

Investment Recipes

by  AtonRā Partners



10 MARCH 2021

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COVID IMPACT ON MENTAL HEALTH

Mind Your Mind

Recognizing mood disorders

Mood disorders are characterized by persistent and prolonged mood swings caused by different triggers (postpartum, Covid-19, genetics). Major ones include depression, bipolar disorders, and anxiety disorders.

- More than 600mn people worldwide suffer from depression or anxiety, and 60mn from bipolarity. The WHO classifies depression as the leading cause of disability.
- The Lancet Commission expects the mood disorders related economic burden (including loss of productivity) to reach \$16tn by 2030.

Covid playing with our nerves

The Covid-19 pandemic affects both the physical and mental health of infected people, but also of those not infected. Depression being the main disorder.

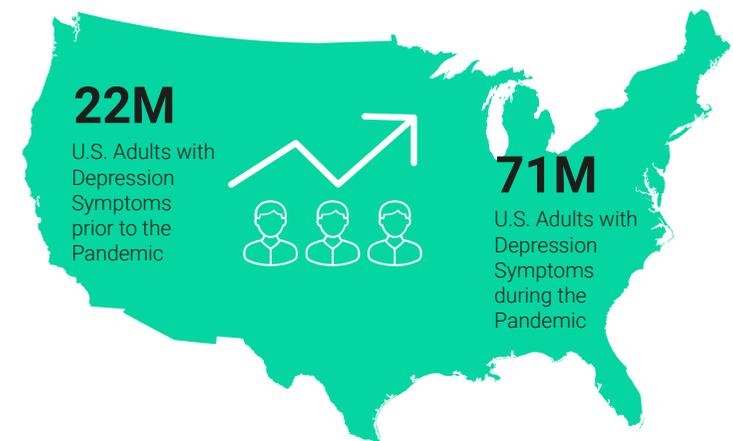
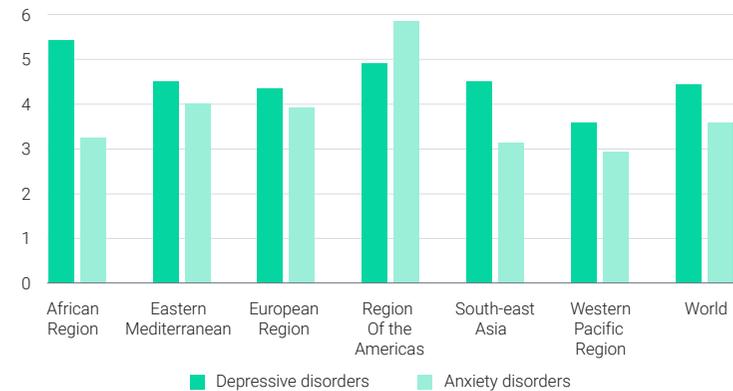
- Ongoing anxiety and isolation have led to a threefold increase in cases of depression in the U.S. This impact was exacerbated in at-risk populations and already diagnosed mental health patients.
- Of the 40% of U.S. adults who reported mental health or substance abuse issues during the pandemic, 75% suffered from depressive disorders.

Transforming depression care

Depression has a wide variety of origins, but its treatment is almost universal. Long treated with generics, the depression market is likely to become more personalized, considering everyone's characteristics.

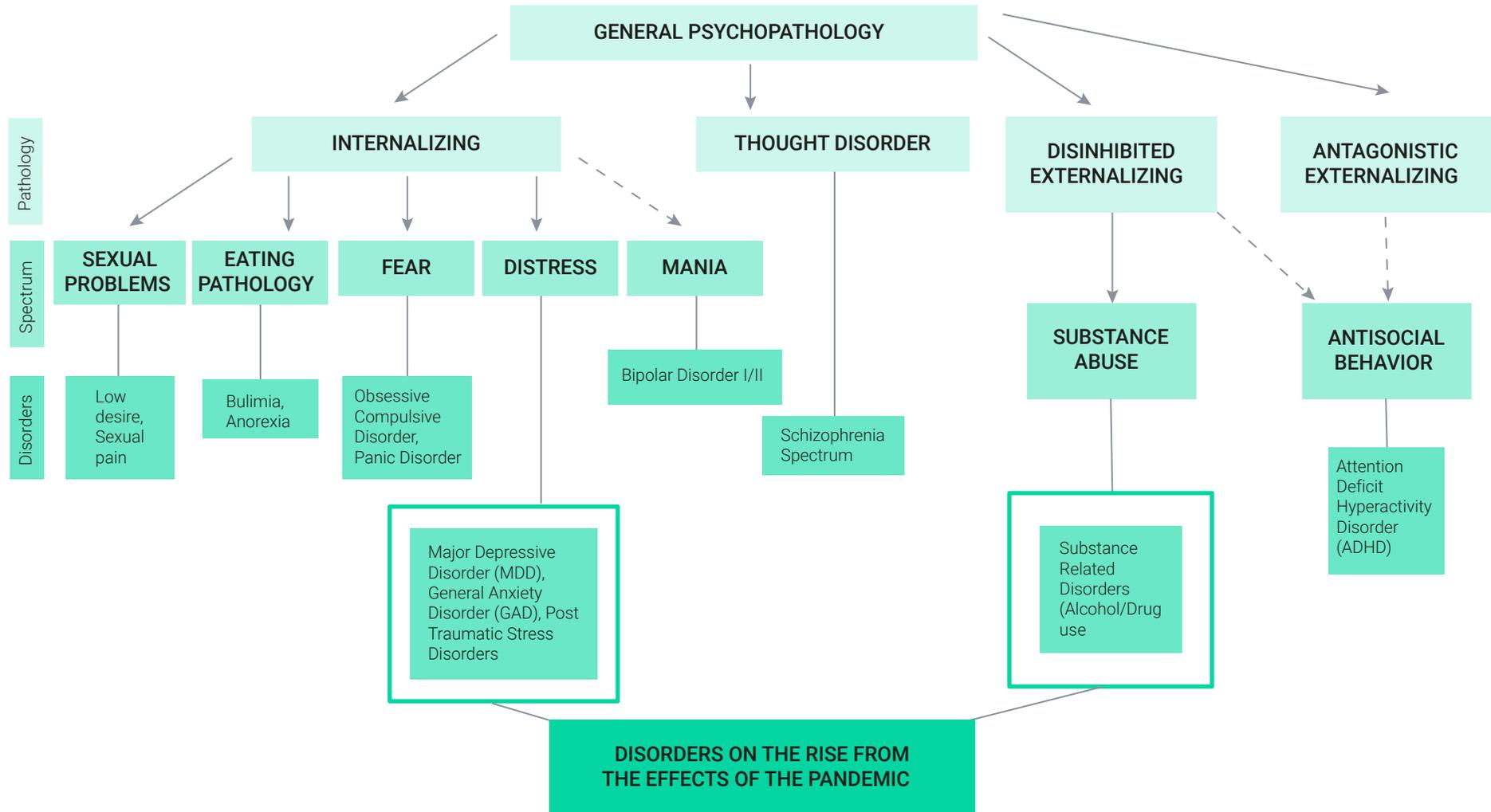
- New mechanisms of action, particularly on treatment-resistant depression (TRD), and the development of non-pharmaceutical technologies and digital treatments such as mental health apps are gaining traction.

PREVALENCE OF COMMON MENTAL DISORDERS
(% OF POPULATION BY WHO REGION)



SOURCE:
The "Lancet Commission" report by 28 global specialists in psychiatry, public health and neuroscience

Mood Disorders – Hierarchical Map



SOURCE:
Adopted and simplified from Votok et al 2017

Depression – An Overlooked Concern

Depression is a basket of mental health issues

Depression should not merely be categorized as a single indication, as people are affected in different ways and circumstances (e.g., post-natal). The first step in depression care is to correctly classify patients into the right type of depression.

- Major Depressive Disorder (MDD) is the primary type of depression, affecting 22mn adults in the U.S. and 320mn worldwide.

Treatment-Resistant Depression (TRD)

A significant unmet need is to improve therapeutic options for treatment-resistant or refractory depression, a chronic condition resulting from a lack of response to mainstay pharmacological options.

- Estimates point to approximately one-third of patients demonstrating TRD, i.e., failing at least two previous therapy lines.
- The high rate of TRD highlights the complexity behind depression disorders and the need for more personalized treatments.

Depression can lead to death

In addition to impact significantly social life and cognitive functions at work, depressive disorders can lead to suicide.

- It's estimated that 800k people worldwide are dying from suicide every year, and this number is expected to increase due to Covid-19.
- According to the World Health Organization (WHO), suicide is the 2nd leading cause of death in the 15-29 years old.

5 TYPES OF DEPRESSION

					
Types of depression	Major depressive disorder	Persistent depressive disorder	Bipolar disorder	Post natal depression	Premenstrual dysphoric disorder
Also known as	Clinical depression	Dysthymia	Manic depression	Postpartum depression	Premenstrual dysphoria
Characterized by	Prolonged feelings of sadness for more than two weeks	Depression symptoms that last at least two years	Extreme fluctuations in mood and energy	Feeling depressed for several weeks after giving birth	More severe than premenstrual syndrome

SOURCE:
The "Lancet Commission" report by 28 global specialists in psychiatry, public health and neuroscience, [WHO / Depression](#)

In The Aftermath Of The Pandemic

Isolation is not suitable for humankind

Covid-19 resulted in severe social distancing restrictions worldwide, with the population being placed in lockdown or banned from public places. Antidepressant prescriptions increased, but physical therapies slowed down, resulting in lower-quality care, and exacerbating the isolation effect.

- In Canada, the prescriptions have experienced a 9.5% growth in one year.
- In the U.S., anxiety drug prescriptions in 1H 2020 rose by up to 31%, while antidepressant prescriptions increased by 22% over 2019.

Covid has increased chronic stress

The pandemic has globally increased people’s anxiety and stress levels, directly linked to a higher risk of burnout, substance abuse, insomnia, and depression.

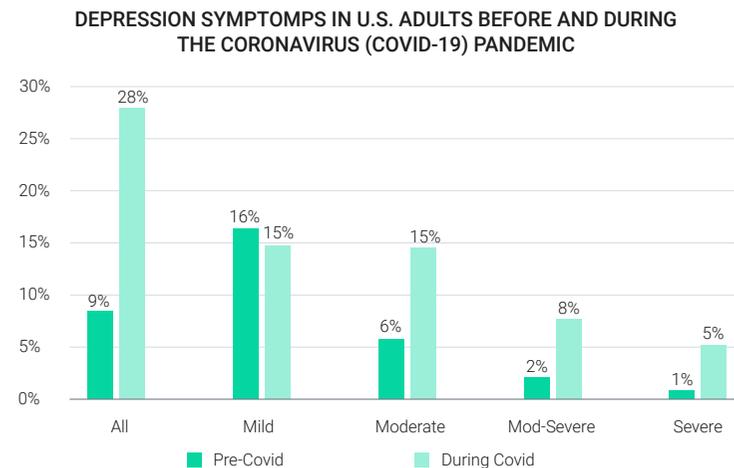
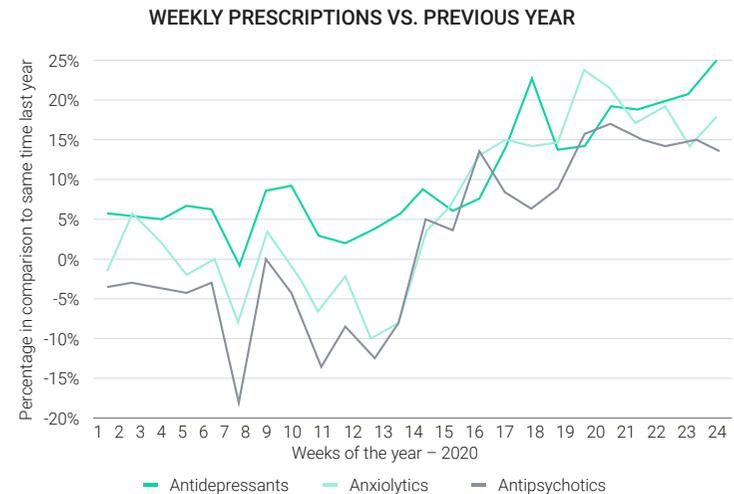
- According to a new survey from Harvard, 85% of people have experienced a decline in general well-being and 89% in workplace well-being.
- Burnouts induce substantial economic costs, with an estimated \$190bn in the U.S. alone, expected to increase due to chronic stress among citizens.

Covid impact on mental health

Physical effects combined with psychological stressors in Covid-19 patients can increase the risk of developing mental illness.

- The Lancet Psychiatry showed that 20% of Covid-19 patients developed a mental health problem within three months following infection.
- The same study also revealed that people with pre-existing mental health problems are 65% more likely to have Covid-19.

SOURCE:
 OutCome Health: Mental Health Impacts of Covid-19, Prevalence of Depression Symptoms in US Adults Before and During the COVID-19 Pandemic,
[What Covid-19 Has Done to Our Well-Being, in 12 Charts](#)



Overcoming A Challenging Environment

Challenges related to the pandemic

Diagnosis of mental health disorders is fundamentally based on in-person meetings; therefore, it was expected to pose a particular challenge for drugmakers, particularly those launching new drugs and requiring physician education.

- Most mood disorder drugs carry a black box warning* for adverse events and suicidal risk, traditionally requiring careful monitoring by physicians.

Resilient performance

Telemedicine initiatives have been supportive for the space, even with relatively new therapies, as new psychiatric drug launches fared strongly during Covid.

- Acadia's antipsychotic drug Nuplazid is expected to show 30% revenue growth in 2020, a notable achievement for a relatively new drug indicated for elderly patients at risk from Covid.
- Sales of Neurocrine's Ingrezza, a tardive dyskinesia drug approved in 2017 and predominantly prescribed by psychiatrists, grew by 32% in 2020.

Supportive FDA

The mood disorders space has been notoriously known for clinical trial failures, with patient heterogeneity and unpredictable placebo responses being regular culprits. However, the FDA has shown greater flexibility in the totality of evidence required, understanding the unmet need highlighted by the pandemic.

- J&J's Spravato received both advisory committee and agency endorsement despite failing to meet significant results in 2 out of 4 studies.
- Intra-Cellular's schizophrenia drug Caplyta was approved despite failing to differentiate from placebo in one of its two pivotal Phase 3 trials.

*Black box warnings are designed to alert of serious side effects



A Likely Long-Term Impact

Covid highlighted the importance of mental health

The high rate of mood disorders following the pandemic increased people and government awareness about mental health.

- Funding dedicated to mental health from governments has risen since the beginning of the Covid pandemic.
- Renewed pressure from patient associations and governments is expected to increase reimbursement policies concerning mental health.

Increasing governments' engagement

The economic crisis induced by the pandemic will inevitably have lasting effects on populations' mental health, increasing the need for government support.

- Biden's \$1.9tn Covid-19 aid proposal includes \$4bn devoted to mental health.
- The CDC (the Centers for Disease Control and Prevention) and the National Action Alliance for Suicide launched an action plan to reinforce the Mental Health Parity and Addiction Act and ensure that insurance plans cover mental health care as well as physical care.

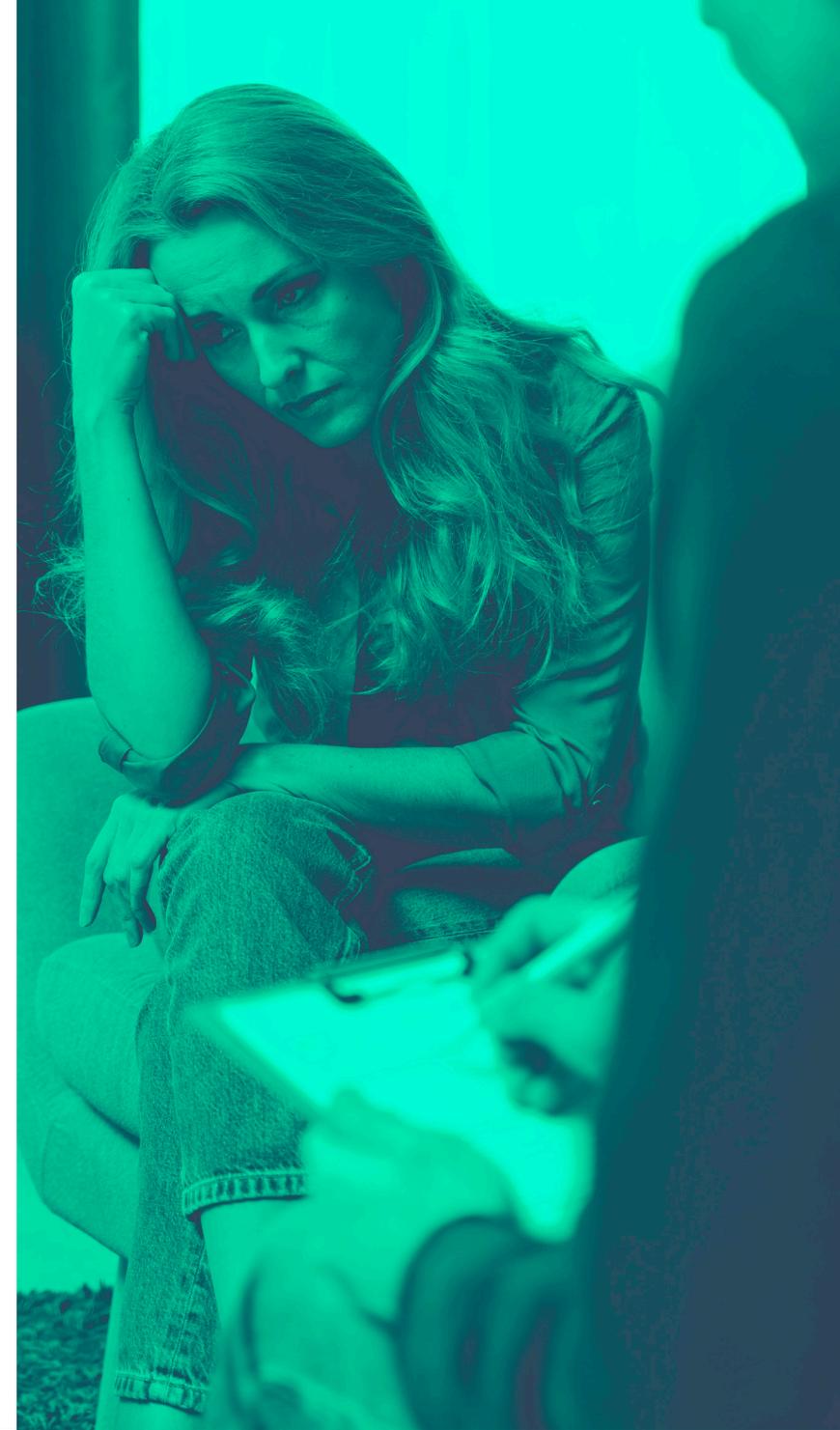
Increasing patients' engagement

Several patient associations have increased their influence to spread knowledge and experience on mental health.

- Last October, several patient associations joined forces to create the BHI (Behavioral Health Integration), aiming to spread knowledge on mental health and enhance the interaction between patients and physicians.
- For the first time, the WHO discussed the inclusion of The Mental Health & Psychosocial Support Network (MHPSS) in its decision-making process.

SOURCE:

OutCome Health: Mental Health Impacts of Covid-19, Prevalence of Depression Symptoms in US Adults Before and During the COVID-19 Pandemic



An Evolving Treatment Landscape

Tracking depression disparities with hi-tech

MDD is challenging to diagnose because none of its nine symptoms are exclusive. Each symptom can manifest itself in other diseases, and new/modified symptoms may appear.

- No new effective biomarker (objective medical sign) has yet been discovered over the last 50 years, as the brain pathophysiology remains not well understood.
- Techs (e.g., health apps) bring more nuances in MDD detection and management by considering multiple factors (e.g., suicide thoughts, personal history, eating and sleeping problems, addiction).

When bionics meets biotech

Covid-19 emphasized that depression is in desperate need of innovative solutions. Technology supports or replaces more conventional treatments.

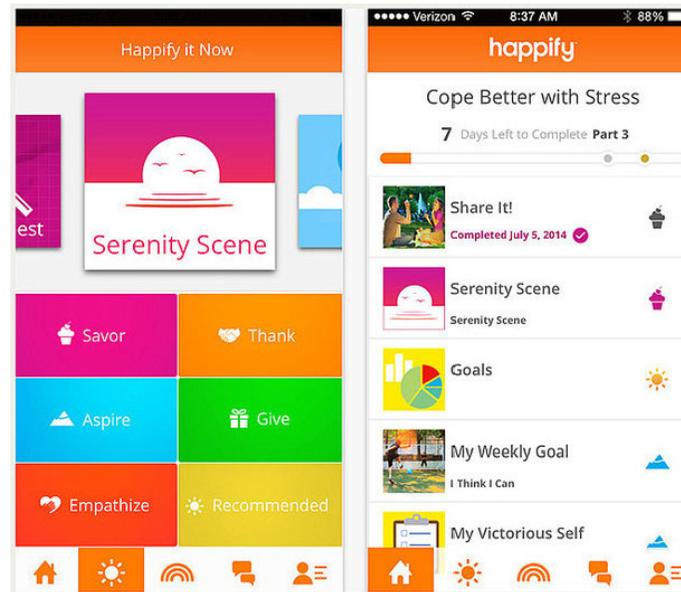
- Non-Pharma techs (e.g., Neurostimulation) could offer cheaper solutions with fewer side effects.
- Sanofi has partnered with Happify Health (i.e., Digital therapeutics) to support multiple sclerosis patient's mental health, where they are 2–5x more likely to suffer from depression.

The biotech dynamic is evolving

Depression is still heavily treated with generics, taking several weeks to show effects without reflecting continuous patients' responses to treatment.

- No new oral mechanisms of action (MoA) in drugs have been approved since 1959, and only 25% of patients achieve remission within three months.
- New MoA such as those developed by Sage or Compass could offer treatments with a reduced onset of action (days vs. weeks) and more durable response.

SOURCE:
[AXSOME Therapeutics Nov 5, 2020](#)



APPROVED PRODUCTS

Class	Tricyclics and MAOIs	Tetracyclics, Dopamine targeting	SSRI/SNRIs	Monoamine targeting	NMDA+
Products Approved/Route	8 approved Oral	6 approved Oral	10 approved Oral	5 approved Oral	Esketamine Intranasal
MOA	Monoaminergic Modulation			Glutamatergic Modulation	
Years of Introduction	1959–1969	1970–1986	1987–2006	2007–2016	2019

Non-Pharma Techs – Neurostimulation

Using electricity as an antidepressant

History proves the benefits of electricity for pain relief and to treat various diseases related to the nervous system. Neurostimulator devices bring a cheaper way to treat mood disorders with fewer side effects than traditional medication but are currently still only used in third-line therapy.

- In the early 2000's it has been shown that electrical stimulation of specific underactive brain areas could have antidepressant effects.

Transcranial Direct Current Stimulation (tDCS)

One of the most promising non-pharmacological technology to treat mood disorders is tDCS, a non-invasive form of brain stimulation that has the advantage of being directly used at home.

- Flow Neuroscience, which just acquired Halo Neuroscience, offers the first tDCS headset approved (in E.U.) to treat depression at home.
- Neuro Relief received the FDA breakthrough device designation in August 2020 for Relivion, their tDCS wearable device to treat MDD, and is awaiting final approval.

Transcranial Magnetic Stimulation (TMS)

Another potential neurostimulation technology used to treat depression is TMS, which stimulates the brain via electromagnetic induction instead of electric current. This neurostimulator, unlike tDCS, is used only in a clinical environment.

- Neuronetics got initial FDA approval in 2008 for their TMS device dedicated to treatment-resistant patients with MDD. Now, they are backed by solid clinical data suggesting the use of this technology in first-line therapy.

SOURCE:

[Neuro Relief wins FDA breakthrough nod for wearable neuromod for depression.](#)
[Flow acquires Halo to further develop mental health treatments](#)



Non-Pharma Techs – Digital Health

Virtual medicine is coming to mental care

Telemedicine and other digital tools are more and more present in mental care, boosted by the Covid-19 pandemic and increased investments.

- Teladoc launched, in October 2020, the Mental Health Care service, followed by Amwell last month (Amwell Psychiatric Care), to provide 24/7 telepsychiatry services to hospitals and patients in the U.S.
- The digital health industry enjoyed a lot of funding in 2020 to reach almost \$15bn in VC funding, representing an increase of 68% compared to 2019.

Mental health apps on the rise

The best way to prevent mood disorders is to maintain mental well-being. Mobile apps dedicated to mental fitness are emerging rapidly, benefiting from the rise of wearable devices to self-monitor health parameters.

- It's estimated that the number of people using digital therapeutics and wellness apps will increase from 627mn in 2020 to more than 1.4bn by 2025.
- The meditation app Calm, has more than 100mn downloads.

Self-regulate our brain using biofeedback

Biofeedback uses real-time physiological measurements (heart rate, brain activity, etc.) recorded via sensors and displayed under the form of visual or auditory feedback to the patient to self-regulate its psychophysiological states.

- Heart-rate variability (HRV) is the biomarker for chronic stress and it can be taught to anxious people how to calm down using HRV feedback.
- Lief Therapeutics is benefiting since last year from insurance coverage in the U.S. for Lief Rx, the world's first smart patch using biofeedback for mental health.

DIGITAL HEALTH VC FUNDING 2010-2020



SOURCE:

[Amwell Psychiatric Care \(APC\) Launches to Support Hospitals and Health Systems Address the Behavioral Health Gap.](#)
[Digital Tools Are Revolutionizing Mental Health Care in the U.S.](#)

Current Pharmacological Landscape

Decades away for precision medicine

The first generation of antidepressant drugs (still in marginal use today) was initially developed to treat tuberculosis until researchers observed patients becoming disproportionately... happy.

- First-generation drugs worked by unselectively decreasing the metabolism of several neurotransmitters.
- While efficacy was relatively good and substantially improved patient care, lack of precision meant a problematic safety profile.

SSRI's – revolution in patient care

Selective Serotonin Reuptake Inhibitor (SSRI) drugs, which include household names such as Prozac and Zoloft, were introduced in the late '80s and are still very much considered as the mainstay in MDD care with a 75%–80% market share.

- SSRI's work by inhibiting only serotonin clearance, an approach proven as strongly efficacious in an array of depression disorders.
- Physicians consider SSRI's adverse events as relatively benign and manageable, contributing to strong adoption.

A “genericized” market

MDD is one of the largest indications in terms of total prescription number, with 13.2% of Americans over 18 reportedly on current pharmacological treatment.

- Global antidepressant market was \$14.3bn in 2019 and has grown to approximately \$29bn in 2020 as a result of the pandemic.
- Adjusting for prescription drug inflation, Prozac peak sales would have been close to \$6bn today, highlighting the vast opportunity for an equivalent new blockbuster.



What's next (1/2)

Still plenty of room for improvement

Despite the relative breadth of treatment options, there remains a very significant unmet need to manage depression. A limitation of current therapies is the slow time to therapeutic effect, a significant challenge for physicians trying to stabilize MDD patients with suicidal symptoms.

- Onset of clinical benefit with current therapies takes weeks to months.
- In this patient population, suicide occurs at 27x the normal rate.

Rapid benefit – an industry focus

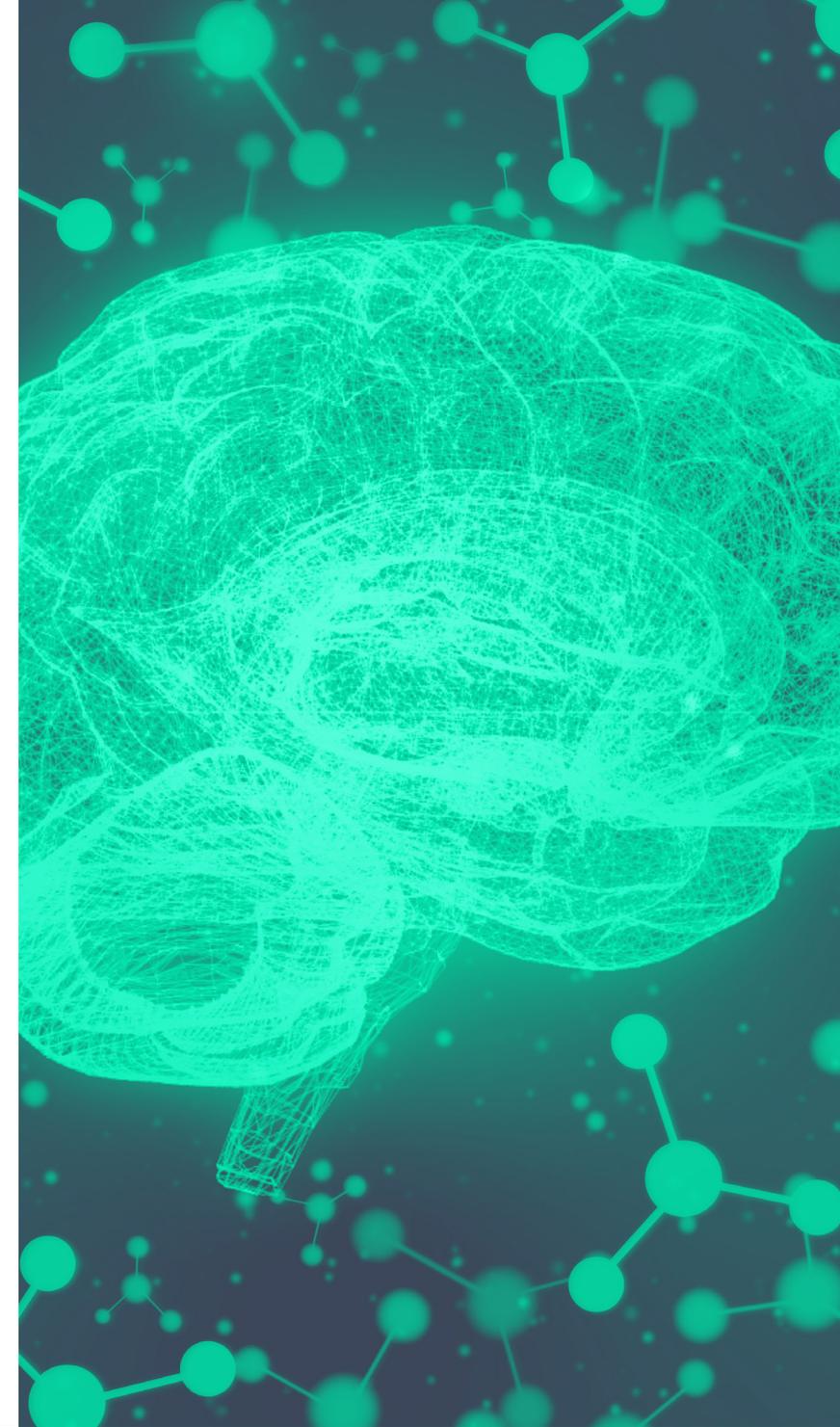
New therapeutic agents are being tested in clinical trials to demonstrate benefit in days rather than weeks, which could be the first significant advancement in the space for decades.

- In the evolving treatment paradigm, rapid-acting antidepressants will be dosed acutely (rather than chronically) in conjunction with SSRIs, aiming to alleviate symptoms during the time chronic treatments require to start to work.

Emerging players

Companies are developing new technologies or repurposing old ones to overcome current common limitations of available treatments.

- SAGE's rapidly acting antidepressant drug zuranolone could become the first to gain broad use and specific label, potentially by late 2021.
- Axsome is developing a new formulation (combining an old cough syrup and a generic antidepressant drug) that already demonstrated strong rapid antidepressant effects in late-stage studies.



What's next (2/2)

When traditional drugs don't work

Another significant unmet need is to improve therapeutic options for treatment-resistant or refractory depression, a chronic condition resulting from a lack of response to mainstay pharmacological options.

- It is estimated that approximately one-third of patients demonstrate Treatment-Resistant Depression (TRD), failing at least two previous lines of therapy.

Need for new mechanisms

As most anti-depressant drugs share similar mechanisms, it is essential to have therapeutic options that work differently to care for TRD patients.

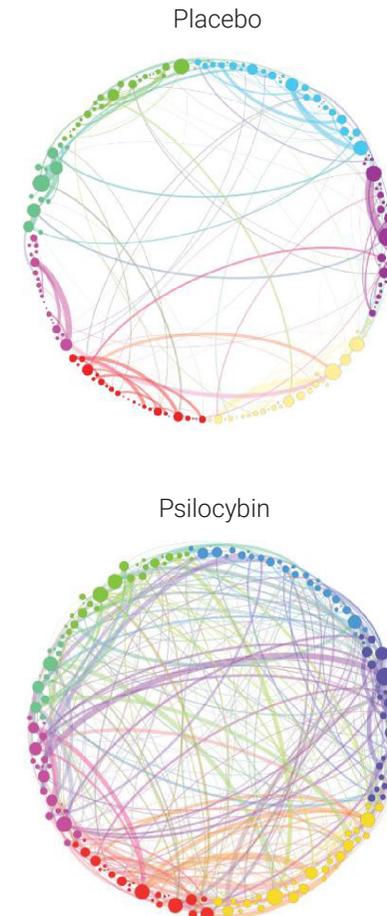
- Antipsychotics show good efficacy when added to SSRIs. However, the side effect profile associated with chronic use is utterly inadequate for long-term use.
- J&J drug Spravato, a derivative of ketamine, was approved in 2019 for TRD, but the potential abuse liability means this drug is reserved only for severe cases treated in a hospital setting.

Magic mushrooms not only for parties

The antidepressant properties of psychedelic agents have been an area of robust medical research in recent years, and early results support a potentially important therapeutic modality for treatment-resistant patients.

- This class of drugs is thought to benefit depression by increasing connectivity in the brain (see figure) outside of the 'default mode'.
- Emerging players in the space, including Compass Pathways, Mind Medicine, and Revive Therapeutics, have attracted strong investor interest.

CHANGES IN BRAIN NETWORK CONNECTIVITY FROM PSYCHEDELIC USE



SOURCE:

[Amwell Psychiatric Care \(APC\) Launches to Support Hospitals and Health Systems Address the Behavioral Health Gap. Digital Tools Are Revolutionizing Mental Health Care in the U.S.](#)

Improving Current MDD Care

Treatment pathway stage	Available treatments	% relapse	Estimated no of patients (worldwide)	Possible improvement
<p>MDD Diagnosis</p> <p>↓</p> <p>New onset depression (MDD) – 1st line treatments</p>	<ul style="list-style-type: none"> • Antidepressants : SSRI's • Psychological interventions – Cognitive behavioural therapy 	30% respond or 60/70% relapse	320mn	<p>A better-defined treatment plan</p> <ul style="list-style-type: none"> – through new diagnosis methods (e.g., mental health apps) <p>Reduced time to answer the benefit</p> <ul style="list-style-type: none"> – Through new mechanisms of action
<p>↓</p> <p>Persistent depression (MDD) - 2nd line treatments</p>	<ul style="list-style-type: none"> • Antidepressants: Tricyclic/Monoamine oxidase inhibitors • Antidepressant's combinations • Psychological interventions 	Adverse events , leading to 50–75% relapse	200mn	
<p>↓</p> <p>Treatment-resistant depression (TRD) – 3rd line + treatments</p>	<ul style="list-style-type: none"> • Augmentation therapy (mood stabilizers, Antipsychotics, anticonvulsants, Esketamine) + antidepressants • Somatic therapy (rTMS, tDCS, ECT, DBS) – “non pharma tech” • High intensity psychological interventions 	Serious lifelong adverse effects, 80/90% relapse	100mn (33% of total)	<p>Reduced onset of action, more durable response or less side effects</p> <ul style="list-style-type: none"> – Through new mechanisms of action – Through Non pharma tech

rTMS = repetitive transcranial magnetic stimulation;
 tDCS=transcranial direct current stimulation;
 ECT=electroconvulsive therapy;
 DBS=deep brain stimulation

Catalysts

- **Clinical data.** SAGE's zuranolone data will be released in 1H21, Compass Phase IIb data, and Axsome's topline results are expected in late 2021.
- **Healthcare spending.** The European Commission increased its seven-year healthcare budget to €9.4bn from €413mn, focusing on mental and chronic diseases. Biden dedicated additional funding for mental illnesses.
- **Telepsychiatry on the rise.** Covid has advanced the use of virtual care through telemedicine and boosted funding in the field. The potential to reach more patients and more continuous monitoring should continue to drive telepsychiatry expansion.

Risks

- **No long-term Covid impact.** Governments' support for mental health in response to Covid may be temporary.
- **Placebo effect in mood disorders.** Placebo response in mood disorders trials is often viewed as a nuisance, and clear advantage might be hard to reach.
- **Reimbursement and access.** For example, J&J's Esketamin product has limited access and can only be administered in hospitals or doctors' offices. Besides, new drugs' high prices relative to generics could limit their use to third-line treatment only.

Bottom Line

- With the Covid pandemic, depression could be on the verge of becoming the new "Mal du siècle". Isolation and permanent anxiety have an undeniable impact on our mental health. However, the pandemic has also brought about increased government support and patient involvement. The depression market has not seen much innovation over the past 60 years, but it is currently undergoing a significant transformation, becoming more personalized. For a while, depression has been treated by the same old antidepressants given to all patients. Advances in biology and technology are leading to new drugs, digital and non-pharmaceutical treatments, offering patients a wider range of care.
- We have exposure to virtual psychiatric care in our Bionics portfolios, and to innovative drugs in our Biotechnology portfolios.

Companies mentioned in this article:

Axsome Therapeutics (AXSM US), Compass Pathways (CMPS US), J&J (JNJ US), Mind Medicine (MMED CN), Revive therapeutics (RVV CA), Sage Therapeutics (SAGE US)

GETTING RID OF MIDDLEMEN IN FINANCE

Banks And Insurers Close To A Kodak Moment?

From fintech evolution to fintech revolution

Technology in finance has improved user experience, reduced operational inefficiency, and helped reach underserved people. Many of these upgrades were possible thanks to software development but were just appetizers – the next innovations will cut intermediaries and change the financial system as we know it.

- Open banking provides the environment for this transformation.
- New banking habits, especially by the younger generations, will curb any resistance to change.

Digital assets, the catalyst for disintermediation

Imagine a world where the allocation of funds from savers to borrowers and money transfers would not rely on the banking system. In such a world, central banks could reach the real economy directly, and people would have better control over their finances.

- The link between the real economy and the digital world are digital assets like central bank digital currencies (CBDCs).

A new financial system suited for challengers

Challengers have the right size and flexibility to be key players in this new ecosystem. Technology-centric, they can quickly deal with a new form of money that can be used to build new types of services. They do not need to deal with legacy IT systems.

- Traditional players will not disappear overnight, but they may struggle to adapt their IT systems to this new form of money.



Disintermediation Economics

Technology brings disintermediation

The financial system is not the first industry to cut the middleman. Changes in a supply chain or full disintermediation are part of a living economy. It is part of the natural process to reduce costs and increase profit margins.

- For instance, Internet has reduced intermediation in many industries, e.g., the number of travel agents in the U.S. is down 75% over the last 20 years.

Why disintermediation matters

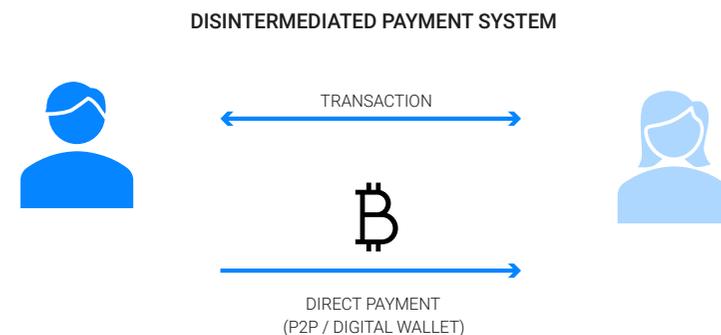
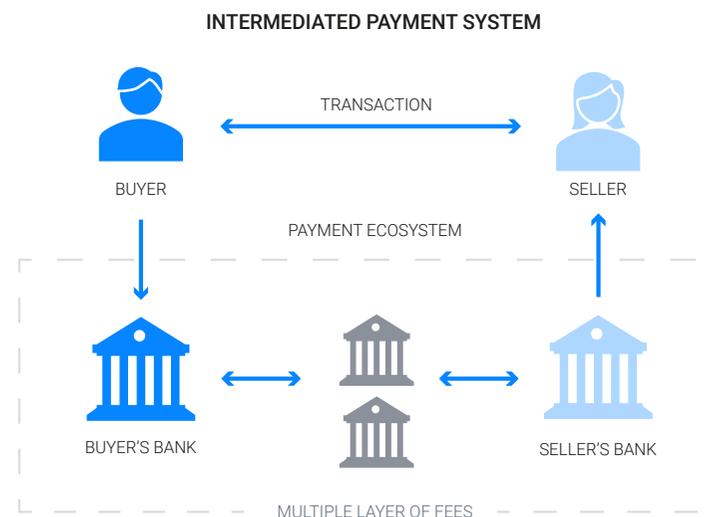
Countries exhibit different levels of financial intermediation. Analysts from the World Bank noticed that economic development and access to financial services were better when intermediation fees were lower. Eliminating intermediation increases financial inclusion.

- High intermediation costs reduce the quantity of credit available, impacting economic development.

You do not need a banker when you have a bank in the pocket

Covid-19 has accelerated the digitalization of financial services. In-person banking has become irrelevant as connected devices provide access to most financial services. Mobile phones are the bank branches of the 2020s.

- There are 4.9bn mobile phone users in the world, of which 3.8bn use smartphones.
- In the U.S. alone, 20'000 branches could be closed over the next decade (vs. 4'500 branches closed since 2010, about 6% of total).



SOURCE: McKinsey, Bank My Cell, World Bank, Global Financial Development Database, World Development Indicators, FDIC, AtonRā Partners

CBDCs In A Nutshell

A form of money for the 21st century

CBDC is a digital form of fiat currency, i.e., government-issued. It is technologically superior to other forms of money and may be blockchain-based. Like cash, it is a direct claim on the central bank. It ensures a safe, trustworthy, and robust payment option tailored for the digitization of the financial system.

- As per a BIS survey from May 2020, ~70% of central banks consider a blockchain infrastructure for their CBDC projects.

The fear of stablecoins...

Initially designed to reduce cryptocurrencies' volatility, stablecoins, digital assets pegged to a fiat currency, have more and more real-life applications like cross-border remittances. Central banks fear losing their monopoly on money.

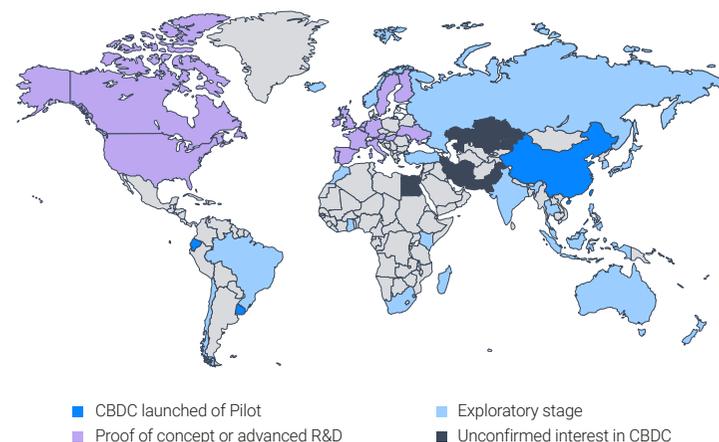
- High-potential stablecoin Diem (ex-Libra) will be launched in 1H 2021.
- The stablecoin Tether has reached a market cap of >\$35bn.

...and a geopolitical tug-of-war

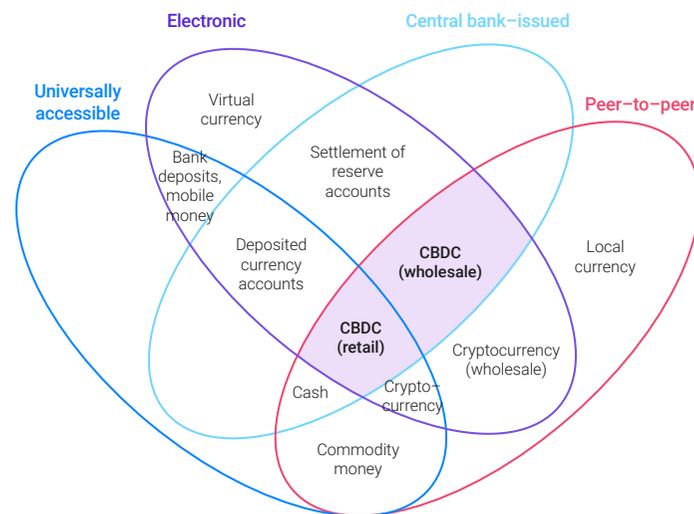
Developed countries had to react with their CBDC projects, as China took the lead and proved its technological know-how. But CBDC is not only an innovation race. It is also a rare opportunity to weaken the quasi-monopoly of the U.S. dollar on global trade and reduce reserve currency status.

- ~80% of exports are USD denominated (excluding intra-euro-area trades).
- China will finalize its e-CNY in 2021 to be ready for the 2022 Olympics.
- Former Bank of England governor suggested replacing the U.S. dollar by a basket of CBDCs in international trade.

CENTRAL BANKS PURSUING CBDC RESEARCH (FEBRUARY 2021)



TAXONOMY OF MONEY (BIS)



SOURCE: Bank for International Settlement (BIS), Coin Market Cap, Kiffmeister Chronicles, Economic Policy Symposium, American Economic Association

CBDC Design: Wholesale vs Retail

As many CBDC designs as CBDC projects

When designing their CBDCs, central banks must consider the consumer needs they want to meet with their digital currency. The choices about design have an impact on the target audience, which in turn will have different consequences on the financial industry.

- Wholesale and retail CBDCs address the needs of different audiences.

Wholesale CBDC, lots of noise for not much?

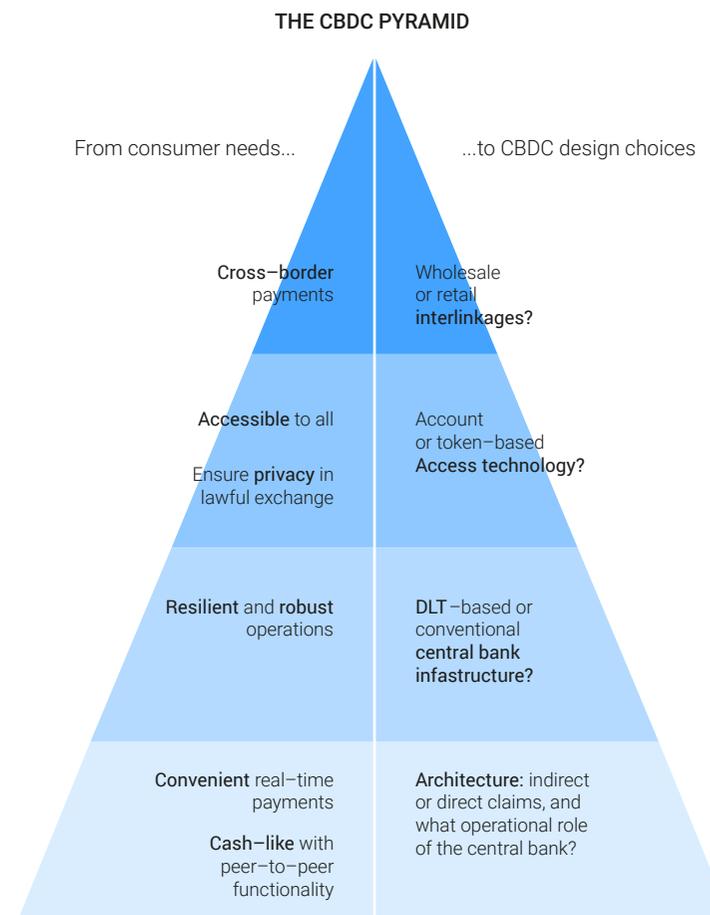
Wholesale CBDC improves the infrastructure for interbank settlements. Less disruptive, it can be the first step before deploying a retail CBDC. Many CBDC projects in developed countries are going in this direction.

- The Swiss National Bank announced in December 2020 to have completed a trial on a wholesale e-CHF.
- Commercial banks lobby for this model: a bank run (i.e., converting all bank deposits into CBDC) is unlikely with a wholesale CBDC.

Retail CBDC, the real disintermediation power

Individuals and businesses would use retail CBDC in their daily financial transactions and payments. In the most ambitious schemes, end-users may open deposits at the Central Bank. Commercial banks will have to reinvent themselves.

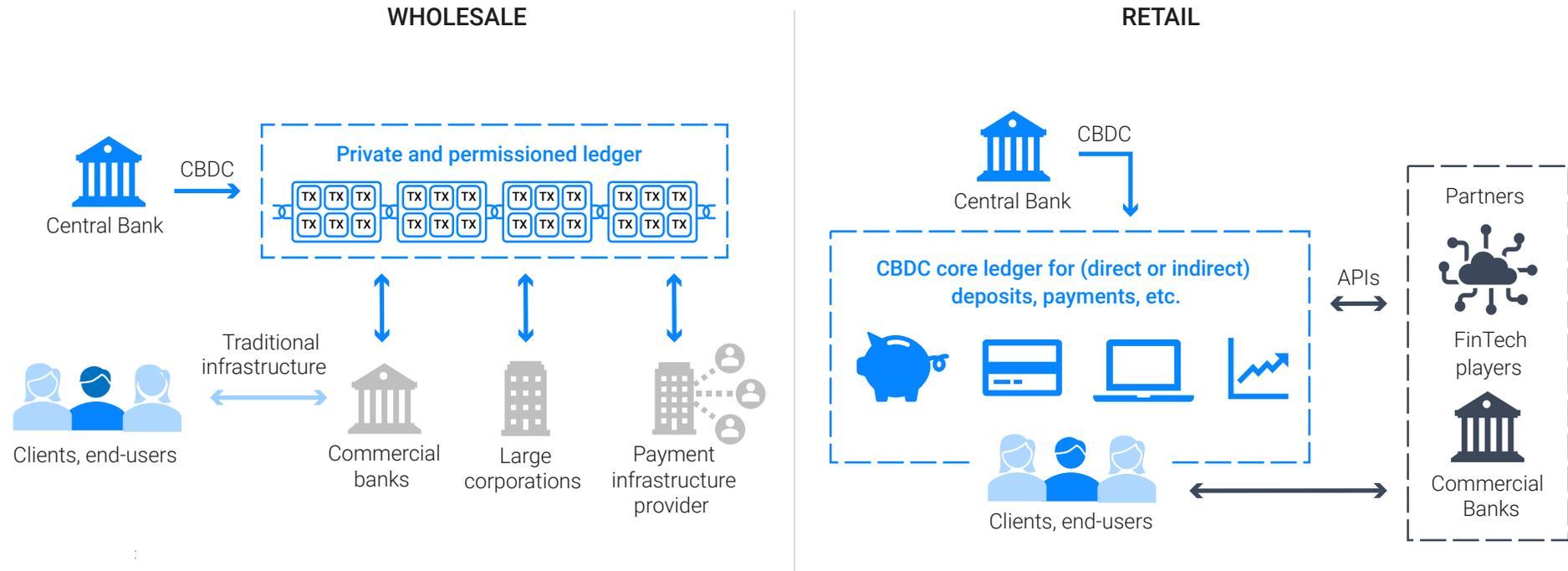
- China is developing a retail CBDC with support from national banks and Big Tech (development of wallets, wearable devices, etc.).
- Retail CBDC reduces intermediation, accelerates financial inclusion, facilitates cross-border remittances, and improves financial stability.



The CBDC pyramid maps consumer needs (LHS) onto the associated design choices for the central bank (RHS). The four layers of the RHS form a hierarchy in which the lower layers represent design choices that feed into subsequent, higher-level decisions.

SOURCE:
SNB, BIS, Consensus, The European Money and Finance Forum

CBDC Design: Wholesale vs Retail



SOURCE:
Consensus, BNP Paribas, Bank of England, The European Money and Finance Forum, AtonRâ Partners

Connecting Two Worlds Through CBDCs

Success or failure depends on interoperability

Interoperability, i.e., the capability to bridge the traditional money systems with digital assets (including other CBDCs), is essential and can be reached through global standards and protocols.

- CBDCs may succeed where payment systems like SWIFT or ACH failed due to their regionality, low speed, and weak transparency.
- The PBoC will deploy e-CNY through payment apps like WeChat Pay and AliPay, guarantying a quick adoption of the digital currency.

Reimagining the range of financial services

CBDCs will eventually have an impact on all financial services, well beyond the payment industry. CBDCs are living their early 90s internet moment – hardly understood back then, essential nowadays.

- The global payment industry generated revenues of >\$1.2tn in 2019, mostly in Asia, where several retail CBDCs are being tested.

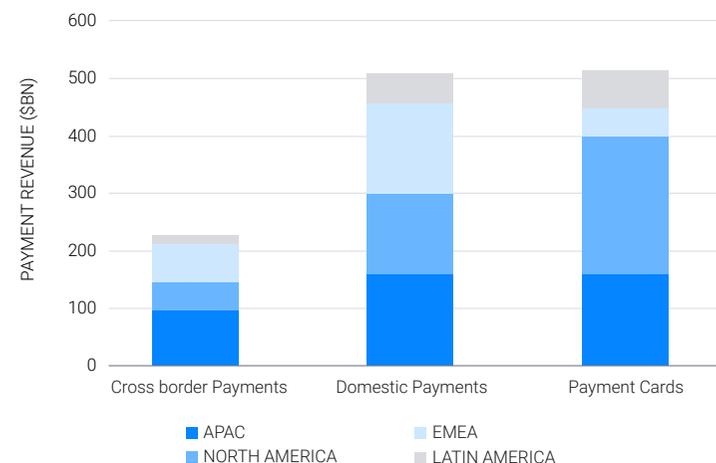
Decentralized Finance (DeFi), a visionary laboratory

The DeFi ecosystem proves that blockchain can develop a system where market participants bypass traditional financial intermediaries. Connecting real-life assets with the DeFi market is one of the development objectives. CBDCs may help achieve it while providing legitimacy to this ecosystem.

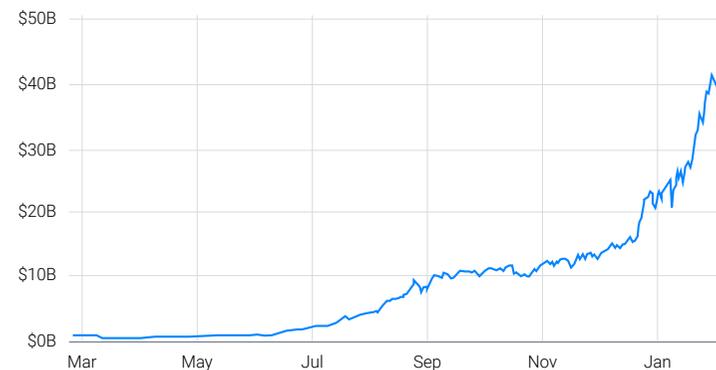
- Applications of DeFi include lending, exchanges, payments, hedging, or fund and asset management – total value locked has been surging.
- For a detailed deep dive into DeFi, refer to our previous article [here](#).

SOURCE:
ASPI – The flipside of China's central bank digital currency, McKinsey, Defi Pulse

DISRUPTING THE HUGE PAYMENT IDUSTRY



1-YEAR EVOLUTION OF DEFI TOTAL VALUE LOCKED (\$BN)



Various Consequences For Different Players

A direct channel for the government

CBDCs will allow governments to make direct transactions with their citizens. The money supply will be better monitored, and tax evasion could be better fought. Moreover, the distribution of benefits to individuals or entities will be simplified.

- CBDC would have eased distributing stimulus checks during Covid-19.
- Social security numbers could be used to simplify identification and avoid third-party involvement.

The misfortune of some...

Many financial organizations will have revenues under pressure, especially in jurisdictions that will implement retail CBDCs. Adapting to a digital form of money will challenge organizations having to cope with legacy IT systems.

- Consolidation in the industry will accelerate, especially for the smaller players without an army of developers.

...makes the happiness of others

On the other hand, new business opportunities will arise for tech-oriented players. API providers will provide the plumbing for the new market infrastructure. And challengers (most of which are neobanks) have enough flexibility in their state-of-the-art digital platforms to meet users' new needs CBDCs will create.

- The number of neobanks doubled in the last two years (~250).

OVERVIEW OF CHALLENGERS (2020)

44	NORTH AMERICA	
46	LATAM	
111	EUROPE	
21	AFRICA & MIDDLE EAST	
34	ASIA-PACIFIC	

SOURCE:
Exton Consulting

Catalysts

- **Diem.** The launch of Diem (ex-Libra) is expected this semester and could potentially reach billions of people. A burgeoning community of developers will launch dozens of financial apps. Central banks must react through their digital form of money.
- **China's e-CNY.** All eyes will be on China as the country will be the first super-power to launch an ambitious digital currency. Developed countries will accelerate their tests to keep up.
- **New banking habits.** The success of the disintermediation of the financial system will depend on the CBDCs' and/or stablecoins adoption rates. Younger generations trust technology and use challengers as their primary bank. Millennials account for the largest generation group and may lead embracing the system change.

Risks

- **Banking industry resilience.** It is not the first time that innovation and technology are thought to change the financial system as we know it. But with time, banks and insurances showed resilience and adapted to the new framework. Their adaptation will require time, and slow or even constrain adoption of digital money.
- **Lobbyism.** The banking sector is unlikely to stay quiet while central banks launch CBDCs that could make their activities become useless or routed to tech-oriented firms. Lobbyism may delay implementation.
- **Privacy concerns.** Data privacy differs across regions and societies. In developed countries, data privacy is a real concern, and it may delay the implementation of revolutionary retail CBDC schemes.

Bottom Line

- The financial system is about to live its most crucial change in decades with the implementation of CBDCs. The new form of money is likely to yield a change in the infrastructure on which the financial system is built, potentially causing massive disintermediation.
- We reiterate our call to avoid traditional financial players that will lose intermediation revenues. On the opposite, challengers have the proper digital tools to adapt to this new paradigm.

Companies mentioned in this article:

Diem Association (not listed)

FREEZING TEXAS' GRID

U.S. Power System On Alert

An unexpected winter storm

Mid-February, an unprecedented cold wave hit the U.S. and especially Texas and left millions of people without power for several hours. About three-quarters of the 48 Lower States were reported under the snow.

- More than 4mn customers across Texas experienced power outages.
- At least 58 people died from this cold blast (due to car crashes, hypothermia, carbon monoxide poisoning, etc.).

Multiple factors caused a power failure

These unusual extreme temperatures drove up demand for heating and simultaneously hampered the supply of electricity. This supply/demand imbalance forced the Electric Reliability Council of Texas (ERCOT), Texas' grid operator, to carry rolling blackouts (cutting electricity in a rotating way over different regions).

- Power was typically cut to homes and small businesses of specific neighborhoods for 15 to 45 minutes before being rotated to other locations.

The way forward

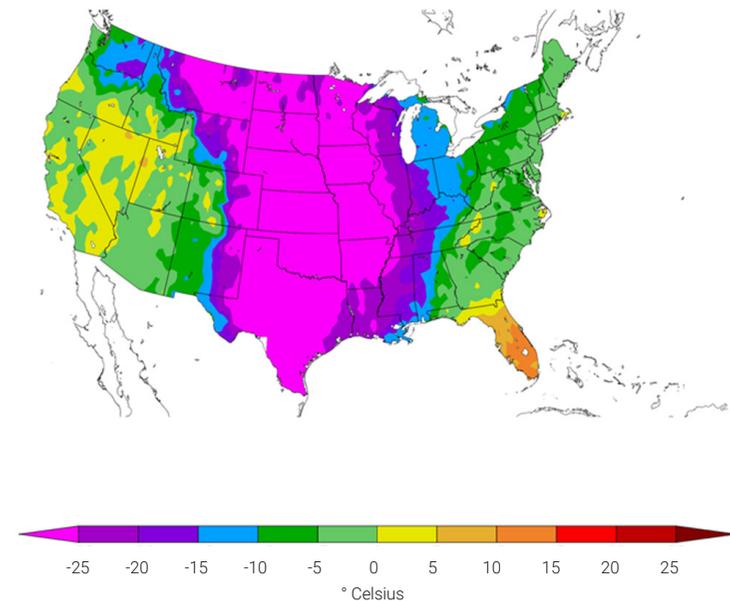
The U.S. energy system and grid infrastructure should be made more resilient to withstand such extreme weather events. Beyond weatherization efforts (i.e., protecting infrastructures from adverse weather events), we believe that various clean technologies have a role to play.

- Weatherproof renewables combined with energy storage solutions could provide the extra power needed during extended cold snaps.

SOURCE:

[Severe power cuts in Texas highlight energy security risks related to extreme weather events.](#)
[Extreme Cold Killed Texans in Their Bedrooms, Vehicles and Backyards](#)

DEPARTURE FROM NORMAL TEMPERATURE ACROSS THE UNITED STATES DURING THE RECENT BLACKOUTS IN TEXAS



Climate Change Is Becoming Real

A direct consequence of climate change

The cold blast originated from the Arctic Circle in a pattern most likely linked to warmer temperatures in the polar region.

- According to scientists, rising temperatures in the Arctic diminishes the jet stream of air that prevents the polar vortex from going south.
- Global warming increases the frequency of such extreme weather events.

Texas' unique case

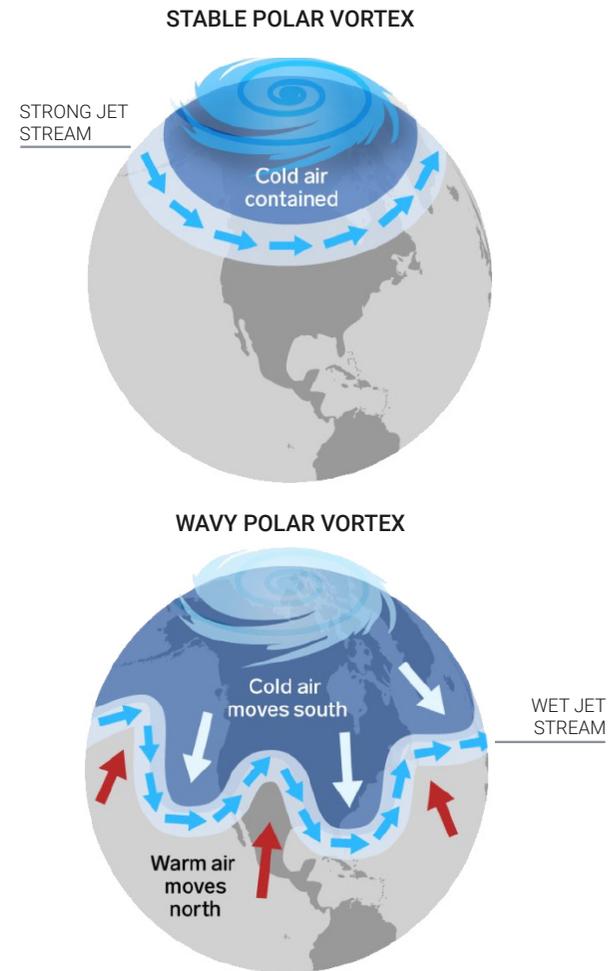
Texas is the only U.S. state that operates its power grid in an «energy-only» market. Producers are paid only for the power they generate and not for keeping reserve capacity on standby (capacity market).

- With no capacity market, Texas has the lowest reserve margin (i.e., excess reserve capacity that guarantees backup) in the U.S.
- Also, because Texas' grid is mostly disconnected from other states, it cannot draw power from its neighbors.

A power market designed to keep prices low

In the 90s, Texas switched from a monopoly utility market to allow a marketplace where many power generators and retail energy providers can compete in a deregulated way. Such a power market is intended to drive electricity prices down but can see prices skyrocket on unexpected events.

- During this winter freeze episode, prices shot up to \$9'000 per MWh, compared to the usual \$20 to \$40 per MWh range.



SOURCE:
[How one Texas storm exposed an energy grid unprepared for climate change.](#)
[Energy explainer: inside Texas' winter freeze](#)

Texas Plunged Into Darkness

Rolling blackouts

A gap between power's supply and demand forced the Texas grid operator to cut power to millions of homes in a mechanism called rolling blackouts (or load shedding).

- At the peak, about 45GW of electricity had gone offline in Texas, more than Sweden's total capacity.
- As a comparison, this event was over 500 times worse than last summer's power outages in California.

Consequences beyond power losses

Many industries were also impacted, including the delivery of vaccines, food pantries, processor chip production, etc.

- A surge in demand from Texans who lost perishable food left many grocery stores with empty shelves in the immediate aftermath.
- Samsung Electronics, NXP, and Infineon had all to shut down their Texas plants, with likely consequences for an already chip-starved automotive industry.

Water systems impacted

The winter storm also impacted water utilities, with many water treatment plants being disrupted by the cold weather. Many pipes burst as water froze (as water freezes it expands and builds up pressure that can lead to bursting the pipe) leaving many families without water.

- ~15mn people were left without running water or asked to boil their tap water.
- Some residents ended up using melted snow for drinking or flushing toilets.

SOURCE:

[How one Texas storm exposed an energy grid unprepared for climate change.](#)

[Energy explainer: inside Texas' winter freeze.](#)

[Over a million Texans are still without drinking water. Smaller communities and apartments are facing the biggest challenges](#)

ERCOT ROLLING BLACKOUTS



Renewables Are Not To Blame

Cold wave drove the power demand

Texas' electricity demand is highly sensitive to varying temperatures, especially in winter. Since the state mostly relies on electricity for heating, freezing temperatures automatically drive power demand to high levels.

- About 50% of Texas residents heat with electricity, ~15% above U.S.' average.
- Because of the rarity of such cold waves, heating systems are not very efficient.
- Demand reached 75 GW, above ERCOT's worst-case scenario of 68 GW.

Natural gas shortage

Natural gas accounts for 46% of electricity generated in Texas (2020), and frozen gas wells hampered gas production while demand kept rising.

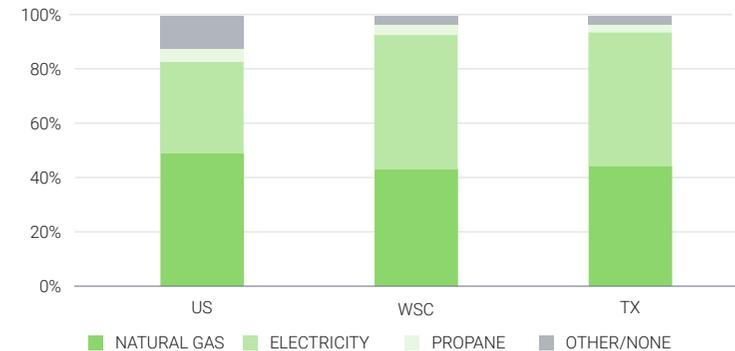
- The South-Central region experience a 20% drop in natural gas production between 6 and 16 February.
- Wellhead freeze-offs occur when the water used for shale gas extraction starts to crystalize and blocks out producing wells.

A hole in supply

Blackouts were mainly caused by supply unable to meet rising demand, and the principal supply gap originated from thermal sources. Wind energy production was also impacted by the cold wave (e.g., frozen wind blades), but Texas wasn't counting on wind capacity during winter anyway.

- Freeze-offs mostly impacted natural gas extraction as well as power generation at natural gas, coal, and nuclear plants (frozen instruments).
- While 12GW of Texas's 25GW of wind power capacity was frozen, the state had planned using only 6GW of wind capacity during winter (due to little wind).

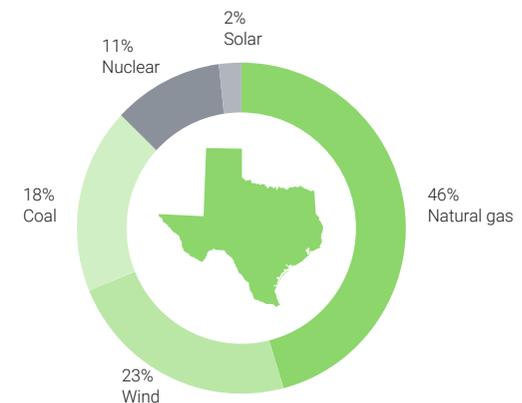
MAIN HEATING FUEL USED



Despite warmer weather than most other states, almost all Texas homes are heated. About half of Texas residents heat with electricity, a greater proportion than the U.S. average

HOW TEXAS GENERATES ITS ELECTRICITY

SHARE OF ENERGY (MWH) GENERATED BY FUEL TYPE IN TEXAS IN 2020



Source: ERCOT via Joshua D. Rhodes, Forbes, Statista

Building Resilience Becomes A Necessity

Weather-resistant infrastructures

The most straightforward measure to mitigate such events would be to fortify grid infrastructure to better withstand extreme weather events. Winterizing infrastructure is technically feasible, but someone will have to bear the costs (either the consumer, the utility, or the state/ government).

- Companies like Hubbell provide grid modernization & winterization solutions for utilities and grid operators.
- Cold weather packages exist for wind turbines (a common practice in cold regions), with heating & water-resistant coatings.

Improve market structure

Texas could update its power market structure to allow for more backup power sources and reserves.

- Texas has the lowest electricity reserves across the U.S. because of its «energy-only» market structure.
- Implementing a capacity market would incentivize the buildup of new power reserves.

Energy efficiency

One solution to reduce electricity demand in extreme weather events is to improve buildings and houses' energy efficiency. That way, homes are better protected from colder temperatures and require less power for heating.

- Investments in buildings insulations and windows should be promoted.
- Texas currently has among the lowest Energy Efficiency Resource Standard (EERS) in the country, a target likely to be lifted in the near future.

SOURCE:

[How Texas solar helped meet winter storm challenges, and could go even further.](#)

Image: Flickr, modified



Innovative Technologies To The Rescue

AI to forecast energy demand and supply

An energy system can integrate artificial intelligence (AI) based grid modeling to predict better power supply, demand, energy prices, and weather patterns.

- Machine learning and AI can use historical data to better predict potential damages and future needs.
- Smart meters (such as the ones provided by Landis+Gyr) can be used to gather granular data to build real-time predictions (e.g., load forecasting, human presence, use of specific appliances, etc.).

Microgrids have a role to play

Microgrids, namely local networks of generators that can be easily disconnected from the large "macro" grid network, can increase the reliability, scalability, and flexibility of power systems.

- Autonomous microgrids, powered by distributed renewables, could provide power backups to critical services such as hospitals, police, and fire.
- Combining microgrids with vehicle-to-grid technology could allow people to use the electricity stored in vehicles' batteries and reduce peak demand.

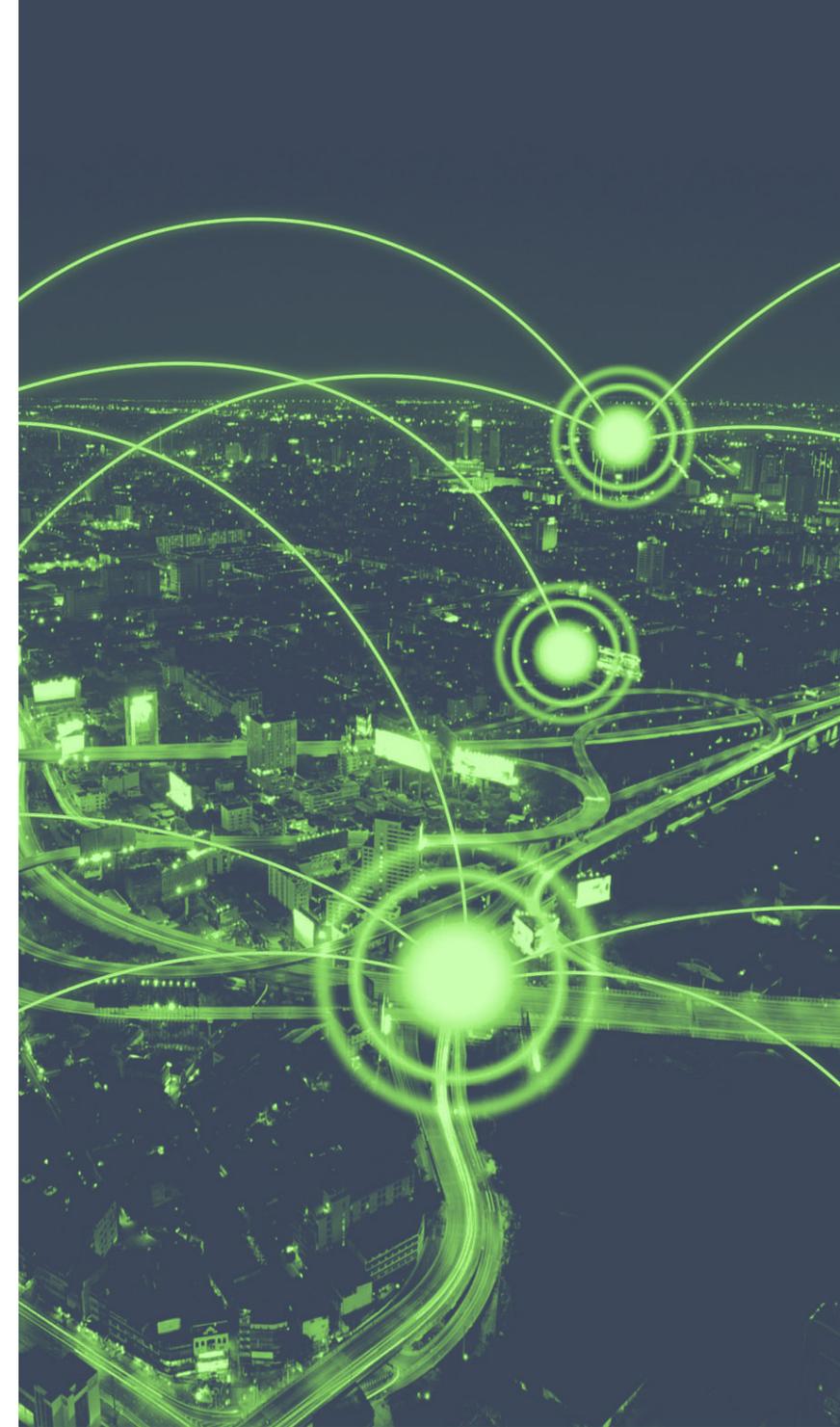
Invest in energy storage

Renewables combined with energy storage are viable solutions in almost all climates. Whether it is at the grid or residential level, energy storage would play a crucial role in providing backup power in emergency situations.

- Sunrun (U.S.' largest residential solar + battery provider) registered a 350% spike in online traffic to its website from Texas during the storm.
- Biden included energy storage in his \$2tn climate plan, and his administration is likely to press on this climate agenda in the foreseeable future.

SOURCE:

[How Texas solar helped meet winter storm challenges, and could go even further.](#)
[Weather Analytics Move From Predicting Storms To Predicting Outages For Better Grid Resiliency](#)



Catalysts

- **Raising awareness.** This extreme weather event directly impacts the population and increases pressure on grid operators to invest in more resilient infrastructure.
- **New government spending.** Biden's administration is likely to accelerate investments in modern grid infrastructure, clean technologies, and energy efficiency to prevent such events from happening.
- **Industrial push.** Many industries impacted by the blackout (e.g., semiconductor, auto, etc.) could look for renewables + energy storage as backup options to prevent such events.

Risks

- **False claims about renewables.** People and politicians may wrongly attribute these blackouts to renewables and negatively impact the image of such solutions.
- **Demand for non-renewable backup.** Consumers may be tempted to go for non-renewable options, such as private diesel generators, for backup power.
- **Investments in natural gas.** Expanding the natural gas supply and network in reaction to the blackouts would hamper renewables growth in Texas.

Bottom Line

- Extreme weather events are becoming more frequent because of climate change and rising temperatures. This unexpected winter storm in Texas is strengthening our conviction about the importance of building a resilient and sustainable energy system across the entire country, and that it will foster U.S. investments in clean, resilient technologies ([see our previous article «Electricity supply: keeping the spark alive»](#) for more details).
- In our Sustainable Future portfolios, we maintain exposure to companies that provide solutions for safe and reliable power supply.

Companies mentioned in this article:

Hubbell (HUBB US), Infineon Technologies (IFX GR), Landis+Gyr (LAND SW), NXP Semiconductors (NXPI US), Samsung Electronics (005930 KS), Sunrun (RUN US)

CHARTS FOR THOUGHTS

The Start Of A New Cycle?

Equally Weighted vs Market-Cap Weighted indices

The charts on this page compare classical Market-Cap Weighted index (MCW) with their Equal Weighted (EW) counterpart. We reference the S&P500 given its broader market representativity and available historic data.

- EW index invests equally across its constituents and is frequently rebalanced to maintain an equal weight, while MCW invests according to market capitalization.
- As relative performances evolve, MCW indices tend to become concentrated. Currently, the top 1% of S&P500 constituents represents 20% of its weightings.

The economic and business cycles

Comparing EW and MCW may help identify changes in cycles. As companies or sectors outperform, they increase their relative weight and drive the MCW index.

- MCW tends to outperform EW close to the end of the cycle, as a few winners drive its performance. As the cycle moves on, new players start to outperform, but their weight is relatively higher in EW indices, which thus better capture this change.
- Historically and over the long-term, the EW index outperforms the MCW index.
- At AtonRa, the median market cap of our holdings is \$15bn and are thus rather positioned to capture challengers' performances.

Is the trend changing?

For the past 6 years MCW outperformed EW and even accelerated slightly before the Covid crisis. Since September 2020 however, EW started to outperform.

- Does it suggest we are entering a new cycle?
- Are new players dethroning the FAANGs?

SOURCE:
[Reuters / Refinitiv Eikon](#)



Invest Beyond The Ordinary

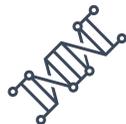
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AtonRâ Partners is a conviction-driven asset manager combining industrial and scientific research with financial analysis. AtonRâ Partners focuses on long-term trends powerful enough to be turned into thematic equity portfolios.

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