

Investing in Bitcoin's Climate Pollution

Big Finance
is Betting on
Dirty Bitcoin



GREENPEACE

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Greenpeace is an independent campaigning organization that uses peaceful protest and creative communication to expose global environmental problems and to promote solutions that are essential to a green and peaceful future.

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EXECUTIVE SUMMARY

Bitcoin has emerged as a new roadblock to progress on addressing the climate crisis. The energy consumption and carbon emissions from Bitcoin, the world's largest cryptocurrency, rival those of some small countries, and the global machine that keeps it running generates air, water, and noise pollution. Bitcoin has also provided a much-needed lifeline to fossil fuels, working against progress in efforts to phase out coal, oil, and gas. Left unchecked, Bitcoin's climate destruction is likely to accelerate.

Despite these challenges, traditional financial services companies continue to fuel Bitcoin's expansion by investing in Bitcoin mining companies and offering new investment products and services tied to Bitcoin. This report evaluates the role nine large

financial services companies are playing in Bitcoin's climate-wrecking growth and whether they are working to address Bitcoin's pollution. All of these companies have connections to Bitcoin and have failed to take meaningful action to solve the problem despite making climate and sustainability pledges.

Our research finds that asset manager BlackRock and bank JPMorgan Chase & Co. are leading Bitcoin supporters in their respective sectors of the financial services industry. These companies provide a range of investments and services, and have done nothing to address Bitcoin's impact on communities and climate. They have failed to acknowledge the problem and take responsibility for cleaning up Bitcoin.



INTRODUCTION

Since Bitcoin (BTC) launched in 2009, the technology has dramatically altered the ways we interact with technology and finance. **Today, Bitcoin poses a threat to our future by fueling the climate crisis.** The latest synthesis report from the Intergovernmental Panel on Climate Change (IPCC) warns us that limiting warming to 1.5°C is the safest trajectory for society, but that target is quickly slipping away and demands fundamental transformations of the global economy.¹ Numerous international agencies and scientific bodies have determined that meeting the 1.5°C target will require us to rapidly expand renewable energy and keep fossil fuels in the ground.² At this moment, Bitcoin's large energy consumption is completely at odds with the dramatic change we need to make.

Bitcoin's problem lies in its code. As coded today, Bitcoin transactions are recorded through an energy-intensive process called proof-of-work (PoW) mining. To feed the machine, **Bitcoin consumes as much electricity as medium-sized industrialized countries like Sweden.**³ The vast network of miners that keep the wheels turning have also revived decommissioned coal-fired and fossil fuel power plants and siphoned electricity from the same infrastructure that powers our homes. Yet, there are alternative consensus mechanisms that consume a mere fraction of the energy.⁴

Bitcoin's energy consumption leads to increased greenhouse gas (GHG) emissions at precisely the moment we need to reduce them. In 2022, Bitcoin was estimated to produce 58 Metric tons (Mt) CO₂, which is more than all of Chile.⁵ Tragically, the problem is only going to grow more severe if Bitcoin fails to evolve beyond PoW. **Future growth in the cryptocurrency's use and price would send Bitcoin's energy consumption and carbon emissions soaring, create incentives for miners to seek cheap energy sources like coal, and roll back the hard-won progress made on cutting emissions.**

Against this background, Bitcoin is at an important crossroad. **To safeguard against further climate destruction, it is critical that we modify Bitcoin's underlying code and eliminate PoW mining.** The challenge to realizing this critical evolution of Bitcoin is precisely the same feature that makes it unique – it is a decentralized network. To adopt a new sustainable

system, a diverse coalition of stakeholders, including financial companies and Bitcoin developers, need to come together, agree on the problem, and shape the next iteration.

To encourage this process, Greenpeace USA is focused on leaders in the traditional financial services sector who facilitate Bitcoin's growth. The Bitcoin industry—including the companies that operate crypto exchanges where people can buy, store, and sell bitcoin, and run industrial Bitcoin mining facilities—is dependent on access to traditional government-backed currencies and banking services. Major banks and asset managers have poured millions into the mining companies that are straining the grid and spewing pollution. Payment processors are driving Bitcoin's accelerating energy consumption by enabling further adoption. Despite any progress these companies have boasted in recent years on reducing the climate impact of their operations and portfolios, their Bitcoin investments and products fall outside the boundaries of their carbon



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accounting and impede progress on environmental sustainability goals.

This report investigated nine major financial institutions pulling the strings to keep the Bitcoin climate wrecking ball swinging. Our research identifies BlackRock as the worst contributor among asset managers, which provide the most direct support to Bitcoin miners in the form of bonds and shareholdings as well as investment products and services tied to Bitcoin. JPMorgan Chase & Co. (Chase) is the biggest Bitcoin backer within the banking sector, which provides a mix of mining company investment, and Bitcoin products and services. Among payment processors, our research found that both Visa and Mastercard provide substantial support for broader Bitcoin adoption.

These companies have a responsibility to engage in future-proofing Bitcoin. Namely, they are uniquely positioned to resource and support the development

and implementation of an alternative consensus mechanism for securely validating transactions and maintaining Bitcoin's digital ledger that is less energy-intensive and polluting. There is a broad menu of technologies to choose from and examples of other digital assets that have evolved beyond PoW mining and adopted less energy intensive systems.⁶ To date, the financial services industry has failed to acknowledge responsibility for the problem. Major asset managers, banks, and payment processors have put profit before people and the planet by turning a blind eye to Bitcoin's climate impact.

The movement to Change the Code offers the finance industry an opportunity to lead the way in developing a new, cleaner future for Bitcoin. If it successfully innovates, Bitcoin can join the other technologies that are innovating to respond to the climate crisis. If it fails, the technology will remain incompatible with a just, habitable planet for all.



BITCOIN MINING'S ENVIRONMENTAL AND SOCIAL COST

Pollution and Community Harm

The process of mining Bitcoin comes with a significant cost to air, land, water, and community health. While Bitcoin proponents argue that PoW mining offers benefits to communities, on-the-ground realities have yet to deliver on the technology's promises.⁷ So, how does Bitcoin cause pollution and community harm?

Bitcoin is the largest and most popular digital cryptocurrency which works outside a centralized authority like a bank or government. It operates through a decentralized and collectively-maintained database, or digital ledger, that provides a record of all Bitcoin transactions stored on the blockchain. The record's accuracy is protected through cryptography to prevent double counting and fraudulent transactions. This process requires a mechanism for reaching consensus to validate transactions. Bitcoin uses a proof-of-work (PoW) mechanism in which participants are committed to protecting the system's integrity by putting in work, and thereby consuming electricity.⁸ Many other, and newer, cryptocurrencies don't use this energy-guzzling process, thus, Bitcoin is far and away the biggest polluting cryptocurrency.⁹

To prove their work, miners compete to be the first to guess the number that completes a complex algorithm. The computers act like random number generators and those with more computing power can guess more numbers in less time, increasing their chances of winning. The winner gets to validate a new set, or "block," of Bitcoin transactions that are added to the blockchain and is rewarded with transaction fees and newly generated bitcoins, or a "block subsidy."¹⁰

As Bitcoin mining has evolved, miners have expanded their computing power. Mining companies use warehouse-sized banks of specialized computers called application-specific integrated circuit (ASIC) computers designed solely to participate in the number guessing game. The machines are

power-hungry and require resource-intensive cooling mechanisms. At the time of this report, **Bitcoin mining is estimated to use more electricity than some entire countries, including what the Philippines and Sweden consumed in 2019.¹¹ In the United States, the seven largest crypto mining companies use the same amount of electricity needed to power every residence in Houston, which has a population of 2.3 million people.¹²**

Electronic waste from Bitcoin mining is also notable. The thousands of specialized Bitcoin mining computers only last a short time, quickly becoming obsolete in the competitive race to have the fastest and most efficient hardware, and turn into e-waste.¹³ Data is incomplete, but one estimate suggests Bitcoin mining generates roughly 45.51 kt of e-waste in a year, equivalent to the IT waste generated by the Netherlands.¹⁴ The comparison to other segments of the financial sector is difficult. What can be said with certainty is that fixing Bitcoin would nearly eliminate this e-waste entirely, reducing the volume of e-waste that ends up in landfills, incinerators, and disassembly operations that harm the poorest and most vulnerable communities.



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Bitcoin is a Carbon Timebomb

A substantial body of research has documented Bitcoin's large and growing energy consumption. In 2014, the electricity needed to mine a single bitcoin was equal to the amount an average U.S. household used in 275 days. By 2022, that figure had skyrocketed to around nine years.¹⁵ From 2016 to 2018, researchers estimate that mining digital assets consumed more energy than the physical mining of copper, nickel, and gold to produce the same market value.¹⁶

Bitcoin's energy-hungry technology has caused substantial environmental and social damage. Much of the electricity powering Bitcoin mines comes from fossil fuels, especially dirty coal. Researchers at Cambridge University's Centre for Alternative Finance estimate that **62% of the electricity used for Bitcoin mining globally in 2022 came from fossil fuels** and coal was the largest single source. Only 26% of the electricity was from renewables.¹⁷ Bitcoin mining companies have even reopened mothballed coal-fired power plants while others are using waste coal, one of the dirtiest sources of energy.¹⁸ Analysis by researchers at the nonprofit WattTime for a *New York Times* investigation found that 34 large crypto mines in the U.S. cause nearly 16.4 million tons of carbon pollution each year.¹⁹

Bitcoin's energy consumption has kept more coal and gas power in our energy mix, in parallel with an

increasingly urgent need to hasten our transition away from fossil fuels.²⁰ Bitcoin's fossil fuel lifeline even extends to companies like ExxonMobil, which is exploring how to do Bitcoin mining at fracked oil and gas wells.²¹

The connection to climate change is real. By creating new demand for dirty energy, Bitcoin mining is accelerating climate change and producing GHG emissions. **In 2022, the global Bitcoin industry produced around 58 Mt of CO2 annually, more than country-level emissions from Chile.**²² And Bitcoin's carbon footprint has only grown over time. **Researchers estimate that in 2021 mining a single bitcoin emitted 126 times the CO2 as a bitcoin mined in 2016.**²³

Much of Bitcoin's GHG emissions originate in the United States, which was estimated to have almost 40% of global Bitcoin mining computer power.²⁴ In 2021, when China cracked down on Bitcoin mining, partially due to environmental concerns, miners relocated to other parts of the world.²⁵ Places with cheap fossil fuels took on a greater share of global mining operations, including Kazakhstan, parts of the former Soviet Republic, and the United States. The net impact seems to be that Bitcoin's carbon intensity increased.²⁶ **In the United States alone, the CO2 emissions from Bitcoin mining facilities is equivalent to adding 7.5 million vehicles to American roadways.**²⁷ Yet, information on the location and energy sources of Bitcoin mining facilities is hard to find, pointing to the need for increased disclosures and transparency in the industry.



Scrubgrass Generating Power Plant in Pennsylvania

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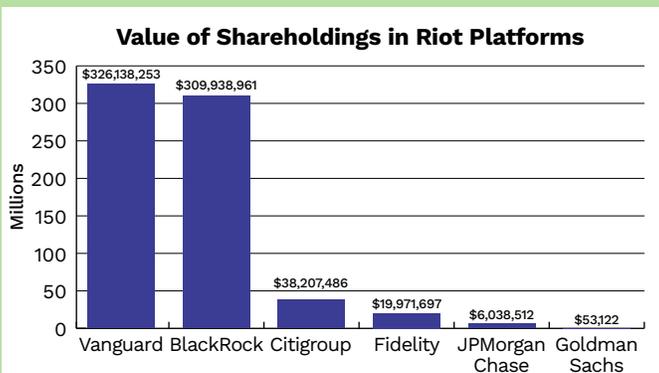
Riot Platforms: The Biggest Carbon Emitter

Of the Bitcoin mining companies in this report, Riot Platforms is a leading recipient of investment dollars from banks and asset managers — over \$700 million from Vanguard, BlackRock, Fidelity, JPMorgan Chase, Goldman Sachs Group, and Citigroup. Vanguard and BlackRock are the company's two largest shareholders, with combined holdings of about one third of shares.

These investments support an energy and subsidy-guzzling facility. Riot's facility in Rockdale, Texas is the largest carbon emitter and energy user among U.S.-based Bitcoin mines, according to a *New York Times* investigation.²⁸ The mine is estimated to consume as much electricity as 300,000 surrounding homes. Analysis by the nonprofit WattTime found that the facility emitted 1.918 million tons of CO₂ per year and 96% of its energy demand was met by fossil fuels.

Riot has even found a way to get paid by Texas ratepayers through a program called Responsive Reserve Service that pays large energy users to use less energy or shut-off during periods of peak demand. Through this program, it can be more profitable for Riot to turn-off its computers than mine Bitcoin.²⁹ In 2022, Riot made nearly \$9.3 million from the program.³⁰

Residents in Navarro County, TX, have organized against Riot Platforms to stop the miner from consuming massive amounts of electricity, increasing rates for water and electricity for residents, increasing air pollution, and causing excessive noise pollution.³¹



Based on shareholdings and prices as of 4/25/2023³²



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If we fail to fix Bitcoin, its energy consumption will continue to grow, particularly as large financial companies further enable its wider adoption and push more miners into this lucrative guessing game. The industry's emissions will continue to take us in the wrong direction and further complicate efforts to avert the worst consequences of the climate crisis. Given the magnitude of Bitcoin's energy consumption and the potential for it to grow rapidly as Bitcoin adoption scales, simply converting the Bitcoin mining industry to renewable energy will not suffice. We need to reduce energy demand to defuse this carbon time bomb before it detonates by changing Bitcoin's consensus mechanism.

Bitcoin Losing Its Social License

Because of Bitcoin mining's excessive energy consumption, some countries have banned mining and several U.S. states are considering stricter regulations. Before implementing a ban on Bitcoin mining in 2021, China hosted the largest crypto mining industry in the world.³³ Iceland, where geothermal energy had initially attracted miners, placed a moratorium on new facilities.³⁴ Sweden and Norway recently increased tax rates for Bitcoin miners making it largely unprofitable to mine.³⁵ In the United States, the New York state government passed a two-year moratorium on new crypto mining facilities operating behind-the-meter with fossil fuels.³⁶

At the local level, communities are resisting Bitcoin mining companies that try to hang a shingle in their backyards. Air, water, and noise pollution drive a wedge between the miners and their communities and feed local resistance.³⁷ Communities across the

United States living near Bitcoin mines have complained about the constant noise from the 24-hour operations.³⁸ Other damages include water pollution from water withdrawal and discharge for power plant operations and cooling mining facilities, solid waste from burning fossil fuels, and land use changes from the construction of these industrial operations.³⁹

The problem is especially dire where mines are powered by coal-fired and fossil gas power plants. Coal combustion produces fine particles of sulfur dioxide, nitrogen oxides, and other air toxins. These local impacts can also worsen existing environmental injustices burdening neighboring communities.⁴⁰

Stronghold Digital Mining, a company in which Fidelity, Goldman Sachs, BlackRock, and Vanguard hold shares, purchased two waste coal-fired power plants in Pennsylvania that had been operating inconsistently but are now running regularly to power Bitcoin mining.⁴¹ Waste coal is one of the dirtiest forms of energy. According to U.S. Energy Information Administration data from 2021, Pennsylvania's waste-coal-fired power plants had average CO2 emissions of over 2,760

pounds per megawatt-hour (MWh), one of the most carbon intensive fuel sources.⁴² Nearby residents are also exposed to hazardous air pollutants, including sulfur dioxide and nitrogen, and safety risks from large trucks carrying waste coal on small country roads to the plant.⁴³ U.S. Environmental Protection Agency (EPA) data shows that the company's operations have increased sulfur dioxide emissions by 351% and nitrogen oxides by 1,224% in 2022 compared to 2020 levels. The waste coal-fueled operations released over 1.4 million tons of carbon dioxide in 2022.⁴⁴

Shareholdings in Stronghold Digital Mining

Company	% Shares	Market Value
Vanguard	2.92	\$1,119,091
BlackRock	0.84	\$318,000
Fidelity	0.03	\$136,375
Goldman Sachs	0.36	\$12,281

Note: Based on shareholdings and prices as of 4/25/2023.⁴⁵

Scrubgrass Generating Power Plant in Pennsylvania



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BIG FINANCE AND BITCOIN'S GROWING POLLUTION

The growth of Bitcoin and the recent boom of U.S. Bitcoin mining relies on the money and support of major financial services companies. Energy-intensive and volatile Bitcoin is adding to the climate crisis and putting everyday Americans' financial security at risk while big investors and corporations reap the rewards of Bitcoin's expansion.⁴⁶ Researchers have found that increased demand for Bitcoin leads to environmental degradation.⁴⁷ Yet these same financial companies have pledges to reduce GHG emissions and the environmental impacts of business operations. Bitcoin investments are a barrier to achieving these goals and need to be addressed as part of companies' sustainability plans.

Cryptocurrencies like Bitcoin were created as alternatives to the traditional economic system but are now intertwined with large, mainstream financial companies in many different ways. **Asset managers and banks are investing and providing financial services for Bitcoin mining companies – supporting the facilities that drive Bitcoin's fossil fuel consumption and contribute to its carbon footprint.** Bitcoin mining has become big business, with large publicly-traded companies dominating the sector. According to JP Morgan Chase & Co. (Chase) analysts, U.S.-listed Bitcoin miners had a total market cap of \$7.3 billion as of April 14, 2023, and were dominant players in Bitcoin mining, collecting an estimated 73% of the annual rewards from adding blocks to the blockchain and representing 21% of the global network hashrate (a measure of computing power deployed for Bitcoin mining).⁴⁸

Large financial services companies are also creating more ways for individual and institutional investors to put their money into Bitcoin. This includes funds tracking the crypto industry, crypto exchanges that let customers buy, sell, and store bitcoin, and tools for trading bitcoin futures and derivatives. Payment processing companies like Visa and Mastercard are also making it possible for people to buy things with bitcoin, and developing software and services to help banks support cryptocurrencies including Bitcoin (see section on payment processors for more details). However, unlike companies such as Tesla, which

owns \$184 million worth of bitcoin, these mainstream financial corporations appear to have no direct bitcoin holdings.⁴⁹

While these companies invest in carbon-intensive Bitcoin, they have made pledges to reduce carbon emissions and plans to increase corporate sustainability. With the exception of Fidelity and Vanguard, the companies Greenpeace USA surveyed for this report have net zero emissions pledges and claim to support the goals of the Paris Climate Agreement. Many have joined global initiatives like the Glasgow Financial Alliance for Net Zero (GFANZ), and the sector-specific United Nations Net Zero Banking or Asset Owner Alliance.⁵⁰ Financial companies are beginning to disclose GHG emissions from business operations and even from investments. Yet, **the leaders of these companies continue to expand into Bitcoin without acknowledging Bitcoin's pollution and contribution to the climate crisis.**

Companies have known about this problem for years. In 2017, Mastercard stated in its Corporate Sustainability Report that "new research shows that cryptocurrencies like Bitcoin are inherently more energy-intensive than Mastercard's payment network."⁵¹ Analysts from Citigroup published a report documenting Bitcoin's high energy use and warned that the carbon emissions could spark regulatory scrutiny.⁵²

With increased scrutiny from regulators and customers, the head-in-the-sand approach will not work for long. Major financial services companies expanding into Bitcoin will have to deal with the growing climate risk on corporate balance sheets. Extreme weather, which is getting more frequent and intense with climate change, is a material risk to Bitcoin mining operations. For example, ice storms in Texas and increasingly severe hurricanes in the Gulf Coast can disrupt energy supplies and directly damage mining facilities.⁵³ Heat waves and cold snaps can increase energy costs, leading miners to curtail and shutdown their operations.⁵⁴ The massive 750-megawatt capacity Riot Platforms mine in Rockdale, Texas had to shut down for weeks following damage to equipment from a series of extreme winter weather events.⁵⁵

Policymakers are starting to take notice and have proposed a range of laws, taxes, and regulations that would require the industry to report its carbon emissions and pay for its energy appetite. For example, the Biden administration proposed an excise tax on electricity used by crypto miners.⁵⁶ Considering their already razor-thin margins, the 30% increase to miners' major operating expense would be a significant blow, concluded analysts with crypto-intelligence firm Coin Metrics.⁵⁷ In 2023, U.S. Senator Edward Markey re-introduced the *Crypto-Asset Environmental Transparency Act*, which would require Bitcoin mining companies to disclose GHG emissions and direct the EPA to study the impacts of Bitcoin mining.⁵⁸

Evaluating Corporate Bitcoin Connections

To hold the financial sector to account on its climate pledges and to encourage greater responsibility for Bitcoin's pollution, this report evaluates companies' ties to Bitcoin and the extent to which those companies are acknowledging and addressing the problem in line with sustainability initiatives. We examined companies in three sectors that play a critical role in Bitcoin's expansion: banks (Citigroup, Goldman Sachs, and JP Morgan Chase), asset managers (BlackRock, Fidelity, and Vanguard)⁵⁹, and payment processors (American Express, Mastercard, and Visa). Within each sector we selected the three largest U.S.-based companies that are the most active in Bitcoin and assess the Bitcoin-related investments and services offered, contrasted with corporate climate and sustainability pledges. We evaluated companies on the extent of Bitcoin investment and services, the strength of climate commitments and emissions reduction pledges, and the level of acknowledgment and action to address Bitcoin's climate and community impacts.

We collected data on the following types of investments and exposure to Bitcoin:

- Providing and supporting investment products tied to Bitcoin
- Investing in Bitcoin mining companies through shareholding, bondholding, lending, and underwriting

- Partnering with and investing in crypto companies that provide vital services for Bitcoin like wallets, exchanges, and data analytics
- Supporting payments and transactions using bitcoin
- Providing consulting, data, and research services related to Bitcoin
- Corporate ownership of bitcoin

We also reviewed company ESG (environmental, social, and governance) efforts and actions on climate change, including:

- Company sustainability and climate reports, including net zero pledges
- ESG and sustainability scores from industry-leading measures including MSCI and Standard and Poor's (S&P)
- Membership in national and international groups and alliances on climate change and sustainability

We assessed the strength of corporate climate and sustainability plans, primarily if the company has a net zero pledge and is a member of the Glasgow Financial Alliance for Net Zero (GFANZ), and the associated groups for banks and asset managers. GFANZ was formed to ensure the financial industry worked to meet the goals of the UN Paris Climate agreement, particularly limiting global warming to 1.5 C. We find that the stronger corporate climate pledges are aligned with reducing emissions to meet a 1.5 C target and have a deadline of reaching net zero company emissions by 2050 or earlier.⁶⁰

Finally, we evaluated companies based on their acknowledgement and action to solve Bitcoin's climate problem. GPUS reached out to representatives of the nine companies and asked about their Bitcoin investments and awareness of the climate impacts. We requested companies make a statement about Bitcoin's pollution and support action to decarbonize Bitcoin. We also reviewed company websites, press releases, and documents related to Bitcoin and crypto to see if they discussed environmental and energy issues.

Failing on Climate

We find that these stalwarts of the mainstream financial industry are expanding into Bitcoin by investing in Bitcoin mining companies, and creating new services and partnerships to enable investments and transactions in bitcoin. All nine companies have ties to Bitcoin and are involved in various activities that help grow and mainstream Bitcoin which will mean more energy use and GHG emissions. **BlackRock and Chase stand out within the asset manager and banks categories, respectively, for Bitcoin exposure in sharp contradiction to corporate climate pledges.**

As a class, asset managers are the Bitcoin mining industry's largest backers, mainly in the form of significant shareholdings in mining companies. BlackRock stands out as a laggard given its mining industry investments combined with a range of services and investment products related to Bitcoin. Vanguard and Fidelity are also betting big on Bitcoin and offer myriad investment and trading services linked to Bitcoin alongside their shareholdings in mining companies.

Among the banks, our research identifies Chase as a key laggard. Its Bitcoin mining company investments total more than \$25 million and it offers a range of investment products and services tied to Bitcoin. Although Chase CEO Jamie Dimon has been critical of Bitcoin publicly,⁶¹ the bank has yet to comment on Bitcoin's environmental impact and Dimon's critical remarks belie the tangible support Chase is providing to Bitcoin. Goldman Sachs has a comparable investment interest, but is found to perform slightly better in our assessment given a smaller breadth of Bitcoin products and services.

Finally, the research finds payment processing companies primarily support Bitcoin by offering credit and debit cards that facilitate bitcoin transactions. Visa and Mastercard are found to be expanding crypto-related services and partnerships that likely have connections to Bitcoin.

All of these companies are failing to address Bitcoin's pollution. Financial companies' Bitcoin exposure demonstrates disregard for the harm to the planet and communities caused by Bitcoin's further expansion. None of the companies have adequately acknowledged Bitcoin's climate problem or supported meaningful solutions. Some companies appear to be aware of Bitcoin's problematic energy use but have not clearly stated the problem to the public or taken any responsibility. However, in an important initial step, several companies, including Visa, Mastercard, and Citi, have started engaging with GPUS on the issue. Mastercard has expressed support for "energy-efficient solutions that consider climate and community impacts."⁶²

Investments in Bitcoin Mining Companies

Financial Company	Total Investments	# of mining companies
Vanguard	\$615,593,590	17
BlackRock	\$595,579,704	18
Fidelity	\$86,707,485	22
Goldman Sachs	\$28,087,684	9
JPMorgan	\$26,068,266	17
Citigroup	\$125,317	10
Total	\$1,352,162,046	24

Based on combined holdings of shares and bonds as of 4/25/2023⁶³



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BITCOIN EXPOSURE SCORECARDS

BlackRock[®]

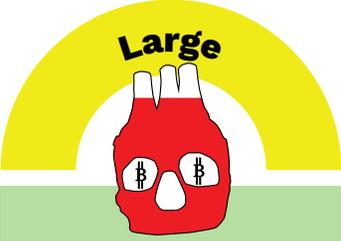
Very Large



Large investments in mining companies and offers BTC investment services and products

J.P.Morgan
CHASE

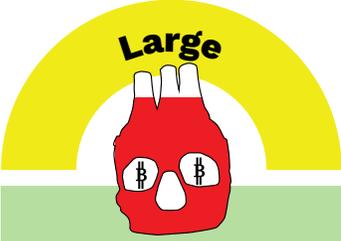
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Investments in mining companies and offers BTC investment services and products

 **Fidelity**
INVESTMENTS[®]

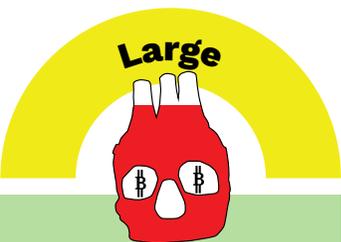
Large



Large investments in mining companies and offers many BTC investment services and products

Vanguard[®]

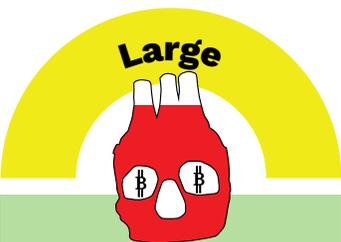
Large



Largest investments in mining companies offers BTC investment services and products

Goldman Sachs

Large



Investments in mining companies and offers BTC investment services and products

citi

Moderate



Offers some BTC investment services and products, and small investments in mining companies



Moderate



Offers BTC debit cards, supports crypto start-ups, and provides crypto consulting



Moderate



Offers many BTC debit cards and provides crypto consulting

AMERICAN EXPRESS

Small



Invests in crypto start-ups and offers debit card with rewards in BTC

Companies' exposure to Bitcoin was evaluated based on the extent of investments in Bitcoin mining companies, Bitcoin investment products and services, and payment enabling services like debit cards that spend Bitcoin. We assess companies' exposure levels from very large, large, moderate, small, very small, to none.

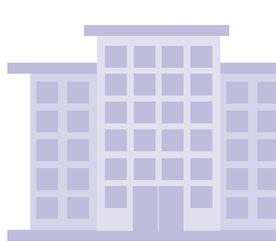
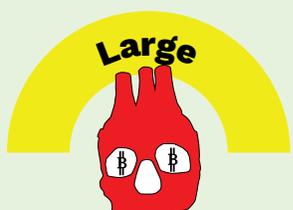
Section 1: Asset Managers

Asset management companies provide essential funding to Bitcoin mining companies and create investment products that enable customers to bet on the price of bitcoin. The trillions of dollars controlled by asset managers play a huge role in how people and companies invest and save money, and can shape the direction of the economy. Therefore, these companies hold a critical responsibility for Bitcoin's expansion and its climate impacts.

Publicly-traded Bitcoin mining companies rely on equity offerings to raise capital, which depends on getting large investors and mutual funds to invest. Without support from these big money managers, the companies that mine, sell, and trade bitcoin would struggle to operate. Plus, it would be riskier and more challenging for individuals to invest in bitcoin without trusted and reputable companies moving into the industry.

Our research examined Bitcoin ties among the three largest U.S. asset managers, BlackRock, Vanguard,

and Fidelity. In 2021, financial news outlets noticed that large asset managers like BlackRock, Fidelity, and Vanguard were buying stocks in crypto mining companies.⁶⁴ BlackRock stands out for having the second largest shareholdings in Bitcoin mining among the three asset managers and breadth of Bitcoin-related investment services. Fidelity has smaller shareholdings in mining companies, but was an early Bitcoin adopter and now offers a wide-range of investment services and products tied to bitcoin that are helping it become more mainstream. Vanguard is the most cautious about crypto investment services, but nonetheless, is the largest shareholder in Bitcoin mining companies among the companies we researched. On climate, Fidelity and Vanguard are laggards. They do not have concrete net zero pledges and have backtracked on their own climate commitments. BlackRock, on the other hand, seeks to be a leader on climate.⁶⁵ Yet none have directly acknowledged Bitcoin's pollution or been willing to engage with GPUS to solve the problem.

	<h3>Asset Managers</h3> <h4>Mining Investments</h4> <p>Share and bond holdings in mining companies fuels industry expansion</p>	<h4>Support BTC Investing</h4> <p>Investment and trading services contribute to growth in BTC price and the incentive to mine and consume energy</p>	<h4>Solving the Problem</h4> <p>Acknowledgement of the problem and support for a code change to reduce BTC's pollution</p>
	<p>\$598 million</p> 	<p>Moderate</p> 	<p>No Action</p> 
	<p>\$615 million</p> 	<p>Small</p> 	<p>No Action</p> 
	<p>\$87 million</p> 	<p>Large</p> 	<p>No Action</p> 

Bitcoin (BTC)

BlackRock

BlackRock is one of the largest asset managers in the world, with \$8.6 trillion in assets under management serving retail and institutional clients.⁶⁶ The company is rolling out various Bitcoin-related products and services that enable clients to buy and sell bitcoin. The company also has investments in Bitcoin mining and crypto industry companies.

BlackRock is expanding into Bitcoin despite the 2022 crypto winter and high-profile collapses and fraudulent activities in the sector. In his 2023 annual letter to shareholders, BlackRock CEO Larry Fink highlighted his optimism for crypto while also pointing out that it carries risk. “At BlackRock we continue to explore the digital assets ecosystem, especially areas most relevant to our clients such as permissioned blockchains and tokenization of stocks and bonds. While the industry is maturing, there are clearly elevated risks and a need for regulation in this market.”⁶⁷ While Fink recognizes the need for regulation, the company is still expanding into the sector while not addressing Bitcoin’s pollution.

BlackRock offers numerous ways for clients to invest in Bitcoin. In August 2022, the company made a significant move into crypto by offering its first direct bitcoin investment product – a private bitcoin trust for institutional investors tied to the price of Bitcoin.⁶⁸ BlackRock’s new partnership with Coinbase, the largest crypto-trading platform in the United States, will make it easier for institutional investors to manage and trade bitcoin.⁶⁹ The service will allow clients to manage their bitcoin alongside their other public and private investments.⁷⁰ In 2021, BlackRock filed documents with the Securities and Exchange Commission (SEC) to include bitcoin futures as eligible investments for two funds, the BlackRock Global Allocation Fund, and the BlackRock Strategic Income Opportunities Portfolio.⁷¹ A subsequent SEC filing showed that the BlackRock Global Allocation Fund held 37 bitcoin futures contracts with the CME. BlackRock also offers investment funds that track the broader crypto and web3 sectors including the iShares Future Metaverse Tech and Communications ETF (MTAV) that tracks companies related to the metaverse,⁷² and the iShares Blockchain and Tech ETF (IBLC) that tracks companies connected to blockchain technologies – the fund had a \$6.5 million market value as of Q2 2023.⁷³ In June 2023, shortly before this report’s publication,

BlackRock requested approval for a spot Bitcoin ETF from the SEC which contributed to a spike in Bitcoin’s price.⁷⁴

The company has investments in Bitcoin miners and crypto-related companies through its institutional investments and various investment funds. BlackRock invests in publicly-traded Bitcoin mining companies through direct ownership of shares and the holdings of ETFs, mutual funds, and other types of funds. Our research finds that BlackRock has shareholdings in 18 Bitcoin mining companies that are valued at over \$595 million, the second largest among the companies we studied.⁷⁵ For example, the BlackRock Small Cap Index VI Fund holds TeraWulf stock.

We can draw a direct line from BlackRock’s Bitcoin mining investments to the revival of fossil fuel infrastructure. BlackRock controls nearly 6% of Greenidge Generation Holdings’ stock and is the largest institutional shareholder. Greenidge converted a closed coal power plant to fossil gas in upstate New York to directly power a Bitcoin mine that has faced scrutiny from regulators and the public for its pollution.⁷⁶ BlackRock also holds \$2.8 million worth of bonds in Marathon Digital.⁷⁷ After the Bitcoin mining company Core Scientific Inc. filed for bankruptcy in 2022, BlackRock was among a group of creditors that lent the company about \$500 million by purchasing secured convertible notes. BlackRock accounted for \$38 million and contributed another \$17 million to a loan enabling the company to operate during bankruptcy.⁷⁸ Arcane Research found that BlackRock held 15.2% of shares in MicroStrategy, a company with large bitcoin holdings, which indirectly exposes BlackRock to Bitcoin.⁷⁹ BlackRock also had extensive holdings in Silvergate, the crypto-focused bank that collapsed in April 2023.⁸⁰

Climate

BlackRock’s Bitcoin offerings are in sharp contradiction with the company’s efforts to be a financial sector leader on climate and ESG. The company publicly supports action on climate change, and environmentally and socially-conscious investments, especially funding energy transitions. BlackRock has an A ESG rating from MSCI and the S&P Global ESG ranking places the company at 93, higher than the banks we examined. BlackRock is a signatory to the Net Zero Asset Managers initiative, which includes

pledging to support net zero emissions by 2050 in line with efforts to limit warming to 1.5°C. BlackRock is purportedly committed to investing in line with net zero emissions by 2050 and developing science based emissions reductions targets.⁸¹ However, the company's net zero plan has not been validated by the Science Based Targets initiative (SBTi).

BlackRock also promotes reporting of emissions as a member of the Task Force on Climate-related Financial Disclosures (TCFD), and a signatory to the UN's Principles for Responsible Investment. The company joined Climate Action 100+, a group of investors that engages with companies to improve climate disclosure and align business strategy with the goals

of the Paris Agreement.⁸² Yet, those disclosures have not incorporated emissions from Bitcoin.

BlackRock's executives have not made a public statement about Bitcoin's pollution and have not been willing to engage in conversation with GPUS. Yet, there is evidence that the company is aware that Bitcoin and PoW cryptocurrencies have a climate problem. BlackRock expressed support for efforts by the non-profits RMI and Energy Web to create more transparency about sustainable energy use in Bitcoin mining.⁸³ Thus, BlackRock has signaled support for at least some solutions to clean up Bitcoin, despite failing to acknowledge responsibility and take more meaningful action toward a code change.



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Fidelity Investments

Fidelity Investments is one of the largest asset managers in the world, with over \$10 trillion in assets under management and around 40 million customers.⁸⁴ The company has extensive mutual fund and 401(k) retirement plan offerings, and many Americans rely on Fidelity for their retirement savings. Fidelity was one of the first traditional finance companies to dive into the crypto sector and now offers many ways for institutional, private, and retail investors to invest in Bitcoin. Fidelity lends crypto a sense of trust and reputability while making it easier for casual investors to bet on Bitcoin, which is critical for its growth.

In 2014, Abigail Johnson took the helm of the private company founded by her grandfather and pushed the company into crypto. Johnson had been involved with Bitcoin mining for some time. “I really wanted to do mining because I wanted us to understand the whole ecosystem, I wanted us to have a seat at the table with people who were really driving things and understand the full stack,” Johnson said in a 2022 interview with *Forbes*.⁸⁵ She now speaks at crypto conferences and advocates for integrating cryptocurrencies like Bitcoin into the mainstream financial sector. Despite its fluctuations, instability, and scandals, Johnson continues to position crypto as part of Fidelity’s long-term strategy.⁸⁶

In 2018, the company launched its Fidelity Digital Assets unit, which focuses on institutional crypto investments and services. By 2022, the unit had scaled to around 500 employees.⁸⁷ Initially, it offered crypto trading and custody for institutions – securely storing investors’ assets like bitcoin.⁸⁸ It has since expanded its service offerings.⁸⁹ Bloomberg describes it as one of the most visible institutional advocates for crypto investing.⁹⁰

In a move that could bring Bitcoin investing to millions of Americans, Fidelity is letting employers with 401(k) plans give employees the option to direct some of their savings into Bitcoin, up to a 20% cap.⁹¹ This is a big move toward integrating Bitcoin into the retirement savings of people who otherwise would not have ventured into crypto investments. This move sparked concern from regulators and several U.S. senators wrote letters of concern to the company.⁹² The

Department of Labor (DOL) issued guidance suggesting 401(k) retirement plans stay away from speculative and volatile crypto investments.⁹³

In March 2023, the company launched its own Bitcoin trading and custody program for retail customers called “Fidelity Crypto.”⁹⁴ This launch marks the first time a major financial institution got involved in directly trading cryptocurrencies, including Bitcoin, and could compete with exchanges run by crypto-focused companies like Coinbase.⁹⁵

Fidelity also offers ways for clients to invest in Bitcoin and Bitcoin-related companies through various funds. The company is the first large asset manager to issue a Bitcoin exchange traded fund (ETF) linked to the price of Bitcoin, the Fidelity Advantage Bitcoin ETF (FBTC) that is listed on the Toronto Stock Exchange.⁹⁶ Fidelity applied to the SEC for a similar Bitcoin ETF in the United States but it was rejected due to concerns about fraud and manipulation.⁹⁷ FBTC currently holds 1590.19 bitcoin which was valued at around \$44.8 million in April 2023.⁹⁸ Fidelity’s All-in-One Balanced ETF also held \$1.7 million worth of bitcoin as of December 31, 2022.⁹⁹ Fidelity also manages funds that invest in the broader crypto industry, including the Fidelity Crypto Industry and Digital Payments ETF (FDIG).

Fidelity holds substantial stock in publicly-traded Bitcoin mining companies through ETFs, mutual funds, and direct investments, although less than fellow asset managers BlackRock and Vanguard. Our research found that Fidelity has shareholdings in 22 Bitcoin mining companies, valued at over \$86.7 million, including Hut 8 and Marathon Digital.¹⁰⁰ Through several funds, Fidelity also holds about \$500,000 of bonds in Greenidge Generation whose Bitcoin mine powered by a fossil gas plant in upstate New York has been subject to multiple lawsuits over environmental violations.¹⁰¹

Fidelity also invests in companies that provide services, like software and analytics, for the crypto sector. For example, in May 2021, Fidelity invested in Talos, a firm that provides companies with software for crypto trading.¹⁰² In 2021, Fidelity was an investor in a \$600 million funding round for Stripe, the payment and transaction software company active in supporting crypto.¹⁰³

While Fidelity does not appear to own bitcoin directly, the company does have Bitcoin exposure through its 7.3% stake in MicroStrategy, which is the largest corporate holder of bitcoin and led by a vocal Bitcoin proponent, CEO Michael Saylor. Microstrategy was one of the first large companies to state it would offer Bitcoin investments to employees through their Fidelity 401(k) plan.

Climate

Fidelity is a laggard on climate and ESG within the financial sector. The company has not joined the Glasgow Financial Alliance for Net Zero (GFANZ), and executives have said they do not want to commit to the net zero by 2050 targets.¹⁰⁴ Still, Fidelity has sustainability goals and reports on environmental and climate issues. Fidelity is a signatory to the United Nations Principles for Responsible Investment and claims to support the Task Force on Climate-Related Financial Disclosures' recommendations.

Fidelity's statement of sustainability intent emphasizes how the company will address energy consumption and other sustainability issues in corporate-owned buildings. The company claims to be in the early stages of adopting sustainability approaches throughout their business, including fund operations, products, risk management, and procurement.¹⁰⁵ In Fidelity's 2021 Environmental Report, company climate change goals are described as continuing "to reduce our greenhouse gas emissions by expanding use of renewable energy, with a dedicated focus on reducing carbon. At the same time, to build climate resilience, we are proactively planning for the increasing unpredictability of climate variability and long-term climate change." Yet, Fidelity has not set transparent and accountable emissions reduction targets or net zero pledges.

Fidelity has not acknowledged Bitcoin's pollution or its exposure to Bitcoin-related emissions. Company representatives have declined GPUS requests to meet and discuss the issue, and the company shows no signs of working to create a solution to Bitcoin's climate problem.



Vanguard

Vanguard is one of the world's largest asset management companies. It provides investment and advisory services, and serves a range of clients, including institutions, individuals, and mutual funds. The company has around \$8.5 trillion in assets under management and offers 215 U.S.-based funds and 205 funds outside the United States.¹⁰⁶ Vanguard's leaders have publicly expressed hesitancy about crypto as an investment, and the company has not created investment products directly tied to Bitcoin or other cryptocurrencies. However, Vanguard and its many investment funds have extensive shareholdings in Bitcoin mining companies, helping finance the facilities that consume large amounts of electricity and have large carbon emissions.

In 2017, Vanguard founder, Jack Bogle, commented that investors should “avoid Bitcoin like the plague” during a presentation at the Council on Foreign Relations.¹⁰⁷ In 2018, Vanguard chairman Will McNabb expressed skepticism about cryptocurrency, particularly due to speculation and “idiosyncratic risk.”¹⁰⁸ Unlike other asset managers, Vanguard does not offer ETFs focused on the crypto sector. In 2022 the company stopped letting clients purchase shares of the Grayscale Bitcoin Trust, one of the first securities tied to the price of Bitcoin and a popular way to indirectly invest in Bitcoin.¹⁰⁹

Yet, Vanguard does have exposure to Bitcoin. The company holds shares in many of the large publicly traded Bitcoin mining companies through its investment advising, institutional holdings, and mutual funds. According to our research, Vanguard holds stock in 17 Bitcoin mining companies, with shares representing over \$615 million – making Vanguard the largest investor in public mining companies among the large asset managers and banks we analyzed.¹¹⁰

Vanguard also has investments in other companies tied to the Bitcoin industry. The company had invested in Silvergate, the crypto-friendly bank that collapsed in early 2023.¹¹¹ In December 2022, Vanguard had indirect exposure to bitcoin through its 8.43% stake in leading bitcoin holder MicroStrategy.¹¹²

Vanguard also uses blockchain technology, which means the company has a stake in ensuring its products and services rely on a consensus mechanism that does not pollute and contribute to the climate crisis, unlike Bitcoin's. In 2017, Vanguard said it was developing the use of blockchain technology to update data for mutual funds, including some of the company's largest funds.¹¹³ By 2019, this system was in operation, making Vanguard one of the first major financial institutions to use blockchain for a core business service.

Climate

Vanguard is a laggard on climate action within the finance sector and has not made the net zero pledges necessary to avert the worst of the climate crisis. In December 2022, the company dropped out of the UN Net Zero Asset Managers initiative.¹¹⁴ Instead of making firm commitments to reduce emissions, Vanguard claims to be working on climate disclosures and getting companies they invest in to report GHG emissions. While Vanguard has some ESG focused funds, they offer fewer than other asset managers like BlackRock. According to research and analytics firm Morningstar, Vanguard has only 28 sustainable funds with assets of \$33.9 billion compared to BlackRock with 282 sustainable funds with assets of \$270 billion.¹¹⁵

Vanguard has not acknowledged Bitcoin's climate problem or the company's role in the issue, and has not applied GHG reporting and disclosure requirements to Bitcoin mining companies. Leaders from Vanguard have declined requests to meet with GPUS and have not expressed an interest in working towards a solution to clean up Bitcoin.

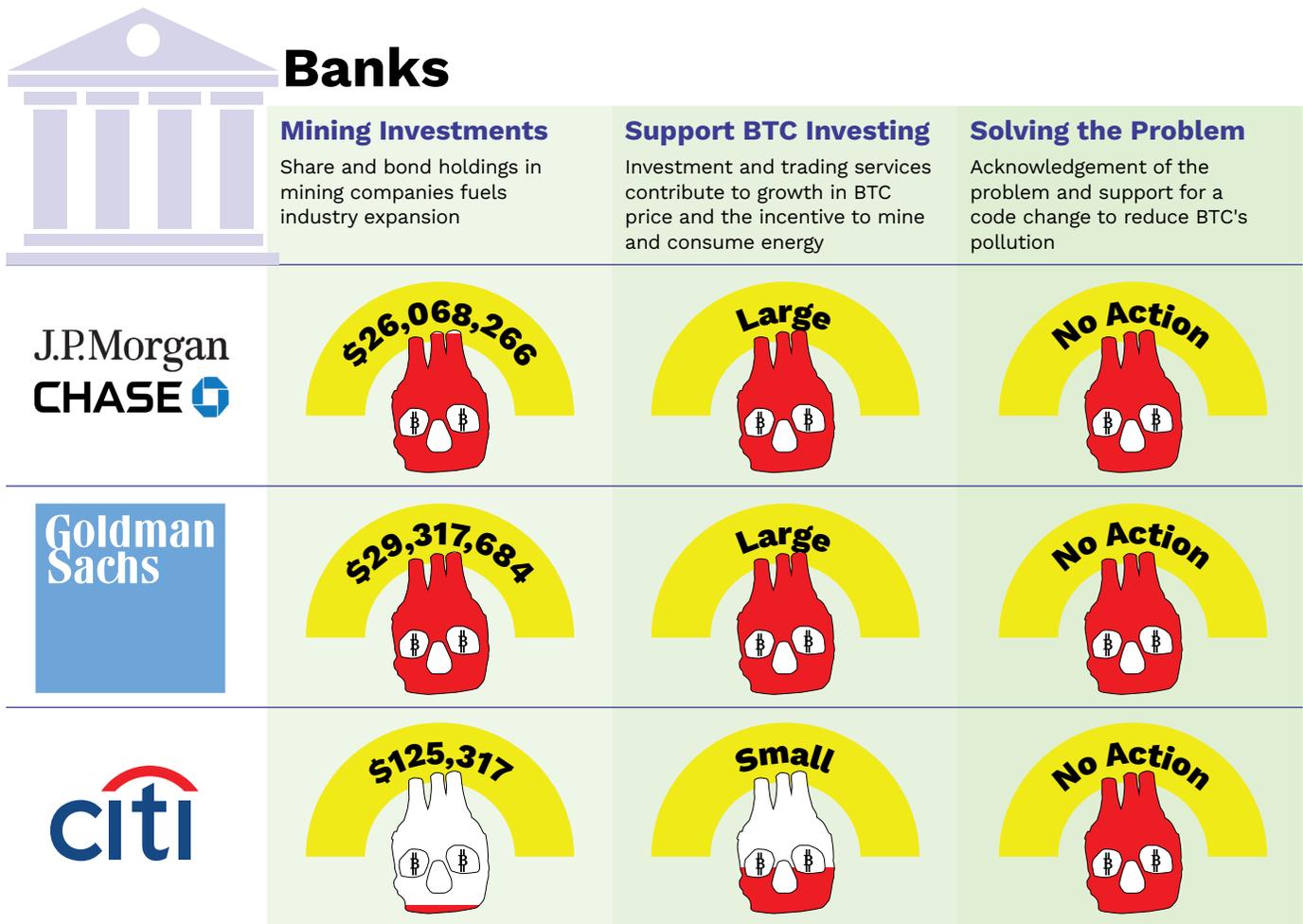
Section 2: Banks

By facilitating bitcoin investments and transactions, banks play a vital role in the functioning of the Bitcoin industry and its expansion. Banks also provide the funding and financial services necessary for Bitcoin mining companies to operate.

Retail and investment banks are creating programs and services that let institutional and individual clients buy and store bitcoin, helping mainstream the cryptocurrency. Commercial and investment banks are also vital for crypto companies that need access to capital to grow and a way to move bitcoin to and from US Dollars. Crypto exchange companies and Bitcoin miners need to pay employees and rent in US Dollars, and move clients' crypto holdings to and from US Dollars to facilitate transitions and payments. Thus, **Bitcoin would struggle without access to the mainstream banking system.**¹¹⁶

Many of the largest banks are expanding their Bitcoin interests. Our research focused on three of the largest U.S. banks (Citigroup, Goldman Sachs, and Chase) that are also the most active in offering Bitcoin products, services, and investments.

All three banks offer some type of Bitcoin investment product, and have invested in Bitcoin mining and crypto companies. Chase offers Bitcoin trading services to clients and, like Goldman, has over \$25 million worth of shareholdings in Bitcoin mining companies.¹¹⁷ Goldman Sachs created a dedicated crypto trading desk and is creating new ways to integrate Bitcoin into investing.¹¹⁸ While Citi has the least shareholdings in mining companies, the bank has helped several mining companies raise capital and offers some Bitcoin-related trading services.¹¹⁹ At the same time, these companies all have net zero pledges but have not reconciled those with Bitcoin's emissions. Citi has taken an initial step of engaging with GPUS to discuss the issue.



Bitcoin (BTC)

Citigroup

Citigroup is a large banking and financial services company with over \$2.4 trillion in assets and nearly \$15 billion of income in 2022.¹²⁰ Since 2021, Citi has been expanding its presence in the crypto sector. The company is reportedly developing new services to facilitate Bitcoin investment by providing trading and other services which could make it easier to buy and sell bitcoin.¹²¹ Citi also has investments that support Bitcoin mining companies.

In 2021, Citi announced that it would offer bitcoin futures trading for some institutional clients.¹²² That same year, Citi's Global Wealth Investments arm formed a Digital Assets Group to expand into crypto.¹²³ News outlets also reported that Citi hired 100 people to work in a blockchain and digital assets division.¹²⁴

Citi is also developing crypto services for markets outside of the United States. Citi's Securities Services team is also partnering with Swiss crypto firm Metaco to build Citi's digital asset custody capabilities, basically secure accounts to store digital assets that could include cryptocurrencies like bitcoin. Eventually clients might be able to keep their bitcoin in a Citi account rather than a wallet run by a crypto-specific company.¹²⁵

Citi has helped several Bitcoin mining companies raise capital through underwriting. Citi was an advisor for an initial public offering (IPO) by Canaan Inc., a producer of ASICS for Bitcoin mining that is expanding into the operation of mining facilities.¹²⁶ In October 2019, the IPO raised \$90 million.¹²⁷ Citi controlled 54.35% of the deal with 5.43 million shares priced at \$9 per share and earned an estimated \$3.91 million in fees.¹²⁸ Citi was also the sole manager of a private placement of \$500 million in notes for Galaxy Digital Holdings, a crypto investment and Bitcoin mining company, on November 29, 2021. Galaxy Digital intended to use the capital to fund growth initiatives.¹²⁹ Later in 2022, the company bought a mining facility in Texas.¹³⁰ While Citi is not a large shareholder in Bitcoin mining companies, the company does hold shares of ten miners worth about \$125,000 including Marathon Digital and Riot Blockchain.¹³¹

Climate

Citi has pledged to act on climate change and to align its business with environmental sustainability and social responsibility. Citi is a founding member of the UN's Net Zero Banking Alliance and has joined the RMI Center for Climate Aligned Finance and the Partnership for Carbon Accounting Financials (PCAF). The bank has committed to reaching net zero in company financing by 2050 and in operations by 2030.¹³² Citi has an A (out of a possible AAA) ESG rating from MSCI, a company that provides industry-leading ESG assessments, and has an 81 ranking by the S&P Global ESG ranking, another commonly used assessment, which is below the global median for peer companies but similar to other large U.S. banks. Citi has issued reports following recommendations by the Task Force on Climate-related Financial Disclosures (TCFD), a global organization that sets guidelines for voluntary climate-related financial risk disclosures, since 2018. Citi is also a signatory to the U.N. Environment Program's Principles for Responsible Banking.¹³³ Citi releases data on the company's investments in carbon-intensive sectors and scope 1, 2, and 3 emissions.¹³⁴ However, the company is not following science-based emissions targets, as defined by the SBTi, which are necessary for creating rigorous and verifiable pathways to net zero.

While Citi appears to know Bitcoin has an energy problem, the company continues to expand its offerings while remaining silent about its responsibility. Citi's climate disclosures and emissions reduction plans have not included Bitcoin. Yet, in 2021, Citi analysts published a report documenting Bitcoin's growing energy use and warned that the carbon emissions would likely meet public and regulatory scrutiny. The report highlighted how Bitcoin's energy consumption would accelerate alongside its price.¹³⁵ While company leaders have met with GPUS and expressed a willingness to engage the issue, **Citi has not publicly acknowledged the emissions from Bitcoin-related investments and services nor taken action to address the problem.**

Goldman Sachs

Goldman Sachs is the second largest investment bank in the world, with a market cap of around \$115 billion.¹³⁶

Goldman's embrace of crypto is a powerful signal of Wall Street's acceptance. The company is investing in Bitcoin related companies, offering new Bitcoin investment services and products, and taking steps towards integrating Bitcoin and cryptocurrencies into the mainstream financial industry. The crypto winter and upheaval following the collapse of FTX have not turned Goldman away. Instead, Goldman's head of digital assets, Mathew McDermott, described this as an opportunity to acquire crypto firms for cheap and to take a larger role in the industry.¹³⁷

Since 2021, Goldman has been busy growing its crypto business which means more exposure to Bitcoin. The bank re-opened a crypto trading desk that serves clients like hedge funds, endowments, and other institutional money managers.¹³⁸ Goldman also started trading in derivatives tied to Bitcoin and was among the first Wall Street investment banks to buy and sell Bitcoin options and futures.¹³⁹ In March 2021, Goldman was the first major U.S. bank to trade crypto over-the-counter, rather than through a stock exchange, in a bitcoin-backed deal with crypto-bank Galaxy Digital.¹⁴⁰ Then in April 2021, Goldman offered its first bitcoin-backed loan in which the borrower uses bitcoin as collateral. *Bloomberg* heralded this as a major step in Wall Street's Bitcoin offerings.¹⁴¹ In May 2021, the company started trading a derivative tied to bitcoin that lets clients bet on the price of bitcoin without actually having to buy bitcoin.

Reports suggest that Goldman is looking to increase crypto investment offerings which are sure to include Bitcoin since it is the largest and most valuable cryptocurrency. Goldman's global head of crypto trading, Andrei Kazantsev, said the bank is exploring new crypto markets and derivative products.¹⁴² For example, *Bloomberg* reports that Goldman is considering ways to offer hedge fund clients exchange-traded notes based on Bitcoin.¹⁴³ The bank is also exploring other services and products including crypto custody services, which could provide safekeeping of customers' Bitcoin.¹⁴⁴ Goldman was reportedly exploring an ETF based on Bitcoin's price in 2021, but thus far the SEC has rejected all applications for similar funds due to concerns about fraud and manipulation.¹⁴⁵

Goldman also has shareholdings in Bitcoin mining companies through funds the company manages and institutional holdings. Our research finds that Goldman controls shares in nine different mining companies with a total market value of around \$28 million.¹⁴⁶ The firm also has director holdings of stock in CleanSpark and Riot Platforms – a company operating the most power-intensive mining operation in the U.S.¹⁴⁷ Goldman holds another \$1.23 million of bonds in Marathon Digital, the company that had kept a coal-fired power plant in Hardin, MT operating to supply electricity for mining Bitcoin.¹⁴⁸

Goldman is the largest institutional holder, 3.13%, of the Fidelity Crypto Industry and Digital Payments Fund, which tracks companies related to cryptocurrency, blockchain, and digital payments.¹⁴⁹

Another crypto growth area for Goldman is research, analysis, and data services. In November 2022, Goldman launched Datonomy, a new classification system for the cryptocurrency market in collaboration with global index provider MSCI and crypto data firm Coin Metrics.¹⁵⁰

Climate

Goldman touts itself as a leader on climate and environmental sustainability within the financial services industry. The bank has active climate and ESG initiatives with various pledges about reducing emissions and conducting environmentally responsible investments. Goldman has an A ESG rating from MSCI and an 81 from the S&P Global ESG ranking, similar to peer companies.¹⁵¹ In March 2021, the bank joined the UN Net Zero Banking Alliance, the UN Net Zero Asset Owner Alliance, and the OS-Climate Initiative as its founding U.S. banking member.¹⁵² Goldman supports the United States returning to the Paris Climate Agreement and has pledged to align investments with a net zero by 2050 pathway. The company claims to have reached net zero in operations and seeks to reach net zero in company supply chains by 2030.¹⁵³ Goldman says the company will also address climate risks in its portfolio and investment strategies.¹⁵⁴ However, the company is not using targets validated by the Science Based Targets initiative (SBTi), a leading evaluator of company net zero plans.

Goldman discloses emissions using the Sustainability Accounting Standards Board (SASB) standards and in 2021 issued their inaugural Taskforce on Climate-related Financial Disclosure (TCFD) report.¹⁵⁵ Goldman also signed onto the UN Environment Program's Principles for Responsible Banking.¹⁵⁶ Goldman has pledged to conduct a carbon footprint analysis across their Fundamental Equity business within their Asset Management division which does not appear to include Bitcoin investments. While the company claims to apply rigorous environmental and social risk management, including a review of investments in carbon-intensive sectors, the company has not disclosed the climate impacts of Bitcoin-related investments.¹⁵⁷

Goldman Executives have not publicly acknowledged Bitcoin's climate impact or the company's role in the problem. They have not responded to

GPUS's communications and have not expressed a willingness to participate in conversations and collaborations to solve Bitcoin's climate problem. **Yet, it appears that some people in the company are aware of the issue.** Goldman has invested in Sustainable Bitcoin Protocol (SBP), a new company backed by major Bitcoin miners creating market-based solutions to incentivize renewable energy use for Bitcoin mining.¹⁵⁸ SBP plans to offer certificates for "green" Bitcoin mined with renewables which can then be bought and sold like a renewable energy credit.¹⁵⁹ However, there is little evidence for the effectiveness of this approach, and it does not address the underlying problem with Bitcoin's energy-intensive code unlike switching away from PoW. Still, this investment signals that Goldman knows there is a problem and could be part of funding and supporting more transformative solutions.



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JPMorgan Chase & Co.

JPMorgan Chase & Co. (Chase) is one of the largest banks in the world with \$3.7 trillion in assets and \$121.6 million in revenue in 2021 and is a leader in retail, commercial, and investment banking.¹⁶⁰ While Chase executives have been publicly critical of crypto, the company has started to expand into Bitcoin and other major cryptocurrencies. The company offers several bitcoin investment products and holds shares in Bitcoin mining companies.

CEO Jamie Dimon has been an outspoken critic of crypto. At the World Economic Forum in January 2023, Dimon famously mocked cryptocurrency as a “waste of time” and Bitcoin as a “decentralized Ponzi scheme” and a “hyped-up fraud.”¹⁶¹

Despite Dimon’s brash public statements, Chase started offering products and services tied to Bitcoin. In 2021, the bank launched an actively managed Bitcoin fund for private banking clients which is a partnership with NYDIG, the Bitcoin arm of asset management firm Stone Ridge. Chase advertises the fund as a cheap and safe way to invest in bitcoin.¹⁶² In July 2021, the company expanded access to bitcoin investments for more clients by allowing financial advisors to give wealth management clients access to Bitcoin funds through Chase brokerage accounts.¹⁶³ An internal memo told advisors that they could take orders to buy and sell five cryptocurrency products, including funds offered by Grayscale Investments that are tied to the price of bitcoin.¹⁶⁴ At the time, this put Chase ahead of competitors like Goldman, Morgan Stanley, and Bank of America, which had not given retail wealth clients direct access to crypto products. Chase analysts also issue research and reports on the Bitcoin market, which clients and industry watchers use.¹⁶⁵

Research also reveals Chase investments in Bitcoin mining companies. Through institutional holdings and managed funds, Chase controls shares in 17 mining companies with a total market value of over \$26 million.¹⁶⁶ It has also invested in other crypto companies, including its February 2022 acquisition of a minority stake in TRM Labs, which provides crypto compliance and risk management services.¹⁶⁷

Chase also uses blockchain technologies and is involved in decentralized finance (DeFi). The company created its own blockchain platform, Onyx, which it describes

as “the first global bank to offer a blockchain-based platform for wholesale payments transactions, helping to re-architect the way that money, information and assets are moving around the world.”¹⁶⁸ The bank completed a cross-border transaction using blockchain technologies which was called “a massive step for the crypto space.”¹⁶⁹ Chase must live up to its commitment to “promote long-term, innovative solutions for a more sustainable future” by ensuring new blockchain technologies are built on a clean and sustainable system that does not use an energy-intensive consensus mechanism like PoW mining.¹⁷⁰

Climate

Chase is actively addressing climate change and says it is committed to increasing sustainability across the company’s operations and investments. Chase has an A rating on ESG from MSCI and the S&P Global ESG ranking puts the company at 73, lower than many peer companies. The bank has been a member of the UN’s Net Zero Banking Alliance since 2021 and has pledged to reach net zero by 2050.¹⁷¹ The bank claims it will align key sectors of its financing portfolio with the goals of the Paris Agreement and will set portfolio emissions reduction targets, including for carbon-intensive sectors. Chase says it will report Scope 3 emissions from the company’s value chain. However, the company’s net zero targets are not validated by the Science Based Targets initiative (SBTi).¹⁷²

Chase has not indicated that Bitcoin-related investments are part of the company’s emissions reduction targets and reporting plans. The company has not made public statements or actions addressing Bitcoin’s climate problem, nor has it responded to GPUS’s requests to meet.



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Section 3: Payment Processors

Payment processing companies provide the credit and debit cards fundamental to the modern economy and can play a pivotal role in turning Bitcoin from a speculative investment asset into an actual medium of exchange. Currently, it's difficult to use Bitcoin for everyday purchases and transactions. However, Visa, Mastercard, and American Express are beginning to transform Bitcoin, making it easier to pay for everyday goods and services with bitcoin.

Research also revealed that payment processors are creating new services that let customers buy and sell bitcoin. Further, this investigation uncovered technical assistance to banks and other companies to support adoption of cryptocurrencies.

We examined the three largest payment processors based on revenue, which are among the biggest global brand names in credit and debit cards. Smaller digital payment companies like Block (formerly Square) and PayPal are very active in adopting Bitcoin into their

services, and are vocal boosters of crypto. However, we did not include them in this report given our focus on traditional finance companies.

Our research shows that Visa and Mastercard are the most active in crypto and are creating a range of services that have ties to Bitcoin. Both companies have partnered with crypto exchanges to offer debit cards that facilitate payments using cryptocurrencies, including Bitcoin, though Visa appears to be expanding these offerings more rapidly. Both offer consulting and data services related to crypto but Mastercard also has a start-up incubator dedicated to crypto. American Express is less active, but has invested in several crypto start-ups and is starting to create partnerships with crypto exchange companies that deal with Bitcoin. On the other hand, all three companies strive to be leaders on climate and sustainability, and have the strongest net zero pledges among the companies we examined. Thus, Bitcoin presents a contradiction for these companies as well as an opportunity to lead innovation on cleaning up Bitcoin.

	Enable BTC Payments Services enabling purchases with BTC that make it more usable and mainstream which increases the price and energy use	BTC Support Services Consulting services and investments in companies that facilitate wider adoption of BTC	Solving the Problem Acknowledgement of the problem and support for a code change to reduce BTC's pollution
MasterCard	Moderate	Large	Initial Steps
VISA	Large	Moderate	No Action
AMERICAN EXPRESS	Small	Small	No Action

Bitcoin (BTC)

American Express

American Express (Amex) is a global payments and travel services company that provides credit and debit cards for consumers and companies worldwide. As of 2021, the company had 71.4 million cards issued and \$24.4 billion in revenue.¹⁷³ Amex has been slower and more hesitant to move into crypto than Visa and Mastercard. Yet, Amex has recently launched new crypto programs and invested in several crypto startup companies, creating some exposure to Bitcoin.

Chairman and CEO Stephen Squeri has taken a cautious stance towards crypto, stating that crypto is a low priority for the company, and that cryptocurrencies are more like an asset such as gold or silver than a usable currency.¹⁷⁴ Still, Amex is getting involved in crypto and using blockchain technologies. In 2017, Amex announced a service for U.S. corporate customers to send instant blockchain-based payments using Ripple to U.K. businesses that bank with Santander.¹⁷⁵ In 2022, Amex issued its first crypto rewards card through a partnership with crypto wealth manager Abra. The card provides rewards in Bitcoin along with other cryptocurrencies but makes transactions in U.S. Dollars, unlike some cards offered by Visa and Mastercard that facilitate payments in Bitcoin.¹⁷⁶

Amex has a strategic investments and venture capital wing called American Express Ventures that has backed several crypto-related companies which has pushed Amex into the crypto sector. In 2015, Amex Ventures made one of its first investments in a crypto startup during a Series A funding round for Abra, a company that operates a crypto wallet and exchange where individuals and institutions can buy and sell bitcoin.¹⁷⁷ The Amex fund was also an early investor in Stripe which created the technology underlying many payment systems. Stripe provides services to many crypto wallet and exchange companies, allowing them to move bitcoin to and from U.S. Dollars, and process payments.¹⁷⁸ In 2021, Amex Ventures invested in a blockchain intelligence startup, TRM Labs.¹⁷⁹ The company also invested in FalconX, a platform that supports institutions trading crypto, which *Bloomberg* described as a sign that large financial companies were moving into crypto.¹⁸⁰ Amex Ventures global head Harshul Sanghi said, "Amex Ventures invests in startups as a way to better understand emerging areas

of the payments ecosystem, and we are pleased to support FalconX as it continues to drive innovation in the digital asset space, including digital currencies."¹⁸¹

Climate

Amex is a leader among peer companies on climate action and has active sustainability initiatives. The company has an AA MSCI ESG rating and is ranked 85 by the S&P Global ESG ranking, lower than the other payment processing companies in this report.¹⁸² The company has made an ambitious pledge to reach net zero emissions by 2035, in alignment with the SBTi.¹⁸³ Amex claims to be carbon neutral in corporate operations since 2018 and powered by 100% renewable electricity. Amex participates in numerous global initiatives to address climate change, including the World Economic Forum's Clean Skies for Tomorrow Coalition and the Global Future Council on Sustainable Tourism. Amex also says it incorporates ESG considerations into its risk management approach, including climate risks. The company supports the Task Force on Climate-Related Financial Disclosures (TCFD) and is evaluating physical and transition risks in line with the TCFD recommendations.¹⁸⁴

Yet, Amex has not addressed how Bitcoin-related services align with company emissions disclosures, climate risk assessments, and net zero pledges. Amex staff did not reply to GPUS's requests to meet and discuss the issue.



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Mastercard

Mastercard is one of the largest payment and financial transaction processing companies in the world, with \$22.2 billion in revenue and a net income of \$9.93 billion in 2022.¹⁸⁵ Billions of people and retailers rely on Mastercard's debit and credit cards to make daily transactions. Mastercard is working to make it easier and safer for banks to adopt cryptocurrencies like Bitcoin and for merchants to support Bitcoin and other crypto payments. Mastercard could significantly impact the sector and dramatically scale up Bitcoin by enabling people to use it for regular transactions. Mastercard executives have extolled crypto including Chief Executive Michael Miebach who wrote in a LinkedIn post about his vision for "bringing crypto to everyday purchases."¹⁸⁶

In 2021, Mastercard began partnerships that enable customers to use cryptocurrencies, including Bitcoin, at more retailers.¹⁸⁷ To do this, Mastercard announced a partnership with Bakkt, a firm that provides crypto custodial services, to allow millions of merchants on Mastercard's payment network and banks to integrate cryptocurrencies like Bitcoin.¹⁸⁸ Institutions, including big banks, that issue Mastercard credit and debit cards will be able to offer cards that convert bitcoin to fiat, facilitating payments with Bitcoin, and give customers reward points in Bitcoin.¹⁸⁹ Although the program's rollout is ongoing, this move could enable a major expansion in how people buy and spend Bitcoin. In 2022, Mastercard announced a partnership with one of the biggest crypto exchanges, Binance, to launch a card that lets users spend Bitcoin from their Binance accounts by converting crypto into U.S. Dollars, or other traditional currency, at the point of sale.¹⁹⁰ The card was launched in Argentina with plans to expand and could eventually support the 90 million online and physical stores across Mastercard's network.¹⁹¹ In January 2023, Mastercard announced the launch of the Binance Card in Brazil which will be issued by Dock, a payment institution regulated by Brazil's central bank.¹⁹² Mastercard is now expanding its crypto offerings in Europe with a partnership with Unbanked, which offers crypto supporting cards and other services for Web3 companies.¹⁹³

Mastercard launched a program called Crypto Source in October 2022 that enables financial institutions to offer crypto trading to their clients.¹⁹⁴ Mastercard will serve as a bridge between Paxos, a crypto trading

platform, and banks, handling security issues that are barriers to financial institutions participating in crypto trading. The service could help banks compete with existing crypto exchanges like Coinbase by creating the ability for customers to buy and sell Bitcoin through their existing banks. This would build trust that could help mainstream Bitcoin investing. In another move to help banks manage risks and security threats from crypto, Mastercard launched a service called Crypto Secure to help find and prevent fraud on crypto merchant platforms.¹⁹⁵

Mastercard has also invested in startup companies developing crypto-related services and products. In 2015 Mastercard invested in Digital Currency Group (DCG) a company that invests in crypto startups and operates wholly-owned subsidiaries Genesis Global Trading, a Bitcoin trading firm, and Grayscale Investments, the firm managing the publicly traded Bitcoin Trust (GBTC) that lets people bet on the price of Bitcoin.¹⁹⁶ DCG and its subsidiaries have become a major player in the Bitcoin and broader crypto industry. Mastercard also has a fintech accelerator called the Start Path program that supports web3 startups and in 2021 launched a crypto-focused branch called Start Path Crypto. As of November 2022, the program had invested in 25 crypto companies.¹⁹⁷ Thus, Mastercard could direct its investments towards companies that use clean blockchain technology and provide financial support to groups working on innovative solutions to change Bitcoin's code.

Mastercard is also increasing staff to support expansion into the crypto sector. Reports from early 2022 indicate the company's plans to hire 500 people were aimed in part at growing a data and services unit that includes consulting on crypto and helping banks with issues around crypto and ESG.¹⁹⁸ However, this consulting does not appear to address the ESG concerns related to Bitcoin.

Climate

Mastercard is trying to be a leader on corporate sustainability and climate action. The company has a AA score from MSCI's ESG rating, higher than the other companies in this report, and the S&P Global ESG ranking places them in the 91st percentile. Mastercard is active in numerous business coalitions supporting carbon reductions including the 1.5°C Supply Chain

Leaders Initiative and the United Nations' Race to Zero which supports small and medium suppliers to half emissions by 2030 and achieve net zero by 2050.¹⁹⁹ Mastercard is also a member of RE100, a coalition of businesses dedicated to sourcing 100% renewable electricity.²⁰⁰ In 2021, the company said executive compensation was tied to ESG goals, including carbon neutrality.²⁰¹

Mastercard has strong climate commitments. The company has pledged to meet net zero goals by 2040, up from 2050. Mastercard also says its operations have been powered by 100% renewable energy since 2018, although much of that depends on renewable energy credits.²⁰² The Science-Based Targets Initiative (SBTi) has approved the company's 1.5°C target, something Mastercard claims is a first among payment processing companies.²⁰³ Mastercard also reports GHG emissions and sets reduction targets aligned with the United Nations Business Ambition for a 1.5°C future using standards set by SBTi. Mastercard's reduction strategy is focused on decarbonization across its value chain, including Scope 1, 2, and 3 emissions.²⁰⁴

As part of emissions disclosures, Mastercard reports the energy used at data centers they own and monitors energy use at data centers they rent but do not manage.²⁰⁵ However, Mastercard's leaders have not

addressed how Bitcoin-related investments and services align with emissions reduction goals.

Mastercard is also working to increase carbon transparency and accounting. The company has a carbon calculator that allows customers to estimate the carbon footprint of card purchases.²⁰⁶ In partnership with Doconomy, Mastercard offers a free mobile banking program that lets users track and reduce their CO2 footprint.²⁰⁷ Yet, this transparency and emissions reporting is missing when it comes to Bitcoin purchases and investments enabled by Mastercard.

Mastercard has engaged with GPUS about Bitcoin's pollution and participated in discussions about the issue. Mastercard's 2022 Sustainability Report states that the company has a preference for working with "energy efficient solutions that consider climate and community impacts" and supports research by the Cambridge Digital Assets Programme that examines the energy use and carbon emissions of cryptocurrencies, including Bitcoin.²⁰⁸ This is an important step in recognizing the need for sustainable digital assets and directing resources to technologies based on clean blockchains. Yet, Mastercard's services still can include Bitcoin and the company has not issued a public statement calling out Bitcoin's climate pollution or taken action supporting solutions for cleaning up Bitcoin.



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Visa

Visa is the world's largest payment processor and provides credit and debit cards that are used by billions of people and accepted by millions of merchants.²⁰⁹ The company is expanding into crypto and exploring new ways for customers and businesses to use digital assets like Bitcoin. Visa could play a critical role in mainstreaming and growing Bitcoin by enabling people to spend and trade bitcoin more easily. In February 2023, a Reuters report claimed Visa was pausing new crypto partnerships and services.²¹⁰ Visa leaders denied it and reaffirmed that the company was still moving forward in the sector.²¹¹

Visa has multiple crypto-linked credit and debit cards that enable customers to spend and earn rewards in bitcoin.²¹² Visa offers a card in partnership with Coinbase, a large crypto exchange company, that lets customers spend bitcoin in their Coinbase wallet at any retailer in Visa's network and earn bitcoin rewards points.²¹³ Visa has also partnered with Crypto.com to issue a prepaid card that lets customers add Bitcoin and U.S. Dollars while also earning rewards in Cronos (CRO), Crypto.com's cryptocurrency that is cleaner than Bitcoin since its based on a different consensus mechanism that does not use energy-intensive mining.²¹⁴ Visa also offers the Upgrade Bitcoin Rewards credit card that is a collaboration with startup company Upgrade and issued by Sutton Bank that gives customers rewards in bitcoin. When customers make payments with the card, bitcoin will be purchased for them and held in a wallet with NYDIG, a financial services company dedicated to Bitcoin.²¹⁵ Visa had offered a debit card with FTX, but it was canceled in November 2022 as the company imploded due to widespread fraud.²¹⁶

Partnerships with crypto companies have created a growing Bitcoin business for Visa. In the first quarter of 2022, Visa reported that customers made \$2.5 billion worth of purchases on their Visa crypto cards.²¹⁷ The company said its network of crypto wallet partners grew to 65 in early 2022, including Coinbase, Circle, and BlockFi, and that almost 100 million merchants now accept crypto, including Bitcoin, on the Visa network.²¹⁸

Visa is also expanding its crypto offerings in the United Kingdom, Asia-Pacific, and Latin America. The company created a long-term strategic partnership with Wirex, a crypto platform, to expand in those regions and offer crypto debit and prepaid cards that support Bitcoin.²¹⁹ Visa also partnered with Binance to offer a crypto

debit card to customers in select European countries that would facilitate bitcoin payments.²²⁰

Visa also operates a Digital Currency Innovation Hub that helps clients understand crypto and other emerging technologies to create new opportunities. The group publishes educational materials on crypto and claims to work with software engineers on new concepts.²²¹ Visa also offers crypto consulting and advisory services to help clients, including financial institutions and retailers, understand and navigate cryptocurrencies.²²² In 2021, Visa invested in a blockchain intelligence startup, TRM Labs.²²³ Bitcoin, as the largest and most valuable cryptocurrency, is likely a part of these services. Yet, Visa does not appear to be using these resources and expertise to address Bitcoin's pollution and climate impacts.

Climate

Visa is active in efforts to address climate change and has a range of corporate sustainability initiatives. The company has an A score from MSCI's ESG rating and placed at 93 on the S&P Global ESG rank. Visa joined The Climate Pledge, a group of companies pledging to reach net zero by 2040, the Climate Business Network, a World Wildlife Fund initiative to accelerate efforts to net zero, and the UN Race to Zero.²²⁴ Thus, Visa has pledged to reach net zero by 2040 in line with the goals set by the Paris Climate Agreement. To do so, Visa has set science based emissions reductions targets that would meet 1.5C pathways which have been validated by SBTi.²²⁵ Visa claims to have achieved carbon neutrality in its operations and to use 100% renewable energy.²²⁶ Visa also claims to embed sustainability into its partnerships and initiatives, but the company does not appear to be applying those principles in Bitcoin-related partnerships.

Visa also offers a CO2 calculator for customers to track the emissions from their purchases. Yet, Visa does not offer specific calculations for Bitcoin purchases on their crypto cards, which have a much larger carbon footprint than U.S. Dollar and other traditional currency purchases.²²⁷

Despite Visa's strong climate pledges, the company has not addressed Bitcoin's large carbon footprint and, as of publication, has not taken concrete actions to solve the problem despite the company's growing role in the Bitcoin space. Leaders from the company have taken an initial step in responding to GPUS to discuss the issue.

INNOVATING BITCOIN FOR A WARMING WORLD

Financial services companies need to reckon with Bitcoin's climate impact and step up to address the problem. All of the nine companies we evaluated have exposure to Bitcoin but no concrete plans to reconcile that with corporate climate pledges and sustainability programs. Many stakeholders are passing the buck and trying to avoid responsibility for Bitcoin's climate and community impacts. Yet, big financial services companies both play a vital role in the industry and have the expertise and resources to drive innovative solutions. Financial institutions cannot claim to be cutting-edge while maintaining their support for Bitcoin in its current form, which relies on growing amounts of electricity powered largely by outdated fossil fuels.

At the time of this report, the crypto industry is largely unregulated and there is a lack of transparency about the location, energy use, and emissions of Bitcoin mining sites. An important first step is increased reporting of GHG emissions from Bitcoin mining and disclosure of financial institutions' Bitcoin-related investments and emissions.

Yet more fundamental and transformative solutions are possible. A shift away from PoW mining toward a new, less energy-intensive consensus mechanism could slash Bitcoin's carbon and environmental footprint. Creating a new clean blockchain for Bitcoin can make it less risky and future-proof it for the impacts of climate change and energy transitions. And financial services companies should lead the way in changing Bitcoin's code.

Cleaning up Bitcoin will be a substantial social and technical undertaking. We will need leaders from the financial services sector and Bitcoin industry to take responsibility for drastically reducing their carbon footprint by coordinating to develop and implement a new consensus mechanism and building support among Bitcoin stakeholders to support a code change.

Failure to innovate Bitcoin is simply not an option. To avert the worst consequences of climate change, we need to transform the ways we produce and consume energy. That includes finding a sustainable solution to Bitcoin's energy-intensive mining process.



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The best way to create a sustainable solution is for all stakeholders to work collaboratively. With Bitcoin miners, developers, and crypto companies at the table with financial institutions and climate experts, we can generate creative and innovative solutions that ensure the needs of the Bitcoin community and the planet are met.

Greenpeace USA is calling on large financial companies to initiate the conversations and collaborations necessary to develop and implement Bitcoin's evolution toward a carbon-free system. Companies could fund startups and developers creating new clean consensus mechanisms and blockchain technologies, and support working groups and alliances with industry organizations and nonprofits developing solutions.

Specifically, we are demanding the financial institutions covered in this report do the following:

- Publicly acknowledge Bitcoin's pollution and its negative impacts to the climate and communities
- Publicly support a code change that switches Bitcoin to a cleaner protocol that does not rely on energy and carbon-intensive digital mining

- Participate in convening experts, industry, and policymakers to create a new consensus mechanism that uses dramatically less energy and ushers in a clean-future for Bitcoin
- Fund startups, nonprofits, academics, and other developers that are working on sustainable blockchain technologies and ways to change Bitcoin's code
- Until a new consensus mechanism is developed and meaningful progress is made toward its implementation, pause further Bitcoin expansion, including:
 - New partnerships and investments with exchanges and mining companies
 - New services that facilitate bitcoin transactions and investing
 - New products that support Bitcoin

Bitcoin revolutionized cryptocurrencies when it launched in 2009. It now has the opportunity to show the strength of its community by creating a new secure, decentralized consensus mechanism that is aligned with a livable planet.

METHODOLOGY

Company Selection

Financial companies were selected from three different categories: banks, asset managers, and payment processors. Each of these sectors are essential to maintaining the Bitcoin system and enabling Bitcoin's wider adoption. Banks and asset managers provide investments and financial services that Bitcoin mining, software, hardware, and services companies need. Banks and asset managers also support trading in Bitcoin and Bitcoin-related products like futures contracts and derivatives. Payment processors enable transactions with Bitcoin and provide vital software and data services that let other financial institutions use cryptocurrencies. Within each category, we reviewed the largest U.S.-based companies and

selected those most active in Bitcoin based on company statements and media coverage. The three asset managers (BlackRock, Fidelity, and Vanguard) are the largest by assets under management and all had ties to Bitcoin. The payment processing companies (American Express, Mastercard, and Visa) are the largest based on number of cardholders and number of transactions. Companies focused on digital payments, like PayPal and Block, that are actively involved with Bitcoin were excluded since they are smaller companies with less impact on the global financial system. For the banking sector, we examined the ten largest U.S.-based commercial and investment banks and through our preliminary research identified JP Morgan, Citigroup, and Goldman Sachs as the most involved with Bitcoin.



Bitcoin Investments and Exposure

Tracing investments in Bitcoin is challenging and different to examining investments in traditional industries such as oil and gas. Bitcoin is unique because it is an investment asset as well as a form of payment that relies on software, hardware, and financial services companies. Bitcoin, and cryptocurrency more broadly, also lacks critical regulatory frameworks to provide transparency, predictability, and sound governance.

The most direct way companies can have exposure to Bitcoin is through corporate holdings, but these can be hard to track because the Bitcoin blockchain is anonymous. Although publicly traded companies typically disclose cryptocurrency holdings in SEC filings. Another way financial companies can have exposure to the Bitcoin system is through connections to companies that do mining, create Bitcoin-related software, and provide services that support Bitcoin. Thus, there are many ways for financial companies to have ties to Bitcoin which are not clearly quantifiable or comparable. In addition, many Bitcoin related programs and services offered by financial services companies are new, and the size and impact of them remain unclear.

Share Holdings in Publicly Traded Bitcoin Mining Companies

Our research assessed investments in Bitcoin mining companies since they are directly involved in creating Bitcoin's pollution. They depend on financial institutions to raise capital and one way is to sell shares in the company to the public. To assess financial companies' shareholdings, we first identified publicly traded Bitcoin mining companies. Since there is no standardized industry classification for Bitcoin mining, we created our own list of companies through news reports, industry group membership, and other public information sources. We identified 27 publicly traded companies that are involved in Bitcoin mining. Using Bloomberg Terminal, an industry-leading financial database, we collected data on the shareholdings of all 27 companies and identified shares controlled

by the nine financial companies. We found that our target companies had holdings in 24 of the miners. Our shareholding calculations include direct institutional holdings as well as subsidiaries, mutual and index funds, and ETFs. Thus, shares are not necessarily owned by the financial company but the company does control the assets. The value of shareholdings was based on the number of shares and the current share price when the data was collected on April 25, 2023. Since shares are bought and sold on stock exchanges, companies' holdings and share prices change regularly. Thus, the data is a snapshot in time.

Bond Holdings in Bitcoin Mining Companies

Another way for Bitcoin miners to raise capital is through corporate bonds. Banks and asset managers can invest in these companies by holding bonds – portions of corporate loans that are bought and sold by investors. Buying a bond means the investor becomes a creditor to the company and gets paid back over a set period along with interest. Bondholders are creditors to the company, unlike shareholders who are a partial owner of the issuing company. Most of the Bitcoin mining companies we identified are relatively small and new, thus few have issued corporate bonds. In the Bloomberg Terminal we used the SECF command to find bond corporate data and identified two Bitcoin miners' bonds held by the companies in our study. We report this data in the company profiles.

Lending and Underwriting

Banks also provide important services and investments for companies by managing the issuance of shares and bonds. For example, if a Bitcoin mining company wants to go public, they need a bank to lead an initial public offering (IPO) to issue and then sell the shares. Banks provide similar underwriting services for the issuance of bonds, essentially breaking a loan into smaller pieces that can be bought and sold. Banks can also provide direct loans to companies. We searched the Bloomberg Terminal for data on banks involved with lending and underwriting for Bitcoin mining companies. We did not find any deals involving our nine target companies via Bloomberg's League tables – an industry-leading methodology to assign

banks a share of value in underwriting deals. We also searched for other loans with the Bloomberg LSRC function and searched individual mining companies' corporate action history to identify banks involved with equity offerings like IPOs.

Bitcoin Investment Products and Services

Financial services companies have just started launching cryptocurrency-related products, services, and partnerships in the past few years. Many are also outside of traditional financial markets and regulatory reporting requirements and offered for private wealth clients. Thus, there is limited data on the scope and size of these products. We relied on news coverage, press releases, company websites, and other public information sources to identify how financial companies are getting involved in Bitcoin. The value, size and scope of these products and services is often hard to determine and quantify. Creating tools for clients to buy and sell Bitcoin, or partnering with a crypto

exchange company to offer Bitcoin debit cards are not quantifiable like shareholdings in a Bitcoin mining company.

While we did identify some investment products that are focused on Bitcoin, like Fidelity's Bitcoin ETF, many others are not Bitcoin specific. Many of the services, programs, and departments companies are creating support a range of cryptocurrencies. However, since Bitcoin is by far the largest and most valuable cryptocurrency, these services are most likely supporting Bitcoin unless Bitcoin is explicitly excluded.

Financial companies are also developing blockchain-based products and technologies that do not involve Bitcoin. However, we include some of that information because we think financial services companies have a stake in ensuring that the broader digital asset and cryptocurrency space is not polluting and contributing to the climate crisis.



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GLOSSARY

Application Specific Integrated Circuits (ASICs):

Specialized computers used by Bitcoin miners to calculate guesses, called hashes, for solving algorithms in the Proof of Work process. To be profitable, miners need large amounts of the fastest and most efficient ASICs which creates pressure to regularly update equipment, producing e-waste.²²⁸ ASICs are also highly specialized and have limited use beyond Bitcoin mining so there is limited potential for repurposing them.

Blockchain: A collectively managed and decentralized digital ledger that is used to track and record transactions in an open yet secure way without a central authority like a bank or government. In the Bitcoin system, thousands of computers, or nodes, run software to store copies of the entire Bitcoin blockchain. Bitcoin was an early innovator in blockchain technologies in 2009, but the use of blockchains has grown rapidly in recent years and has applications well beyond cryptocurrencies. For example, groups are exploring how blockchain technologies could be used for carbon accounting and tracking, and in international development programs and micro-loans.²²⁹

Block Subsidy: Amount of new coins (e.g., bitcoins) produced and added to a block, awarded to the miner that successfully records that block.

Consensus mechanism: The process used by blockchain technologies to verify transactions and secure the digital ledger. Participants in a blockchain network, like Bitcoin or other cryptocurrencies, need a mechanism for reaching agreement that a set of transactions are valid and preventing double-counting – spending the same Bitcoin twice. This mechanism is the backbone of a cryptocurrency's blockchain and how cryptocurrencies can operate without a central authority like a government. There are many different types of consensus mechanisms including Proof of Space, Proof of Authority, and Proof of Burn. Currently, the most widely used cryptocurrency consensus mechanisms are Proof of Work and Proof of Stake.²³⁰ However, this is a dynamic field with new mechanisms and protocols being developed and tested.

Custodianship: Cryptocurrencies, like other valuable assets including stocks, gold, and money, need to be stored safely and securely which is often done through a third party, a custodian. For crypto, custodians safely store customers' private keys – the passwords – to their crypto holdings, not the crypto coins themselves that exist on the public ledger called the blockchain. Institutions that manage people's money and other assets, like asset managers and investment banks, are required to have a custodian store a client's assets and keep it separated from the company's finances. This protects clients' assets in case of a bankruptcy. Yet in the largely unregulated crypto industry, many companies that offer crypto exchange and wallet services have not securely stored client holdings with a custodian. This contributes to risky business practices where company and client crypto assets are mixed, and customers potentially losing their investments when companies have gone bankrupt such as FTX.²³¹

Cryptocurrency: A digital form of currency that relies on a decentralized blockchain and cryptography to ensure transparency and security. Currently cryptocurrencies are primarily used as investments and a way to store value, although value that is quite volatile, and less frequently used as a medium of exchange. However, payment processing companies are starting to integrate cryptocurrencies, making it easier for casual users to spend crypto and make transactions. Cryptocurrencies are one type of digital asset which include a range of different virtual products like non-fungible tokens (NFTs) and tokenized assets – turning physical assets like stock or even land into a digital asset.

Crypto exchange: An online trading platform used to buy, sell, or trade cryptocurrencies, like Bitcoin, and convert cryptocurrencies to and from government-issued money like US Dollars. Popular exchanges include those run by Coinbase and Binance.

Crypto wallet: Cryptocurrencies need to be stored somewhere and owners need to make sure the private keys, or password, to their cryptocurrency is kept safe and secure. Thus, wallets are used which can be physical devices similar to a hard drive, software programs, or online services like those operated by Coinbase and Binance.

De-centralized Finance (DeFi): A broad term for an emerging field of finance that works outside of traditional financial institutions and companies using public blockchains to facilitate direct transactions between users without intermediaries. An important tool is smart contracts that are code on a blockchain which can automatically execute the terms of an agreement once a set of criteria are met, eliminating the need for parties to meet. Ethereum is used for many DeFi services. Bitcoin, however, is not a central component to the broader DeFi industry in part because its code and PoW mechanism have fewer uses and do not support services like smart contracts.

Exchange traded fund (ETF): An investment security that typically tracks a certain index, sector, or commodity which is similar to a mutual fund but is traded on a stock exchange. There are ETFs that track the crypto industry and the price of Bitcoin, although the U.S. has not approved an ETF tied to Bitcoin's spot price yet due to concerns about risk and lack of regulatory oversight.

Net zero: The goal of companies, institutions, and countries to reduce greenhouse gas (GHG) or carbon dioxide emissions to net zero, usually involving a mix of approaches designed to reduce or eliminate emissions and offsetting all remaining emissions with removal of GHGs from the atmosphere. Many companies have pledged to reach net zero often by 2050 or earlier, and to create pathways to net zero that are aligned with the Paris Climate agreement and goals to keep global warming to 1.5 degrees Celsius.

Non-fungible Tokens (NFTs): A physical or virtual item, like a painting or a song, that has been tokenized to become a digital asset by using a blockchain. Each NFT is assigned a unique identification code and metadata which reduces the likelihood of fraud while enabling buying, selling, and trading – often in cryptocurrencies. NFTs have been popular in the art world but can also include other physical objects, people's identities, and property rights. NFTs are like a digital form of a collector's item. Most NFTs have been created on Ethereum which provides a way to track their ownership. Bitcoin was originally not used for NFTs but in the past year an update to the Bitcoin code made it possible to create NFTs on the Bitcoin network. This is controversial and contested in the Bitcoin community. Yet, other platforms, like Ethereum, remain the most popular and useful for NFTs, which also means they have a very small carbon footprint since they do not rely on Proof of Work.

Proof of Work (PoW): A consensus mechanism used by some cryptocurrencies, including Bitcoin, to validate and secure transactions that involves “miners” competing to solve algorithms – doing work – and the chance to verify and add a new set of transitions, a block, to the blockchain. In return, the winner gets newly created coins and fees. This system is used to provide security for the blockchain and prevent malicious actors from disrupting the system

Proof of Stake (PoS): A consensus mechanism used by many cryptocurrencies, such as Ethereum, to validate transactions and add new blocks to a blockchain. The process involves owners of a cryptocurrency placing coins as collateral, “staking,” in order to get the chance to validate a new set of transactions in return for fees and/or new coins. Validators are chosen at random, but the more coins a participant puts in, or stakes, the greater the chance they have at winning. If a participant tampers with or adds faulty transactions, they lose the coins they staked. Thus, participants have an interest in maintaining the security and integrity of the system. PoS does not require large computing power as participants can validate transactions and update the blockchain on their personal computers.

Scope 1 emissions: Direct GHG emissions from sources that are directly owned or controlled by the company such as the emissions from a coal fired power plant that a company owns.

Scope 2 emissions: GHG emissions caused indirectly by a company through the production of energy it purchases and uses, such as the electricity purchased to run a factory or data center.

Scope 3 emissions: GHG emissions that the company is indirectly responsible for along its value chain, including the impact of goods purchased and sold, and all the emissions not included in Scope 1 or 2. For the financial sector this includes investments, and lending and advisory services. For example, a bank that provides a loan to a coal mining company.

Stablecoin: A type of cryptocurrency that is supposed to be backed by fiat money, like the U.S. Dollar, or some physical asset. The price of a stablecoin is supposed to be more stable and follow that of the fiat money it's tied to, unlike cryptocurrencies like Bitcoin for which the price is set by the market and typically highly volatile.

ENDNOTES

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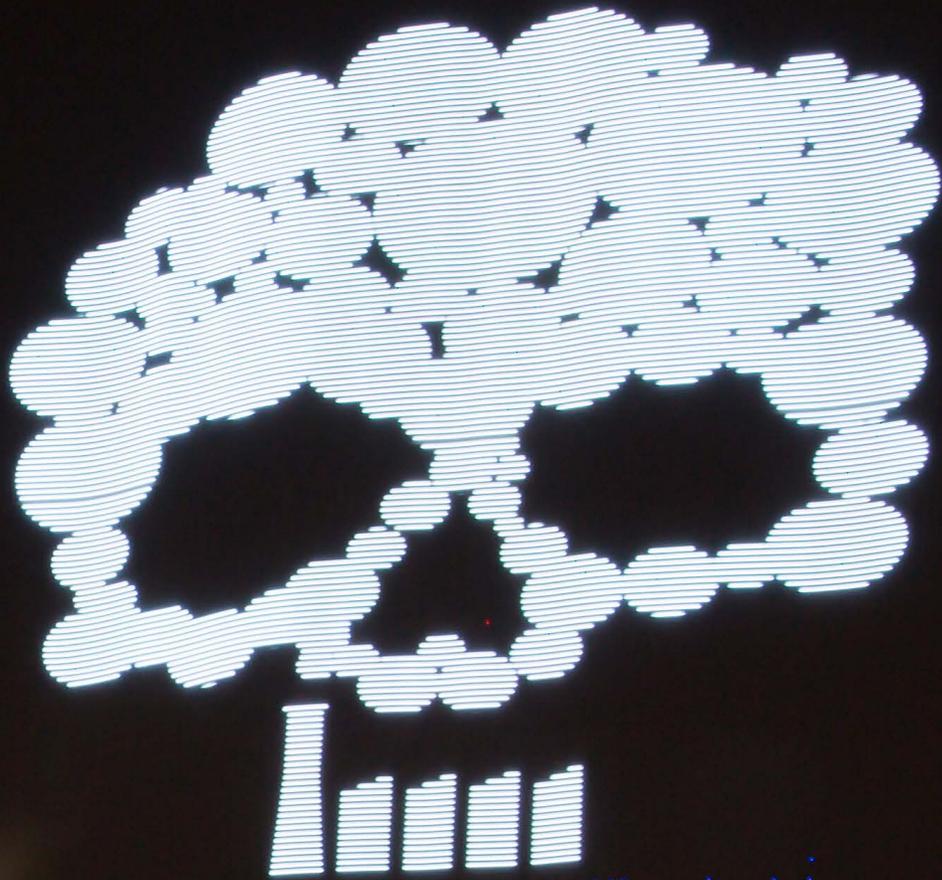
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