyeing the digital ID market. Credibly establishing who users are online could be a boon for super app ecosystems as consumers could more seamlessly access sensitive services like banking and healthcare. These companies would also find themselves at the center of even more daily interactions in consumers' lives – both online and offline. While Google's ID feature for its Google Wallet is still in the works, Apple's Wallet IDs are now supported at several TSA checkpoints. Patent filings recently surfaced by Fintech Business Weekly indicate where Apple may head next with its identity credentials: know-your-customer (KYC) checks, peer-to-peer (P2P) transactions, and possibly voter identity verification.

Even Elon Musk now has super app ambitions. In October 2022, Musk tweeted that "buying Twitter is an accelerant to creating X, the everything app." Twitter's \$44B price tag could someday look cheap if it is actually transformed into a full-fledged super app – and [Musk's range of other business interests](#), from satellite-based internet to autonomous vehicles to brain-controlled software, may benefit from a platform that ties them together.

Of course, significant obstacles exist for super app wannabes, such as gaining the consumer trust needed to handle so much digital activity while also benefiting from network effects in a soon-to-be-crowded space. But the allure of super apps has already taken hold across the tech landscape. Big players are on a super-sized collision course in 2023 and beyond as they compete for increasingly overlapping aspects of consumers' online lives.

Fintech's rapid regeneration

Fintech startups are facing the rockiest market conditions since they were founded, but many are already adapting by expanding into new spaces and catering to enterprises.

Fintech is undergoing a tectonic shift.

The sector led the broader VC market's meteoric growth in recent years, capturing \$1 out of every \$4 invested in the venture market at its peak in 2021. But most fintech startups, having built their businesses in the growth period since the 2008 financial crisis, haven't endured a prolonged market downturn.

The prospect of a recession looms especially large for fintech compared to many other tech sectors.

Some of the most well-known fintechs, from [Robinhood](#) to [Chime](#), rely on everyday consumers having cash to throw around — a vulnerable revenue source during a recessionary period. Meanwhile, as interest rates continue to rise from historic lows, borrowing money is becoming increasingly costly for digital lenders, dragging down their businesses. Real estate tech firms have been plagued by layoffs this year as soaring mortgage rates and inflation scare off would-be home-buyers.

Even [Stripe](#) — the fourth-most valuable unicorn in the world based on its last funding round — is under pressure from slowing e-commerce activity and has reigned in costs.

The shift has already uprooted fintech's hold over the venture market. In Q4'22, the sector drew just 14% of all VC dollars — down 10 percentage points from its high of 24% in Q2'21.

Fintech is losing its dominance in VC with each passing quarter

Fintech funding as a percentage of total venture funding (as of 12/19/2022)



Today's stark economic environment threatens to upturn the current fintech landscape. To survive, fintechs are already moving in 2 key directions:

1. Expanding into new business lines and product features, including non-financial ones
2. More vigorously targeting enterprise buyers

The first survival tactic is accelerating diversification efforts – a long-standing goal for many fintechs that has now become more vital than ever. Fintech leaders are bundling services to better monetize their existing customers, [build moats](#), and reduce their dependence on now-riskier business lines.

Take [Klarna](#), one of the biggest names in the buy now, pay later (BNPL) space. Its valuation reached \$45.6B in 2021 – up more than 8x from its funding round just 15 months before – on the heels of the BNPL market's [rapid growth](#).

Since then, the space has drawn regulatory scrutiny and BNPL providers have seen losses mount as more consumers fail to pay back loans on time. The new reality has hit Klarna hard: It conducted 2 rounds of layoffs across 2022 on top of an 85% cut to its valuation in July.

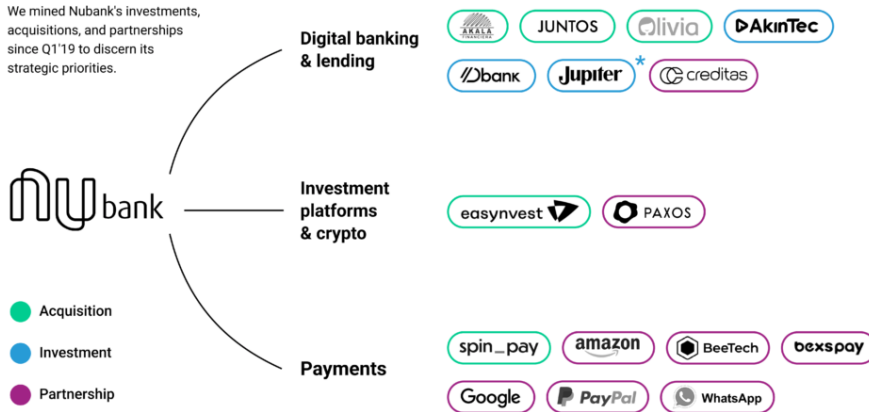
With BNPL facing headwinds, Klarna is insulating itself by pushing into new product areas. In the past few months, it has rolled out features including a price comparison tool, shoppable videos, and a platform to connect creators and brands. These steps are helping Klarna move from a pure-play financial partner for merchants to an end-to-end commerce tool for retailers, influencers, and shoppers.

In this vein, we'll see more name-brand fintechs move towards becoming something resembling a “[super app](#)” — connected ecosystems where users can manage their money, shop, buy insurance, and more. [Revolut](#), for one, has built an arsenal of around 50 products, including salary advance, pet insurance, and business payroll. In November 2022, it even added instant messaging functionality to enable customers to communicate with each other — a non-financial step in the mold of Asian super apps like Alipay.

Meanwhile, fellow challenger bank Nubank has engaged with [numerous startups](#) to expand into insurance, investments, crypto trading, and more. Today, it says its active customers use more than 3 different Nubank products on average.

Nubank Strategy Map

We mined Nubank's investments, acquisitions, and partnerships since Q1'19 to discern its strategic priorities.



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*indicates multiple investment rounds in the period

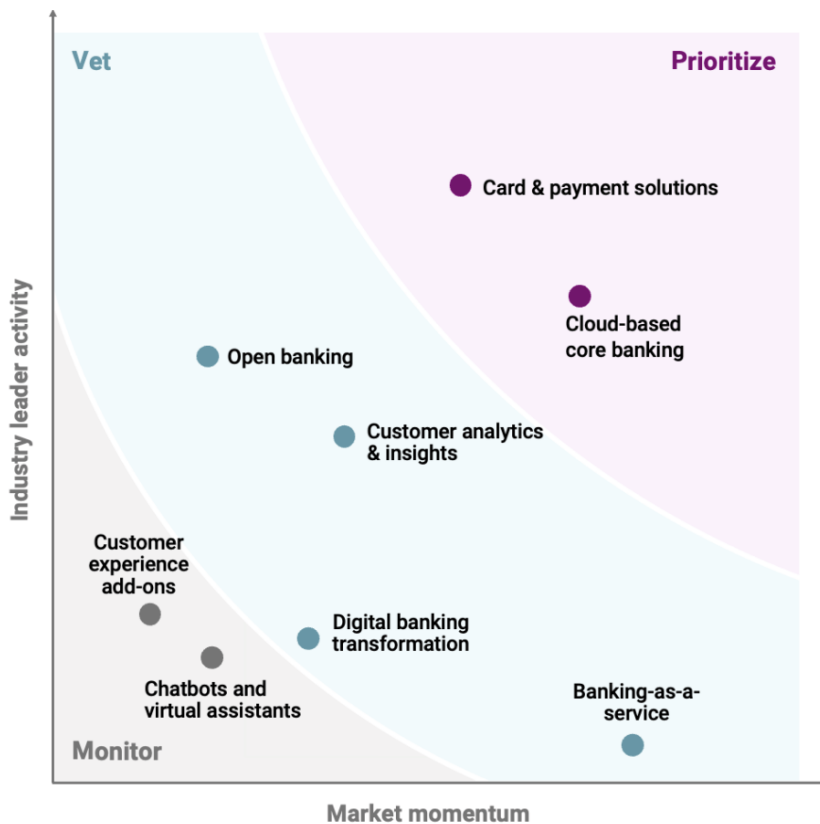
SEE WHERE NUBANK IS PLACING ITS BETS IN CB INSIGHTS' [NUBANK STRATEGY MAP](#).

Beyond new products, fintechs are leveraging a second tactic to ride out today's market conditions by hunting down a more stable client base: enterprises.

Consumers and small businesses are a flight risk when the market turns sour. Some fintechs are making hard pivots to avoid that exposure. Corporate spend management firm [Brex](#), for one, recently announced it would drop its small business clients altogether and instead serve large enterprises and startups that have raised funding.

Meanwhile, [Starling Bank](#), one of the UK's [first challenger banks](#), is pushing into the banking-as-a-service (BaaS) arena. In February 2022, it launched Engine — a cloud-agnostic, "bank in a box" technology that helps other financial services firms bring banking products to market.

Similarly, [cloud-based core banking platforms](#) – which integrate with or replace banks' existing core systems – help banks quickly adapt to changing customer needs and lower costs across the retail banking value chain. This is a significant opportunity for tech-savvy fintechs to sell into the world's largest financial firms and secure a recurring revenue stream.



CLOUD-BASED CORE BANKING IS A TECH SOLUTION RETAIL BANKS SHOULD PRIORITIZE, PER CB INSIGHTS' [CORE BANKING SERVICES MVP](#).

Even BNPL providers are now going after businesses as the end user, particularly in areas like supply chain & trade finance. B2B BNPL providers attracted [steady investment dollars in 2022](#), despite the broader fintech funding drought. Investors are prioritizing the B2B side for several reasons: the average purchase size is much higher among businesses than consumers, so BNPL providers can command larger fees; and lending to profit-driven businesses is less risky than bankrolling expensive consumer purchases.

Under-pressure fintechs are adjusting their go-to-market strategies to focus on the most stable and secure sources of revenue – whether by developing new products to hawk to their existing customer bases or building entirely new business lines. While the old assumptions about seemingly endless growth for fintech no longer apply, new opportunities will continue to surface for the startups willing to reinvent themselves.

Bots in the house

Tech leaders and startups alike are exploring how robots can operate safely in the home – both as helpful cleaning aids and as empathetic companions.

While the Jetsons' iconic flying car might not be making it into suburban garages quite yet, another must-have for the futuristic family could be just around the corner: the at-home robot.

Recently, tech incumbents like Amazon, Google, and Dyson have made notable moves in the consumer robotics space – signaling a looming competition to transform the home and put themselves at the center of consumers' day-to-day lives. The opportunity in the space is already substantial: The consumer robots market is estimated to be worth [\\$22B](#), per CB Insights' Industry Analyst Consensus.

Robots that can assist with simple household tasks, like cleaning or transporting items from room to room, are currently a key focus.

For example, while [Amazon](#) has long been a major force behind advances in robotics for applications like operating warehouses, it is now [making strides into consumer robots for homes](#). In August 2022, the tech giant announced it would acquire [iRobot](#), maker of the popular Roomba vacuuming bot, for \$1.7B. The deal is in Amazon's [top 5 largest acquisitions ever](#).

Earlier in 2022, Amazon participated in a \$3.1M follow-on seed round to [Labrador Systems](#) via its Amazon Alexa Fund. Labrador is developing at-home assistive robots to aid users living with chronic pain and other health conditions. Its robots can navigate users' homes to transport items and even retrieve objects from tables and countertops.

The company has also been experimenting with its own at-home robot called Astro, which it's effectively pitching as a self-propelled Alexa tablet that doubles as a Ring-equipped security guard for monitoring homes when people are out.

(CB Insights clients can [read more about Amazon's home automation strategy here.](#))

Consumer appliances leader [Dyson](#) has also been exploring the potential for robotics to assist with household tasks. In May 2022, the company shared a video teasing prototype robots completing tasks like washing the dishes, setting the table, picking up toys, and other chores.



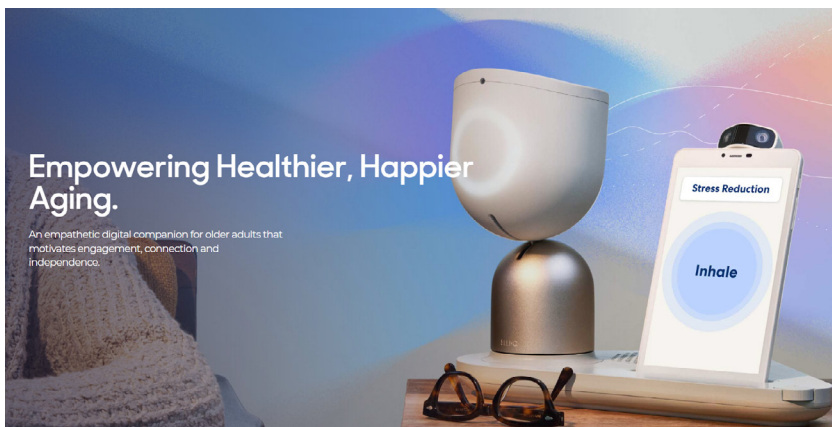
SOURCE: DYSON

While these projects are still in R&D stages, they indicate the company's interest in deploying advanced robotics that can safely operate in home environments – and hint at the developments in home robotics that we may see unfold in 2023 and beyond.

Google is also entering the family robot fray. In August 2022, the search giant released a similar video showing a robot moving around a kitchen to do tasks like opening drawers and placing items on counters. The prototype is additionally equipped with chatbot-esque conversational skills to interact with users, leveraging AI language processing technology to better respond to human commands.

Beyond assisting in household tasks, a host of companies are exploring another purpose robots can fulfill in the home: companionship.

For example, **Intuition Robotics'** small robot ElliQ is designed to provide companionship to people who spend most of their time at home, especially seniors. The bot uses AI to conduct natural-sounding conversations – making jokes, playing games, and offering suggestions to promote healthy habits. On average, ElliQ users reportedly have 20 daily interactions with the bot.



SOURCE: INTUITION ROBOTICS

Intuition Robotics has raised \$56M to date from investors including Samsung NEXT, Toyota Ventures, and iRobot. In May 2022, the New York State Office for the Aging (NYSOFA) announced plans to distribute 800 ElliQ units to older adults.

But affable bots aren't only for seniors. Disney Accelerator alum [Miko](#) offers an AI-powered companion bot for educating and entertaining children. The robot can display animated stories, play games, and dance. The India-based company, which has raised \$70M to date, launched a Disney collaboration spanning 140 countries in August 2022.

Artificial Intelligence. Genuine friendship.

Miko's got dozens of emotions (and a few tricks up its sleeve). Not just recognizing you and calling you by name, but responding to your mood and getting to know you a little better each day. Need a joke when you're down? A dance when you're bored? Miko's on it. Because it's not just the smartest little robot you'll ever meet. It's also your friend.



SOURCE: MIKO

Despite the potential benefits when it comes to housework or just hanging out, bringing robots into consumers' homes will not be without challenges.

For example, robots in the home will have to operate in much more dynamic environments than [those performing repetitive tasks in less variable settings like warehouses](#). Size limitations are also more pressing for at-home robots, and safety is paramount for commercial use – especially in homes with pets and children.

Robots built to keep people company have their own set of risks. Advances in conversational AI will be key to make robots more responsive and realistic, but companies will have to be careful with how they leverage emotional connections to users. For example, as robots become more multi-functional and talkative, they could also act as powerful data harvesters or ad platforms for contextual product recommendations – but companies may expose themselves to heavy criticism if they're perceived as exploiting loneliness or a robot's access to children. Robot makers will have their work cut out to build users' trust.

Despite these types of privacy concerns, expect to see big tech companies like Amazon and Google bundling more and more of their services into family robots. Beyond completing physical tasks for users like fetching objects, multi-talented robots could act as convenient gateways for accessing a host of services, from streaming music to monitoring health to controlling smart home devices.

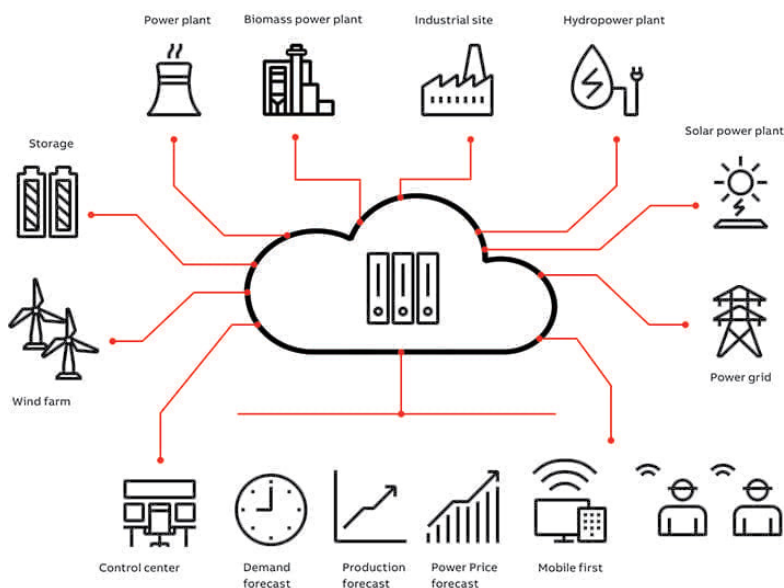
In 2023, expect to see tech giants leverage advances in AI and sensor technology to stake bigger claims in the emerging space. Meanwhile, watch for increasing activity and innovative tech from robotics insurgents eager to enter the home. The battle of the bots is just beginning.

Virtual power plants

Decentralized energy systems are picking up traction as the demand for renewable energy increases, grid stability concerns escalate, and communities contend with surging energy prices.

Historically, the variability of renewable energy generation has made it difficult to reliably integrate renewables into the electricity grid. Whereas conventional power plants can burn more or less fuel to account for changing electricity demand, renewable energy sources like wind farms and solar panels rely on weather conditions.

Virtual power plants (VPPs) could help, and they're quickly gaining momentum. These decentralized energy management systems aggregate power from a network of distributed energy resources – such as residential solar panels, large-capacity batteries, wind farms, and more. Using a cloud-based system and deploying AI tools to manage what's going where, these systems can make grids more resilient by constantly reconfiguring themselves to draw from wherever power is available even as demand fluctuates.



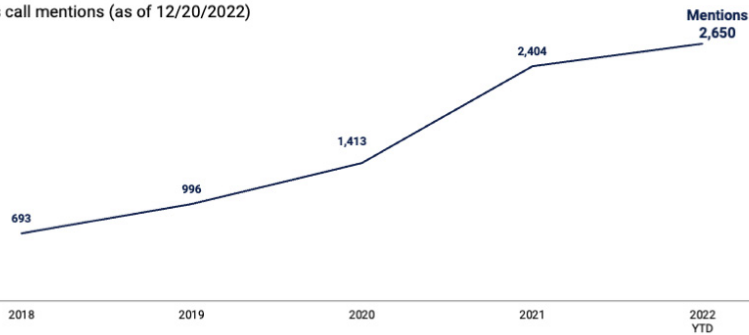
SOURCE: POWER MAGAZINE

For example, if a wind turbine isn't producing energy at a given moment in time, then a series of charged-up residential battery packs on the other side of town could help compensate for it.

By optimizing the coordination and use of energy sources, VPPs can help reduce reliance on coal and gas, stabilize the grid, and lower energy costs for households. Investor, industry leader, and government interest in startups that support VPP management and energy storage has been increasing steadily, driving advances and competition in the space. As a result, VPPs are becoming much more common.

Executive attention on renewable energy, grid stability, and electricity costs has risen steadily

Earnings call mentions (as of 12/20/2022)



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The concept of VPPs has been around for some time now, but it's taken a while for them to catch on. For example, Texas-based residential solar company and VPP software provider [Sunnova Energy](#) was founded in 2012 and raised more than \$1.5B before going public in 2019. At the time of Sunnova's public debut, the VPP space was still relatively nascent and 70% of its business was in just 3 markets: California, New Jersey, and Puerto Rico.

But in September 2020, the situation changed entirely: the US Federal Energy Regulatory Commission (FERC) approved Order 2222, which required US grid operators to allow VPPs to access wholesale markets – bringing the approach into direct competition with traditional resources. It became much easier for VPPs to operate at scale and activity in the space took off in the US.

In January 2021, in partnership with [Tesla Powerwall](#), energy and smart grid solutions startup [Swell Energy](#) announced plans to launch a VPP spanning the Oahu, Maui, and Hawaii islands. While the startup had previously kickstarted VPP programs in other locations, at the time of the announcement, its project in Hawaii was expected to be its largest to date – with participation from 6,000 residential homes. At the end of November 2022, Swell Energy raised \$120M in funding to advance its VPP programs across the US.



A RESIDENTIAL HOME EQUIPPED WITH SOLAR PANELS AND A BATTERY THAT CAN BE INTEGRATED INTO A VIRTUAL POWER PLANT. SOURCE: SWELL ENERGY

Tesla launched its own VPP later that year in California to help the state's strained energy grid and prevent outages for consumers. By November 2022, over 5,500 Powerwall battery-equipped homes were participating in the program. In December, the automaker said it was setting up a big VPP in Texas as well.

Meanwhile, Sunnova and VPP provider [AutoGrid](#) partnered in September 2021 to establish a residential virtual power plant for California energy supplier Clean Power Alliance (CPA). Just one month later, AutoGrid raised an \$85M Series D from Schneider Electric Ventures, Microsoft Climate Innovation Fund, Shell Ventures, and National Grid Partners, among others. [Schneider Electric](#) acquired the startup in May 2022.

VPPs are even starting to span multiple states. In October 2022, [Sunrun](#) announced that it had successfully established a VPP that covered Massachusetts, New Hampshire, Rhode Island, and Vermont — making New England the first regional energy market to incorporate a VPP.

Well-funded startups are also emerging as the scene heats up. For example, [Lunar Energy](#), a VPP-focused home electrification startup founded by former Tesla exec Kunal Girotra, emerged from stealth this year with \$300M in funding.

As demand for renewable energy increases and consumers become more concerned with grid stability and electricity costs, expect VPP investment and partnership activity to accelerate in 2023. Meanwhile, as more people electrify their homes and invest in electric vehicles with bidirectional battery packs (like [Ford's](#) popular F-150 Lightning), VPPs will become easier to implement on a big scale. Virtual power plants are just warming up.

Healthcare's invisibility trick

Ambient health monitoring will go beyond standard remote patient monitoring approaches to continuously collect data via devices that are more connected and less invasive than ever.

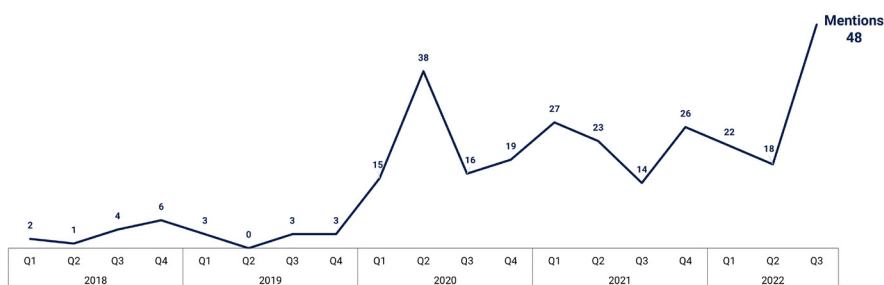
Ongoing, passive healthcare monitoring may soon prove the adage that an ounce of prevention is worth a pound of cure.

"Ambient health monitoring" systems are taking off. These solutions rely on a broad range of sensors to collect data relevant to patient health – with the goal of offering less intrusive, more proactive diagnoses and treatments to improve health outcomes.

Interest in remote patient monitoring (RPM) – which captures and analyzes patient data in real time to enable virtual care and ongoing disease management – increased rapidly along with the onset of the global Covid-19 pandemic, with earnings transcript mentions of "remote patient monitoring" remaining elevated since 2020.

Interest in remote health monitoring is on the rise

Earnings call mentions of "remote patient monitoring"



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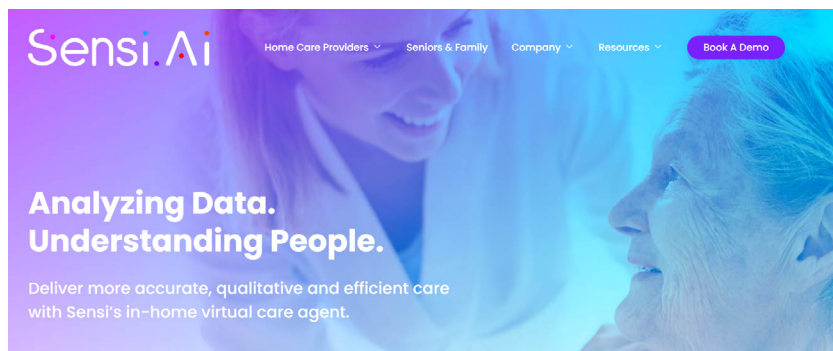
While RPM tech has existed for some time, 2023 will see its evolution into a more advanced form that relies less on wearables and more on passive, ubiquitous sensors.

For example, in October 2022 [Google](#) acquired digital therapeutics startup [Sound Life Sciences](#), which offers an FDA-cleared smartphone app that leverages sonar technology to monitor breathing. This breathing data can be used to diagnose sleep apnea, a process that can otherwise require an uncomfortable overnight visit to a sleep lab. The app can also help monitor patients with chronic obstructive pulmonary disease (COPD), asthma, anxiety, and other conditions, alerting caregivers to clinically meaningful shifts in breathing patterns.

The acquisition comes on the heels of [Verily](#) (Alphabet's life sciences research organization) raising a billion-dollar round to fund projects focused on precision health.

(For more on Google's moves in healthcare, check out our research on [Google's healthcare AI strategy](#) and [big tech in healthcare](#).)

Another startup leveraging audio data is [Sensi.AI](#), an Israel-based remote care monitoring platform focused on senior care. The platform leverages home audio data from sensors like smart speakers, smartphones, security cameras, and more to detect when patients go about daily activities (like meals and showers), as well as to alert care providers to potentially dangerous situations like falls.



SOURCE: SENS.AI

The company raised a \$14M Series A in early 2022 and is featured in our [member health management market map](#).

Belgium-based smart lamp developer [Nobi](#) is also focused on fall detection, using motion detection to turn on lights for users and alerting care staff to patient activity. While Nobi's product can alert care providers of a patient fall, it is also built to be non-intrusive and aesthetically pleasing – those not in the know would probably just take it to be a typical, if minimalist, light. In January 2022, the company raised a \$16M seed round from BNP Paribas Fortis, EQT Life Sciences, and PMV.



SOURCE: PICKR

While more nascent, vocal biomarker tech – which uses voice data like pitch, frequency, tremor, and more – may also help advance the ambient healthcare monitoring space. In a healthcare context, this data can help detect early symptoms of conditions like Parkinson's, as well as symptoms of depression and various pulmonary conditions. The vocal biomarker industry is projected to be worth \$5B+ in the next 5 years, with startups like [Ellipsis](#), [Aural Analytics](#), and [Kintsugi](#) working to develop the space.

(Read about these companies and others transforming the healthcare space in our most recent [Digital Health 150 list](#).)

Even monitoring devices that require physical interaction are on the path toward becoming less invasive. For example, researchers are developing solutions like barely there “smart stickers.” These patches adhere to skin and continually collect and transmit data like glucose levels, pulse, and movement.

Further along the R&D scale, pharma giants such as [AstraZeneca](#) and [Eli Lilly](#) have shown interest in the RPM space, [forging partnerships focused on RPM and chronic condition management](#). Eli Lilly in particular has focused on diabetes management.

[Chronic conditions like diabetes](#) present a strong opportunity for ambient healthcare monitoring, as they require continuous data collection that can intensely intrude on patients' everyday lives. Making tech like glucose monitoring less invasive without sacrificing data quality will be of huge value to both diabetic patients and their care providers.

In 2023 and beyond, one major question in the ambient healthcare space will be how to best blend continual data collection and “easy to live with” technology that requires little effort from patients. Designing devices that are both technically effective and aesthetically pleasing will be a key focus for companies defining the next iteration of remote health monitoring.

Another question for players in the space will be what vital stats can truly be monitored remotely and unobtrusively. While ambient solutions for monitoring vitals like heart rate, breathing, and movement already exist, less obvious markers – like blood pressure or oxygen saturation – present more difficult cases to crack.

The success of this tech will also rely heavily on the underlying IoT infrastructure that supports fast, accurate communication between devices. Companies eager to make their mark on the space will do well to invest not only in innovating health devices, but also in the AI and connectivity tech that will power them. The future of patient monitoring may be effortless, but the transition won't be so simple for the companies building it.

Smell goes digital

Digitizing scent is a complicated process, but smell tech is making significant progress that could affect industries including food, retail, healthcare, and more in the coming year.

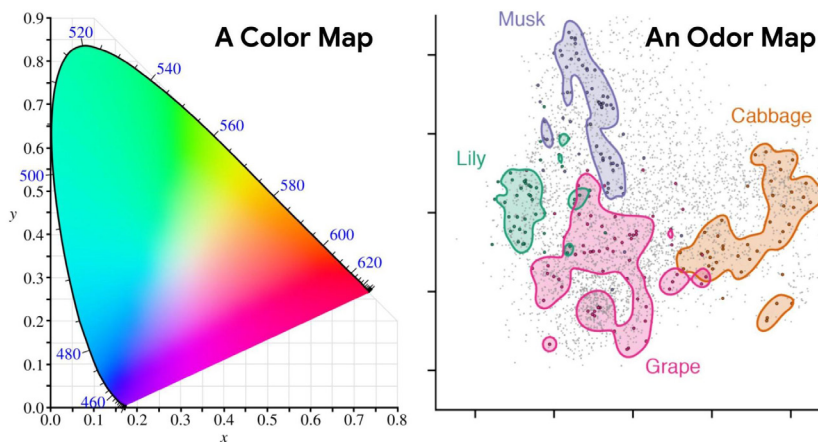
Bringing smell into the digital world is a huge challenge.

While light and sound can easily be measured with sensors and mechanically replicated to create a predictable sensory experience, odors are much harder to decode as they're based on a complex interaction between molecules and smell receptors. Further, many seemingly distinct smells — like baking bread or freshly-brewed coffee — emerge from hundreds of different molecules being detected in tandem. People can also react to the same set of molecules differently, so even agreeing on what an odor should smell like is complicated.

Despite these challenges, digitizing smell would offer lots of benefits. For example, being able to accurately measure, analyze, and predict odors could lead to better detectors for disease, explosives, or food ripeness. Food and beauty companies could use smell prediction to experiment faster and more cheaply by identifying potential products that consumers would actually enjoy. Meanwhile, being able to accurately digitally encode and recreate a smell would offer a new dimension to immersive experiences, like those being built for the metaverse.

Now, after years of toil, smell tech is making progress. Startup activity is ramping up, and researchers are announcing notable advances in understanding smell. One big driver has been powerful AI tools.

Google's AI team recently announced that it used machine learning to map molecules to perceived smells. Crunching through massive data sets, the team was able to successfully (though not perfectly) predict the resulting smell from the structure of a molecule.



SOURCE: GOOGLE

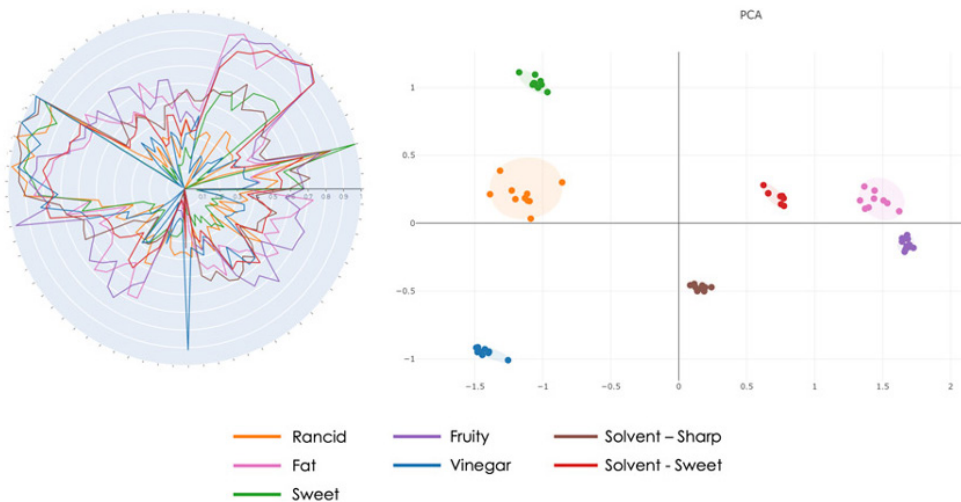
Google even used its AI model to identify patterns in how animals have evolved to perceive some molecules as unpleasant odors — such as those associated with rotting fruit or spoiled meat. Building on this, Google claimed that it could predict smells that mosquitoes would find off-putting, potentially opening the door to cheaper and more effective repellents.

Google isn't the only company using AI to digitize smell.

For example:

- France-based [Aryballe](#) claims to use machine learning and special sensors to help clients from an array of industries develop products and test for quality throughout the supply chain. The company has raised more than \$18M in total funding from investors including from Samsung and Hyundai.
- California-based [Aromyx](#) has raised \$17M to develop a platform for AI-driven smell insights with cross-industry applications. Its platform is focused on supporting product development and quality checks along supply chains, but the company claims it can also be used to help target consumer groups based upon how different demographics may react to a product's smell.
- [Ajinomatrix](#), which recently entered the Plug and Play Food & Beverage Accelerator program, is using AI to interpret smells for the food industry when creating new products. For example, odor data could be used to predict which recipe iteration would best match the desired taste profile.

Meanwhile, some startups, like [Breathomix](#) and [The eNose Company](#), are building electronic noses that analyze patients' breath to detect disease – including those to help with the early diagnosis of some types of cancer.



MAPPING SMELLS CAN BE USED IN THE FOOD INDUSTRY TO PREDICT FLAVOR OR CHECK FOR THE QUALITY OF INGREDIENTS. SOURCE: ARYBALLE

Koniku even claims to use living cells in its smell detectors, which use machine learning for pattern recognition. The company aims to use its devices to detect a host of diseases from pre-identified biomarkers – similar to how some dogs can accurately sniff out certain medical conditions – and to detect explosives. Koniku announced an extension of its partnership with Airbus in July 2022 to apply its smell detection technology to aviation security. The startup has raised more than \$1M in equity funding.

Meanwhile, other companies are trying to reproduce smells. As the metaverse gains momentum, companies are showing interest in “smell-o-vision”-style technology that releases odors to accompany virtual experiences. This tech would make metaverses more immersive, and it would offer a new way for companies to brand themselves in the digital world.

[OW Smell Digital](#), which spun out of University College London and the University of Sussex, raised \$1M in seed funding in March to build a device that emits small bursts of odor alongside a platform to help developers weave smell into digital experiences. Similarly, [OVR Technology](#) is building a smell emitter directly into VR headsets. The company is initially targeting wellness experiences and immersive training applications.

The digitization of smell is far from complete, but recent advances are already opening up new ways to explore the world – from predicting flavors to detecting hazardous materials – with potentially lucrative opportunities for companies. In 2023, watch for smell analytics platforms to become more powerful as odor-predicting AI models improve. Also, expect more companies to begin implementing odor analytics into their workflows to save money and time. Finding new tools to automate quality checks or cut down on product development times will become increasingly attractive for enterprises fearing economic uncertainty.

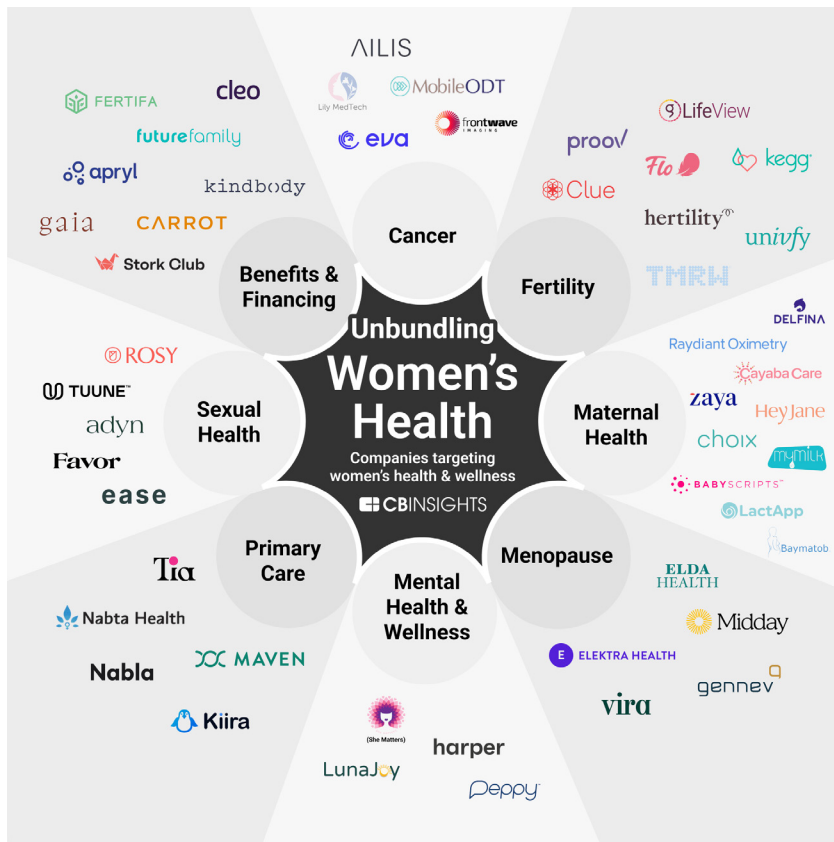
Femtech turns to menopause

More startups are turning their attention to underserved issues like menopause as the women's health space continues to expand.

Women control [most of the healthcare spending in the US](#), but many healthcare issues specific to women are still overlooked and underfunded. Menopause – which represents a market set to grow to [\\$16B by 2025](#) – is a primary example.

As significant as this natural phase is, there is little in the way of formal education for women. Ninety percent of women are not educated about menopause at school, and 60% don't feel at all informed about it, according to survey results published in Sage Journals. This makes it difficult for women to identify symptoms of menopause and seek support. In fact, only a quarter of women affected by menopause symptoms get treatment, according to Bonafide's State of Menopause Study.


But as momentum in the broader women's health space continues to build – with many companies targeting areas like primary care, fertility, and mental health – a growing cohort of [startups are specifically catering to women going through menopause](#).



The transition to menopause can be associated with various distressing symptoms, such as cognitive impairment, vasomotor symptoms (e.g., hot flashes and sweating), and insomnia, among others. Yet medical treatment options for significant menopausal symptoms – which last for about 7 years on average – are currently limited.

Several startups are working to help tackle this by making remote menopause care more accessible. For example, Rory connects patients to doctors who can treat menopause symptoms with prescriptions and supplements, all delivered discreetly to the patient's home. Rory's parent company, Ro, raised \$150M in Series D funding in early 2022, valuing the company at \$7B.

Meanwhile, Alloy's telehealth-driven menopause prescription service focuses on plant-based hormone therapies. The company also provides educational pages on the most common menopause symptoms.



Why are we starting with menopause?

MASSIVE NEED
Nearly 1 billion people worldwide are coping with menopause. Over 80% say that symptoms interfere with their daily life and nearly half say it has made work difficult or even untenable.

BROKEN CURRENT CARE MODEL
Less than 10% of women in the UK say they are happy with the care they receive and over 90% of women in the US say they want non-invasive solutions.

LONG-TERM HEALTH IMPLICATIONS
The issues that affect women in later life, such as cardiovascular disease, diabetes, osteoporosis and dementia can be triggered at menopause. Improving the care and treatment for a woman in her 50s and 60s can fundamentally help to tackle these issues early-on.

SOURCE: VIRA HEALTH

To address the gender data gap and offer personalized menopause care, Vira Health – which raised a \$12M Series A in March 2022 – launched Stella, which provides AI-backed digital therapeutics for menopause. Stella offers personalized guidance supporting behavioral and lifestyle changes that have been shown to help women manage the effects of menopause. The company plans to expand its approach to cover other common health concerns women face.

Another factor that complicates care is that many general practice physicians, and even some OB-GYNs, don't have expertise surrounding the nuances of treating menopause. Despite this gap, 4 out of 5 women are never referred to a menopause specialist, according to an AARP survey.

[Gennev](#) – which raised about \$5M before being acquired in October 2022 – works directly with physicians to help them become “menopause supportive providers.” Through the Gennev app, primary doctors can offer their patients integrated menopause care and educational programs, and they can also keep themselves up to date on new research.

Some companies are also approaching the menopause market from non-medical angles. For example, [51 Apparel](#) uses high-tech materials to design temperature-regulating clothes for women contending with menopause symptoms.

In 2023, watch for menopause-focused startups to gain traction with consumers and investors alike as competition builds to break into the underserved market and more women's health companies look to expand their appeal to a broader range of age demographics.

The bio-based materials boom

Companies are transforming substances derived from natural sources like mushrooms and seaweed into next-gen materials.

Bio-based materials are made from organisms like mushrooms and seaweed. They can be pretty durable – with some exhibiting resistance to fire, water, and mold – and many have properties that enable them to serve as a biodegradable alternative to plastics. Given this combination of qualities, bio-based materials are drawing more and more attention from CPG companies, fashion brands, and government entities pursuing ambitious sustainability goals.

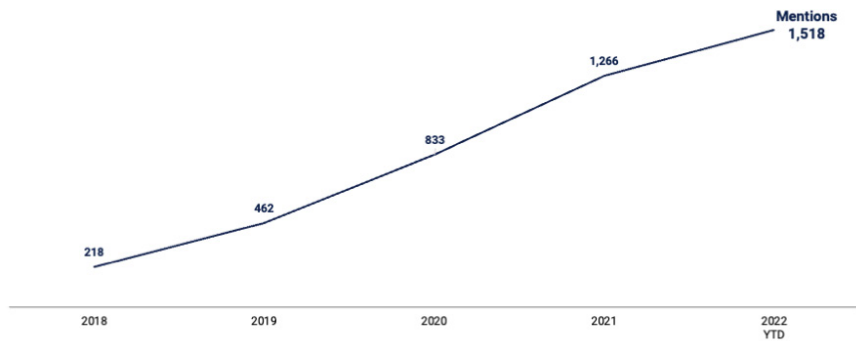
Many CPG incumbents have baked the use of post-consumer recycled (PCR) plastic – material made from used plastic – into lofty corporate sustainability goals. For example, [Unilever](#) has stated that 25% of its plastic packaging will be PCR by 2025. Similarly, fashion brands like [H&M](#) and [Gap](#) have committed to sourcing at least 45% of their polyester – which can be used to create animal leather alternatives and other textiles – from recycled sources by the middle of the decade.

But one major obstacle is that there simply isn't enough recycled plastic to go around. Only around 9% of the world's plastic is being recycled, according to the OECD, and Recycling Partnership projects a 1B-pound gap between current US recycled plastic supply and expected demand in 2025 – the year that many corporations have set as the target for their PCR plastic goals.

In the face of a looming recycled plastic shortage, more consumer and fashion brands are turning to bio-based materials to reduce their dependence on plastic altogether.

The global plastic shortage attracts rising media coverage

News mentions related to the global plastic shortage (as of 12/12/2022)



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Seaweed-derived products are one subset of bio-based materials quickly gaining traction.

Players in the space include UK-based [Notpla](#), which provides seaweed-based food packaging and an edible bubble for containing liquids. It has raised nearly \$20M in equity funding to date and secured a grant from Innovate UK (the UK government's innovation agency) in partnership with UK beverage company Lucozade Ribena Suntory.

[B'ZEOS](#) also generates biodegradable and home-compostable seaweed-based materials, including an edible drinking straw. The company has partnered with [Nestlé](#) to expand more broadly into flexible packaging. In December 2021, it was awarded a nearly \$2M grant by The Research Council of Norway to develop alginate-based films for packaging.

Packaging designed to disappear

Ooho can be eaten or thrown away in a home compost, where it will disappear within a few weeks, just like a fruit peel, leaving no harmful environmental trace.



SOURCE: NOTPLA

In the world of fashion, [Smartfiber](#) produces a biodegradable and compostable seaweed-based fabric called SeaCell. The range of brands using SeaCell demonstrates the versatility of the material – examples include CALIDA (lifestyle), WYLD1 (activewear), Speidel (lingerie), and Fair Trade Cashmere (knits). Similarly, [Keel Labs](#) (formerly AlgiKnit) produces seaweed-based fibers to be an alternative to nylon and polyesters. It has raised \$17M in total funding, including a \$13M Series A round that drew participation from fast fashion retailer H&M.

Mushroom-derived products are another big winner from the bio-based materials rush.

For example, [Ecovative's](#) styrofoam alternative MycoComposite is made from a combination of mushroom mycelium (a sprawling, web-like substance) and hemp hurd (woody fibers). Unlike its plastic (polystyrene)-based counterpart, it is entirely biodegradable. In 2019, IKEA announced that it would replace its styrofoam packaging with Ecovative's fungi creation (part of a push by the furniture retailer to eliminate plastic from all of its consumer packaging by 2028).

[MycoWorks](#), on the other hand, has made a splash in the fashion world and beyond with its mushroom-based leather, which it calls Reishi. Unlike many other animal leather alternatives, Reishi does not contain any plastic and is entirely biodegradable.



MYCOWORKS COLLABORATED WITH HERMÈS TO PROVIDE MUSHROOM LEATHER FOR A \$4,200 HANDBAG. SOURCE: MYCOWORKS

French luxury fashion house [Hermès](#) partnered with the startup to add mushroom-based panels to its Victoria handbag in 2021. Since then, MycoWorks – which raised a \$125M mega-round in early 2022 – has inked contracts with a number of major luxury brands across the globe. It's also receiving attention beyond fashion with a recent injection of funding from General Motors' venture arm alongside an agreement to develop automotive interior materials.

Given the relative nascency of the seaweed- and mushroom-based materials spaces, it's likely that neither industry will be able to generate enough supply to meet demand for plastic alternatives alone. However, a host of other bio-based options are also gaining traction, including materials made from sugarcane, soy, corn, cork, and more.

With an increasing variety of options to choose from – and many bio-based materials offering highly desirable properties alongside environmental benefits – expect to see mushroom- and seaweed-based products pop up in stores much more frequently in 2023.

India's tech ascent

VCs are betting on India in the hope of capitalizing on the startup ecosystem's next big period of growth.

India has stepped into the venture capital (VC) spotlight. The country, which is projected to become the world's third-largest economy by 2030, presents a technology opportunity that domestic and international VCs are betting big on.

In 2022, a number of firms raised massive funds devoted to the region, including: Sequoia Capital, which launched a \$2B India fund; Accel and Lightspeed, which each raised \$500M+ funds for India and Southeast Asia; and India's own Fireside Ventures, which closed a \$225M fund. Tiger Global Management is reportedly raising a \$6B venture fund that will feature India as a core focus area.

The fact that these VCs are doubling down on the country even as global economic uncertainty looms in the year ahead reflects several driving forces propelling India's tech space, including:

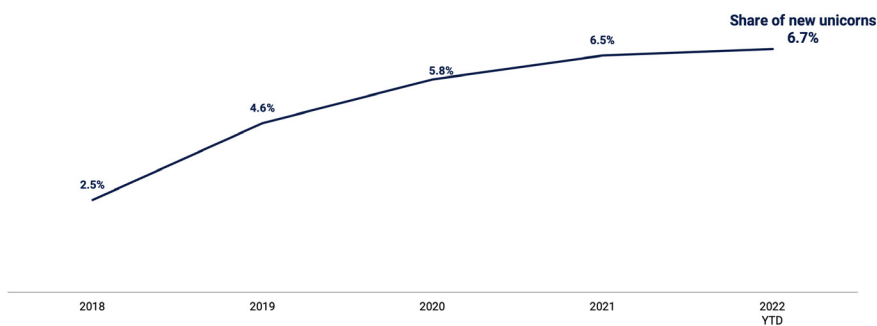
- India has laid the foundation for a strong tech sector, with a growing share of the world's billion-dollar unicorn companies.
- India's digital economy is taking off. Sectors like financial services and healthcare are rapidly digitizing, while consumer internet adoption more than doubled from 2018 to 2020, according to the World Bank.
- India has emerged as a strong emerging market investment alternative to China, whose crackdown on tech and stringent Covid policies have made it a riskier bet for VCs. India will directly benefit if investors continue to downshift on China.

India's startups have not been spared from 2022's [global funding drought](#). After record-high funding and deal levels in 2021, VC dollars to India fell back to earth in the second half of 2022, with funding dropping 58% QoQ to hit \$2.8B in Q3'22. Nevertheless, deal volume in Q3'22 was more resilient than the venture market as a whole and came in stronger than any quarter prior to 2021. In the next year, investors will likely prioritize India's early-stage startups – which grabbed 3 out of 4 deals in the country in 2022 – to ride out short-term market fluctuations (given these companies won't be headed for the exits any time soon).

CB Insights data underscores the long-term opportunity in the country. For example, India is becoming a bigger contributor of [unicorns](#): In 2022, amid a global [slowdown in unicorn births](#), India accounted for a high of 6.7% of new global unicorns. India is now the third-largest producer of unicorns in the world, following the US and China.

India accounts for an ever-larger share of the world's new unicorns

The percentage of global unicorns that are born in India (as of 12/15/2022)



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As India's tech companies continue to mature, there will be more opportunities for investors to realize gains through high-profile exits. Accel, for instance, made a profit of over \$1B on a \$1M Series A investment in Bengaluru-based e-commerce firm [Flipkart](#), which sold a majority stake to Walmart in 2018.

India's expanding tech ecosystem is taking shape across a range of sectors. Several in particular are poised to boom in the coming year and beyond:

- **Climate and clean energy:** With 70% of the country's electricity coming from coal, India has a long road ahead to reach its pledge of achieving net-zero emissions by 2070. Given the scale of the issue, the country has seen a flurry of activity in climate and clean energy tech from domestic startups — including [SolarSquare](#), [Climes](#), and [Turno](#), which each raised early-stage rounds in 2022 — and VC funds, such as Avaana Capital and Climate Angels.
- **Consumer fintech:** Digital payments have exploded in India, largely driven by its Unified Payments Interface (UPI), a payments rail that enables real-time transactions between mobile phones. In just 6 years, UPI monthly transaction volume has reached \$135B. Fintechs have an opportunity to build on top of UPI's open design to provide improved financial services to Indians, particularly to boost financial inclusion.
- **B2B enablement:** Digitizing the kirana store, the small mom & pop shops that make up the vast majority of consumer goods sales, is one of the [biggest opportunities in retail in the country](#). B2B segments like e-commerce enablement, business banking, cloud infrastructure, and B2B marketplaces will all heat up.

Meanwhile, major tech players, including [Apple](#), have moved some operations from China to India – adding tech-supporting infrastructure and building up expertise in the country. The device maker, which has relied heavily on China for manufacturing in the past, has rapidly set up and scaled iPhone 14 production in India. While the majority of iPhones will continue to be produced in China, JP Morgan analysts expect India will manufacture 1 in 4 iPhones by 2025.

India still has a long way to go to catch up to China's status in global VC, but increasing attention from global tech players combined with perceptions of abundant growth opportunities will spin the investor flywheel as more firms move in for fear of missing out. In Q3'22, an index of India's stocks outperformed a Chinese index by 33 percentage points, the largest margin in over 2 decades, according to Bloomberg. As risk grows in China, Citigroup indicated in September 2022 that India is one of the top markets it will target for expansion.

India's startup ecosystem finds itself on the precipice of a massive growth period, fueled by mounting VC attention. In 2023, watch for big-name VCs like Sequoia and Accel to develop their investment theses in the country and ratchet up dealmaking. Furthermore, watch for the government to feed into this wave by ramping up investment and R&D in enabling technologies like AI and quantum computing, and more clearly defining tax policies around VC gains.

Regenerative agtech takes root

As fashion brands and food giants turn to regenerative agriculture to slash their emissions, startups offering enabling technology are gaining momentum.

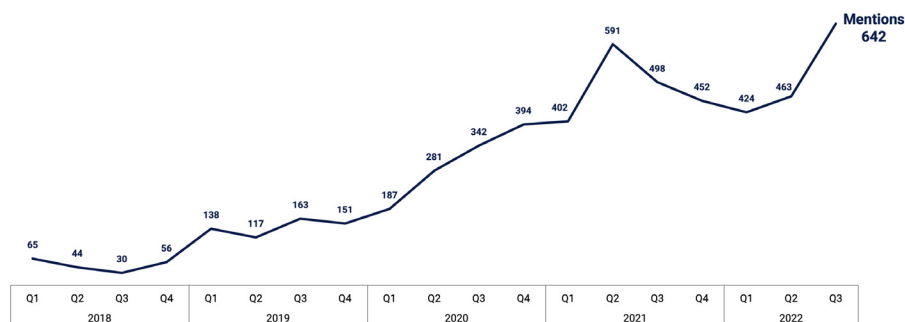
As consumers demand more sustainable products, big brands and retailers are setting ambitious goals to slash their emissions and adopt less harmful ecological practices for sourcing key agricultural outputs like cotton and grain – industrial farming, which many brands and retailers rely upon, is estimated to account for roughly 30% of global carbon emissions, 70% of freshwater use, and 60% of biodiversity loss, according to Fast Company.

One solution that’s quickly gaining momentum is regenerative agriculture.

Regenerative agriculture restores soil health and prevents erosion through practices such as planting trees among crops, minimizing plowing, avoiding synthetic fertilizers and pesticides, and using rotational grazing techniques – for a lot of these methods, a decent amount of CO2 is even sequestered along the way.

Buzz around regenerative agriculture is on the rise

News mentions of “regenerative agriculture”



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Several major fashion and food companies have already started investing in regenerative agriculture, including:

- Outdoor clothing brand [Patagonia](#) aims to use 100% regenerative cotton and hemp by 2030 and helped launch the Regenerative Organic Certified program to encourage these practices. The company debuted the first products from its regenerative cotton crop initiative in spring 2022 – a program that now includes 2,200 farmers.
- Footwear company [Allbirds](#) – which went public in late 2021 – says that all of its wool will come from regenerative sources by 2025.
- [Nestlé](#) is incentivizing cocoa farmers in West Africa to use regenerative agriculture practices. The company is also exploring regenerative agriculture trials in grain and cereal farming as well as coffee production.
- [General Mills](#) is working to use regenerative practices on 1M acres of farmland by 2030.
- [PepsiCo](#) aims to deploy them on 7M acres of cultivated land by 2030.



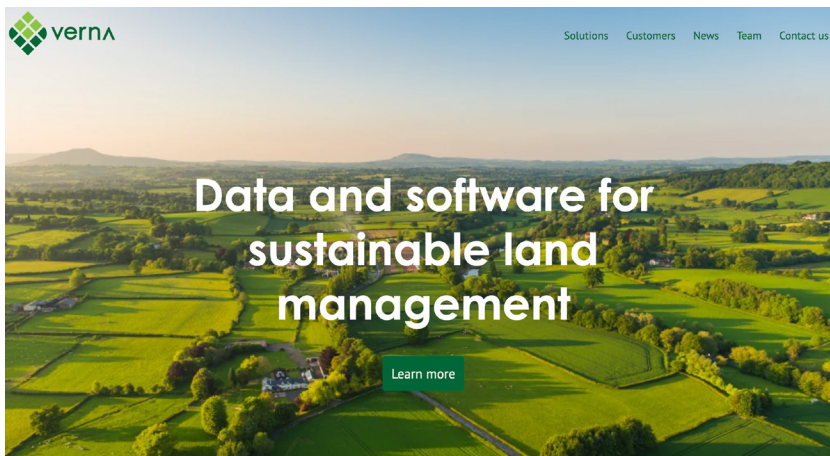
SOURCE: REGENERATIVE ORGANIC ALLIANCE

Though demand for regenerative agriculture is growing, it comes with its own set of challenges, including being difficult to manage on a large scale and requiring a fair amount of upfront investment to convert land. In response, a host of agtech companies are aiming to make regenerative agriculture easier to pull off.

For example, [Verna](#) – which works with the UK government and raised \$1M in seed funding in December 2022 – analyzes geospatial data to predict which land is most suitable for regenerative agriculture and would offer the best return on investment. It also provides recommendations for other sustainable practices, like where to plant woodland.

[Twisted Fields](#) in California – which was set up by the founder of [autonomous warehouse](#) and manufacturing company [Vecna Robotics](#) – develops self-driving robots specifically designed to support regenerative farming by helping to automate tasks like precision planting, weeding, and harvesting.

Meanwhile, Scotland-based [SilviBio](#), which graduated from the government-backed CivTech incubator, has developed special seed coatings to improve yields and make regenerative practices more productive while decreasing overall water usage for crops.



SOURCE: VERNA

Other startups are looking to use tech platforms to make it more affordable for farmers to implement regenerative agriculture practices. For example, [Regen Network](#) runs a marketplace for blockchain-based carbon credits tied to regenerative agriculture projects – with the idea being that it provides another source of revenue for those who implement these practices. The Techstars graduate has partnered with farm management platform [FarmOS](#) and universities like Cornell and Yale.

Berlin-based [Klim](#) – which raised more than \$6M in early-stage funding in September – launched a platform in May 2021 to help farmers access financing and training to transition to regenerative practices. It also works directly with companies to overhaul their agricultural supply chains.

Looking ahead to 2023, expect investor interest in startups offering tech-driven tools that support regenerative agriculture – including cross-industry technologies like computer vision, supply chain management platforms, and geospatial imaging – to pick up as more big companies begin demanding these practices from their suppliers. Meanwhile, as consumers put more emphasis on the sustainability of products, watch for retailers to tout regenerative agriculture alongside other climate-tech measures as they seek to establish credibility and make customers feel better about buying their wares.