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CONFIDENTIAL

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VGB INSIGHTS

SCALEUP VIEWS

The Increasingly Horizontal Climate Software Opportunity

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FinTech | Enterprise Software | Consumer | InfraTech | Healthcare | DeepTech

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Section I: Key Takeaways

Through conversations with private market investors and sector experts, as well as organic market research, we've concluded that climate software will likely soon be widely viewed as a horizontal investment opportunity supporting a continually expanding set of cross-industry applications

- **Software as an enabler:** software plays a vital role in advancing the clean energy transition because of its ability to buttress the efficiency and resiliency of energy and infrastructure assets, and enable broad enterprise adherence to regulatory and voluntary reporting and decarbonization trends. Software also appeals to a diverse set of private market investors and generates tangible economic value from the large quantum of carbon and ESG-related data generated by – and impacting – nearly every industry. Moving forward, we see significant potential for "hardware-as-a-service" models and full-stack hybrid / software solutions to provide some of the highest-upside opportunities for investors as the interdependencies of funding both categories become magnified to the broader market

- **Tangible value creation:** software innovation must co-exist with continued investment into renewable power, electrification, long-duration storage, and grid / distributed energy hardware assets, and can drive direct bottom-line impacts by: 1) providing emitters with a baseline to evaluate and implement emission reduction strategies capable of justifying future CapEx / development spend, and 2) offsetting the impacts of increasing grid complexity by simplifying predictive analytics and forecasting functions to ensure appropriate scoping and execution for new projects

- **It's still early innings**: the overall market for climate tech software is still relatively nascent; some categories are further along the development curve than others, however there is a shortage of at-scale case studies to provide "benchmarks for success" when it comes to evaluating climate software GTM models and unit economics, which are slightly different than traditional enterprise SaaS profiles given their slower sales cycles and implementation and servicing-related COGS

- **Time to be opportunistic:** private climate software-focused funds are heavily concentrated at the early stages, where there has been robust company formation in the industry; there is a significant market opportunity for new investors to lead Series B+ rounds over the next year and beyond as these businesses compete for scale-up capital. Sector-focused funds leading rounds at this stage raised only 13% of the total funds raised across all stages from 2021 – 2022. "Pure software" investments continue to see the strongest YoY growth (~30% in 2022) in climate tech amidst a high interest rate environment and investor hesitancy to back long-duration hardware assets and pre-revenue development projects

- **A global, interconnected ecosystem:** climate tech is one of the most globalized innovation sectors we have studied, and national / regional legislation has accelerated the pace of climate tech innovation and accessibility of fundraising in certain geographies. The US and China – which have attracted the greatest private investments historically – have begun to shift focus away from mobility-related start-ups to emissions control / energy efficiency technologies, even as EV infrastructure continues to attract significant funding (including half of Q3 '23's largest deals). Europe has emerged as the fastest-growing climate tech incubation hub since the height of the COVID pandemic

- By market segment, we drew the following conclusions:
  - **Emissions management / built environment** software is a key innovation area at both the venture and growth stages. This is mostly due to the rampant opportunity to improve the collection and analysis of emissions-related data that is growing in direct parallel with the capital deployed toward infrastructure development and the renewables transition
  - Both the **carbon accounting / reporting** and **data services** categories are software's "bread and butter" in terms of value creation, but in different ways. Carbon accounting / reporting demand is heavily driven by disclosure regulations and internal company reporting standards, and the category is well-suited for AI-native applications backed by models trained on industry-specific emissions data points. Data services software continues to see segment growth with rising demand for interpolated models that facilitate estimation and evaluation of companies and asset performance by external sources
  - The horizontal influence of the **ESG reporting** segment is perhaps the greatest of all we covered, however the market is fragmented and crowded by an increasing number of legacy enterprise data and workflow management vendors adding ESG-related modules and features to facilitate automated reporting. Product development has been largely opportunistic, and its effectiveness has been primarily hampered by: 1) a lack of reliable data collection capabilities and 2) inconsistent metrics and reporting across sectors. Software platforms that streamline solutions to both problem sets will help new entrants challenge legacy corporates who are cross-selling ESG features to long-standing customers
  - The voluntary **carbon offsets / marketplaces** category is becoming truly horizontal in its appeal across industries. Yet, investors remain cautious as the industry determines how to verify and validate the inherent value of voluntary offsets projects (i.e. reforestation, renewables, agriculture), and await further clarity on sovereign participation in these markets through Article 6 of the Paris Agreement
  - In "asset-heavy" verticals – such as **grid / distributed energy** and **battery / storage** – standalone software platforms integrating with physical infrastructure assets are in early stages of innovation, yet could be among the greatest long-term economic and environmental value-creators. Some of the most proactive innovators in these categories to date have been operating companies and service providers layering software suites onto their existing service lines
  - **Climate FinTech** is still in early stages of development and will likely continue to emerge as a high-growth category enabling the transition to a low-carbon economy. Investable opportunities are layered across full-suite banking, lending, payments, and UW / risk solutions for energy and infrastructure providers, as well as wealth management and sustainable investment marketplaces that expand consumer access to the industry
  - **EV / mobility software** is a category with less horizontal applicability, however has one of the largest TAMs that is inherently tied to broader EV adoption rates. We think it is likely this category sees consolidation as a finite group of software players partner with the leading charging station developers and auto OEMs to amass market share. Continued private investor demand for EV infrastructure and lithium-ion battery investments will likely bolster the need for interoperability, infrastructure management, and performance optimization / analytics software solutions

– The **circular economy / supply chain** category within climate tech continues to expand in scope (i.e. the way goods and services are sourced, produced, consumed, and disposed) with greater public awareness of the mutual dependencies between each step along the circular value chain and broader net zero goals (70% of GHG emissions are directly tied to everyday product consumption)

Sources: MIT, B Capital Group, Deloitte, PWC, BIS, Energize Capital, London & Partners, UNDP, CB Insights

Section II: Why Climate Software?

Burgeoning cross-industry applications for software solutions deterring and mitigating the effects of climate change and facilitating the global transition to renewables should make the category a top priority for a diverse set of private market investors over the next 12+ months

To set the stage for our analysis, we break down the climate software market's core investable opportunity segments below in Figure 1. While there is some overlap between categories, this mapping serves to provide a "zoom-out" perspective on the growing, sector-agnostic use cases intrinsic to the sector.

Figure 1: Climate software market segmentation

ESG Reporting
Software enabling organizations to manage and measure their environmental (i.e. carbon emissions), social (i.e. diversity and inclusion), and governance (i.e. risk management) performance
SUSTAINALYTICS envizi sphera

Emissions Management / Built Environment
Software helping organizations monitor and reduce methane and other GHG emissions. We have grouped this category with software tools managing emissions for real estate and other built environment assets
Wolters Kluwer enablon Diligent cority

Carbon Accounting / Reporting
Software enabling organizations to quantify, calculate, track, and report on their GHG emissions leveraging standardized frameworks
PERSEFONI Watershed IBM

Batteries / Storage
Software managing performance and optimization of battery and other energy storage systems that improve grid efficiency and lower costs
AutoGrid stem Ansys

EVs / Mobility
Software managing EVs, charging stations / other mobility infrastructure, vehicle-to-grid, and asset interoperability and security
driivz NUVVE CHARGELAB

Grid / Distributed
Software optimizing performance of distributed energy resource management systems and smart grid management and monitoring capabilities
GRIDPOINT Schneider Electric INTEGRAL ANALYTICS

Carbon Offsets / Marketplaces
Software facilitating the purchase, sale, and rating / validation of regulated and unregulated / voluntary carbon offsets ("vouchers") derived from renewable, community, and nature-based projects
Xpansiv RUBICON CARBON Patch

Energy Management / Optimization
Software applications that assist industrial, real estate, and other infrastructure operators with a range of solutions including energy usage, billing, metering, modeling, and equipment management
POWERFACTORS FLUENCE RADIAN GENERATION

Data Services
Software providing primary sources of climate and energy-related data points to organizations, as well as data analytics tools that integrate with a company's existing enterprise workflow solutions to measure energy / ESG-related performance metrics
ENVERUS AVEVA ORENNIA

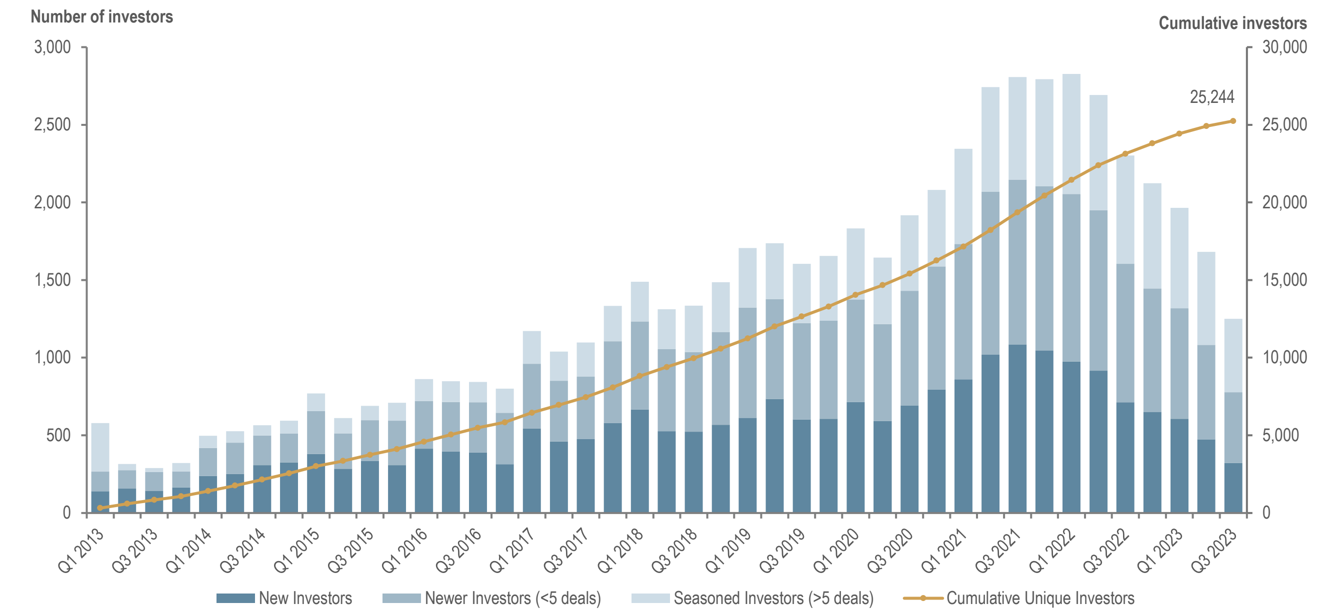
Circular Economy / Supply Chain
Broad category encompassing software solutions related to sustainable product manufacturing, packaging, supply chain, transport, and returns / waste management
optoro ecovadis SAP

Climate Finance / Investments
FinTech applications, infrastructure, and marketplaces enabling both consumer and corporate sustainable banking, financing, and investing solutions
REFINITIV ethic. Doconomy

Sources: Lazard VGB Insights

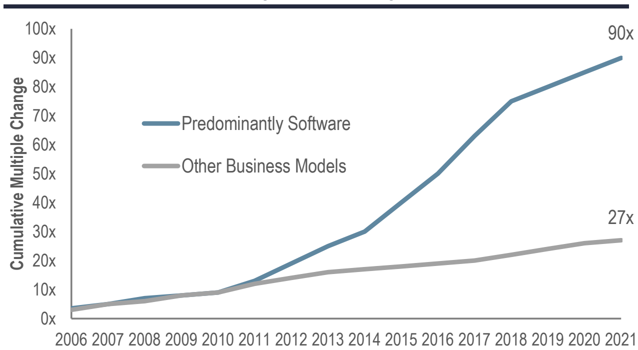
1) Robust market tailwinds and capital stack: even with the proliferation of billion-dollar sustainability and impact-focused funds flooding the market ($23B+ of new climate tech capital raised YTD 2023), we believe climate tech's fundamental drivers – including mounting global decarbonization pressures and corporate net zero commitments, government budgetary and regulatory tailwinds, cost savings from renewables and electrification, and robust early-stage company formation – will continue to increase generalist growth investors' appetites for investing in the clean energy transition over the next several years. In 2022, climate software private investments grew ~3x the rate of other climate tech business models as new investors continued to enter the market (Figure 2), and early-stage company formation has skewed heavily towards software models in recent years to the point where there is now relative balance at the venture and growth-stages across all climate tech business models (Figures 3 and 4).

Figure 2: Climate tech new private market investor growth



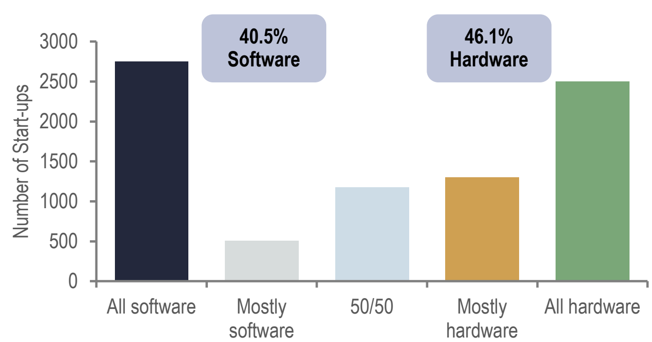
Sources: PWC

Figure 3: Multiple change in the number of climate tech companies incubated by business type



Sources: Endeavor Insight, Powerhouse Fund

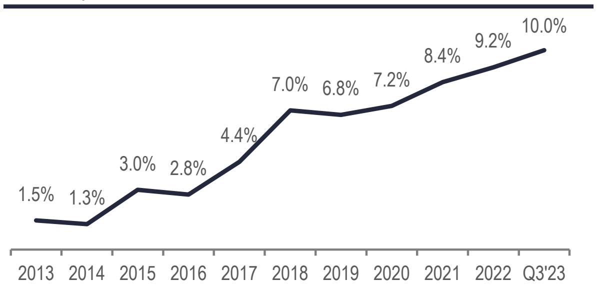
Figure 4: Climate tech VC-backed start-ups by type (as of Aug. 2023)



2) Clear opportunities at the scale-up phase: despite total private market funding decreasing 50% YoY through Q3 '23, climate tech continues to proportionally increase its share of the total venture and growth investment pie (see Figure 5). In an industry where software and hardware must co-exist and innovation has historically been characterized by capital intensity, long lead times, and delayed returns, this new wave of climate software companies with fast-growing enterprise and consumer end-markets is creating on-ramps for growth-oriented investors to enter the industry, particularly at the early-growth stages (Series B and C), where there has historically been far fewer participants (see Figure 6).

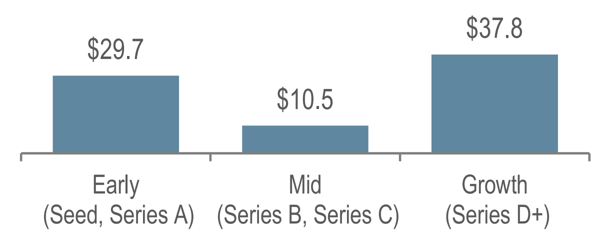
Figures 5 and 6: Climate tech fundraising landscape

Climate tech private market investments as a % of total start-up investments



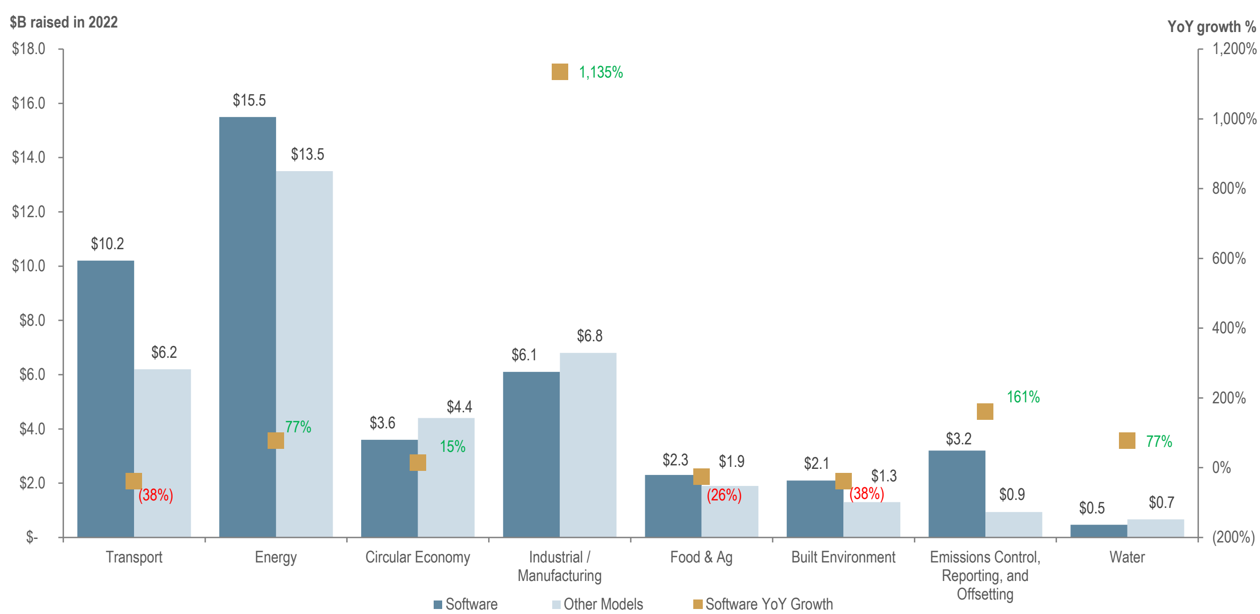
Sources: PWC, Union Square Ventures

Estimated total private climate tech-focused funds raised by focus stage in 2021 and 2022 ($B)



3) It's all about data: we believe software's role as an innovation catalyst in climate tech will continue to expand as widespread enterprise demand for automation tools that optimize the collection, analysis, and reporting of the reams of data being generated by historic investments into clean energy infrastructure (IEA projects $1.7T in 2023 following six years of increases). Currently, the highest-growth areas within the software category include industrial / manufacturing data and automation platforms (often paired with hardware and sensors), emissions control and offsetting tools, and energy management solutions covering the production, conversion, distribution, and consumption of energy for both consumers and enterprises.

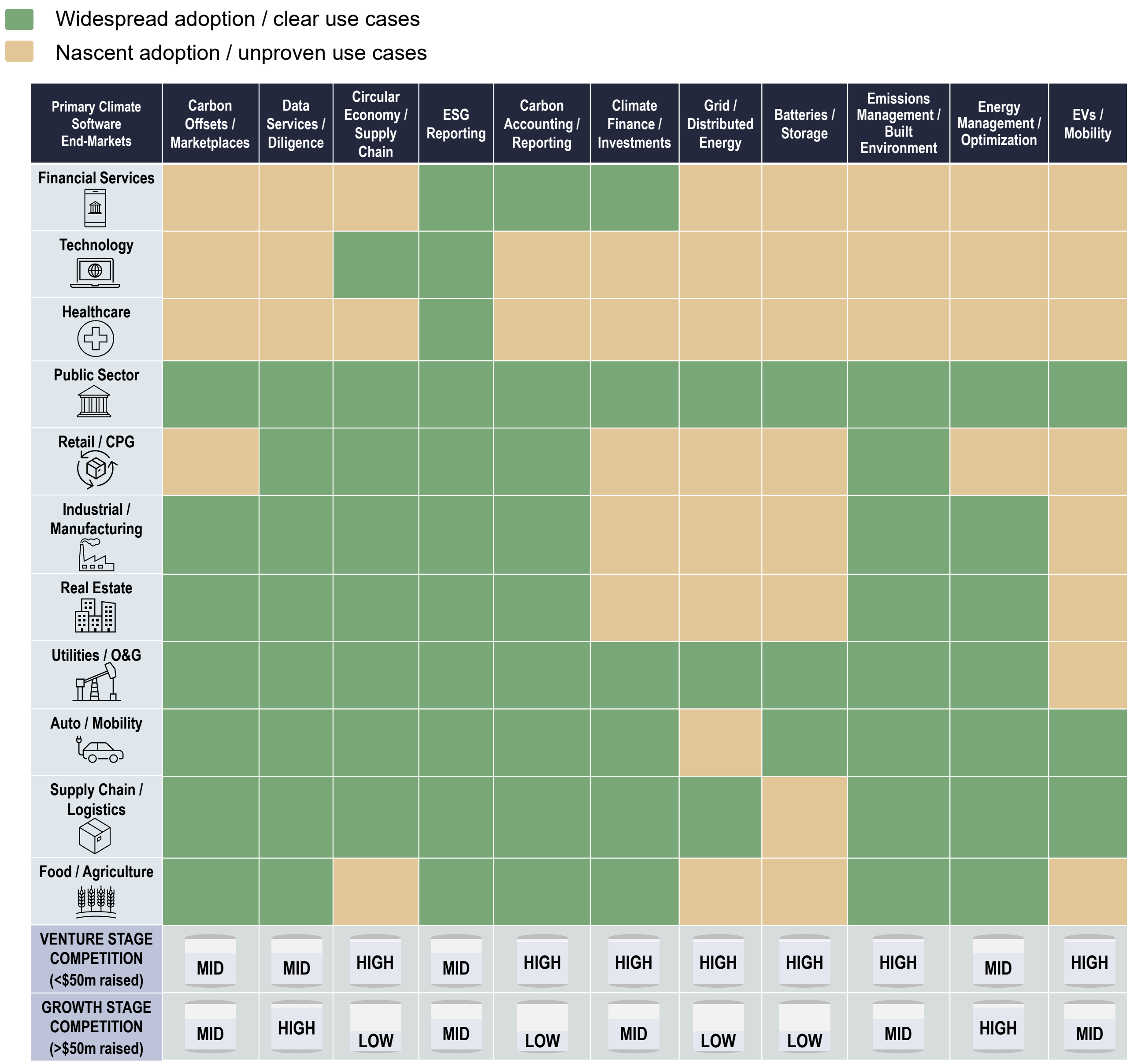
Figure 7: North America and Europe climate tech investment trends by type in 2022 ($B)



Sources: Net Zero Insights, PWC

4) Attractive end-market potential: much like we are seeing in the current AI “hype cycle,” the realization of climate software’s broad enterprise applicability will likely hand a competitive advantage to the first-mover investors who craft a well-defined thesis and identify the categories that maximize ROI. In Figure 8, we map these key categories to the verticals where we have seen evidence of enterprise customer adoption to date. We also outline the relative maturity of each category based on our analysis of market competitiveness at the venture and growth stages.

Figure 8: North America and Europe Climate Software YoY Investments by Type (2022)



Source: Lazard VGB Insights

Section III: Category Overviews + Emerging Innovators by Stage

ESG Reporting	
Market Segmentation	• **Trends:** highly fragmented market; growing ~12% over the next 5 years; both new platform investments and consolidation opportunities expected. Public, managed ESG funds have seen a thawing out of generalist investor interest after record-breaking investments flowed into the space in 2021 • **Adoption:** ~40% penetration in the US, UK, and Canada; ~15% penetration in Europe • **By Vertical:** 1) environmental (*decarbonization, waste / pollution, supply chain*), 2) social (*health / safety, diversity*), 3) governance (*corporate controls, AML, data security*) • **By Function:** reporting and disclosure (*mature*), data management (*nascent*), operational improvement (*nascent*)
Business Models	• **1) Environment, Health, Safety, and Quality (EHS&Q)** – legacy EHS&Q vendors rebranding to ESG full-suite platforms • **2) Financial Reporting** – integrating ESG into traditional financial KPI reporting solutions • **3) Point Solutions** – pure-play, industry-focused ESG tools catering to specific customer segments • **4) ERP Vendors** – legacy ERP providers adding ESG modules to enterprise products
Incumbents	• **Data Management:** IBM (Envizi), Morningstar (Sustainalytics), Intelex, Nasdaq (Metrio), Novisto • **Reporting:** Diligent, Workiva • **Scores and Ratings:** S&P Global • **EHS&Q**: Sphera, Quentic, Isometrix, Wolters Kluwer (Enablon) • **Risk / Audit:** AuditBoard, EHS Insight, Benchmark Gensuite
Sample Vertical Use Cases	• **Energy Infrastructure / O&G** – YPF Energy uses Sphera to modify and automate environmental data tracking • **Industrial / Manufacturing** – Baker Hughes uses Workiva to provide standardized and automated sustainability reports • **Retail / CPG** – Target uses Metrio to provide insights into ESG performance and to develop implementation strategies • **Financial Services** – DNB Norway uses Sustainalytics to optimize its sustainable "green loans" product framework
Growth Drivers	• **Regulation / Frameworks** – NFRD, CSRD, international sustainability standards (PRI, TCFD, ISSB) • **Corporate Standards** – enterprise sustainability commitments / external demands for transparency; 90% of S&P 500 companies and 70% of Russell 1000 companies now publish ESG reports • **Demand for Process Improvements** – evolving customer needs for productivity gains and operational improvements driven by digitization of data collection / optimization and metrics standardization / reporting; • **Buyer Behavior** – products making ESG claims averaged 28% cumulative growth between 2017-2022 versus 20% for products that made no such claims • **Horizontal Applicability** – increasingly industry-agnostic, but high demand for industry-specific metrics and standards

Sources: Lazard VGB Insights, McKinsey, Pitchbook Data, Inc., Strategy&.

ESG Reporting

Emerging Innovators

Venture (<$50M raised)

Company	HQ	Core Offering
NOSSADATA		Operator of ESG reporting and data management platform intended to reduce the cost of capital and compliance
ACTUAL		Developer of a sustainability transformation platform designed to help organizations bring capital investment in large-scale infrastructure projects
YvesBlue		Operator of a data analytics and reporting platform intended to provide ESG analysis and portfolio management
GREENOMY		Developer of sustainability software intended to help issuers and investment funds comply with the new EU Taxonomy
Quentic		Developer of software products for health and safety, environmental management and sustainability management
novisto		Developer of ESG analytics platform intended to bring a new vision to managing sustainability data for companies
worldfavor		Developer of a sustainability information platform designed to share and obtain business information
pulsora		Developer of compliance tracking and insight software designed to manage and improve ESG footprint
SOCIALSUITE		Developer of an impact management software designed to help organizations measure the impact of their programs and services
ATLAS METRICS		Developer of ESG technology intended to collect, manage, and report environmental, social, and governance data
Datamaran®		Developer of a data-driven platform intended for tracking the environmental, social, and governance issues critical for business
impaakt		Developer of a knowledge platform intended to provide the social and environmental impact of listed companies

Growth (>$50M raised)

Company	HQ	Core Offering
CLARITY AI		Developer of a sustainability technology platform that uses machine learning and big data to deliver environmental and social insights to investors, organizations, and consumers
measurabl		Developer of a data management platform intended to provide informed analysis of sustainability performance
esgbook		Developer of a digital platform intended for ESG data management, disclosure, and analytics
AUDITBOARD		Operator of a cloud-based audit automation platform intended to revolutionize the way risk and compliance is managed, solved, and reported
novata		Developer of a technology platform designed to offer corporate governance measurement, data collection and benchmarking to its clients
SESAMm		Developer of artificial intelligence-based financial software designed to detect online information useful to investors
OneTrust		Developer of a governance platform designed to help in tackling privacy and ESG program management
ENCAMP		Developer of compliance software designed to align corporate and environmental goals using technology

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Emissions Management / Built Environment	
Market Segmentation	• **Trends**: global B2B emissions management software market relatively mature ($15B in 2022 growing at a 16% CAGR) • **Adoption:** strict regulatory mandates for scope 1 emitters has driven adoption in the US and EU; US: 85% ; EU: 100% • **By Vertical:** 1), manufacturing (greatest share) 2) energy / O&G / utilities, 3) transportation, 4) real estate, 5) construction, 6) industrial / manufacturing, 6) agriculture, 7) tech / telecom • **By Function**: 1) data aggregation and analysis, 2) performance analytics, 3) build/design, 4) forecasting/predictive intel
Business Models	• **1) Emissions Management** – provide insights and GHG reduction strategies, enabling enterprises to understand or reduce the flow of GHG emissions and validate / report on measurements and explore more sustainable alternatives • **2) Build / Design** – optimize emissions reduction in the planning, design, development, and operation of buildings, landscapes, and other public infrastructure assets • **3) Compliance** – assisting companies with the legal permitting and regulatory requirements necessary to build and operate in certain geographies and industries
Incumbents	• **Geographic Information Systems:** Kayrros, Absolut Sensing, SensorUp, Orbio Earth, Muir.ai, Flintpro • **Data Tools:** UL Solutions, VelocityEHS, Envirosoft, Watchwire AI, Terrascope • **Emissions Management:** Wolters Kluwer (Enablon), Envana, TruClimate, FlintPro, Cority, Avarni, Greenstone Plus • **Smart Buildings:** Cisco, Planon, Atrius • **Adjacent Vendors:** ENGIE Impact, Salesforce, and Schneider Electric have all developed carbon management offerings
Key Customer Verticals	• **Oil & Gas** – Halliburton and Siguler Guff jointly launched Envana Software – enables vertical emissions management • **Industrials / Manufacturing** – Morrison Hershfield uses Avarni to estimate and reduce GHG emissions • **Agriculture** – Rangelands Project uses FlintPro to manage carbon emissions in Australian rangelands • **Technology** – Fujitsu uses Greenstone Plus to manage emissions across 400 sites • **Real Estate** – Brookfield Properties uses Watchwire to track and manage emissions
Growth Drivers	• **Regulation / Disclosure** – US: GHGRP, tax incentives, energy-efficient build stimulus packages, global methane pledge to cut 30% of GHG emissions by 2030 compared to 2020 levels, EPA reporting requirements on Scope 1 emissions • **Net Zero Milestones:** the IEA estimates 20% of today's building stock needs to draw down energy consumption to meet net zero requirements by 2030 to meet overall net zero targets by 2050 • **New Builds / Population:** global population growth of an estimated two billion by 2050 will require significant investment into circular construction models; by 2030, roughly half of US building stock will have been built since 2006 • **Cost Savings** – design / build of energy-efficient infrastructure streamlines operating costs for providers and end-users • **Capital Availability** – private investments in emissions control technologies have materially increased since 2010; US: $746M since 2020 (~5x annual increase on average relative to past decade); EU: $524M since 2020

Sources: Lazard VGB Insights, EPA, Cleantech Group, IEA, Pitchbook Data, Inc., Verdantix

Emerging Innovators

Emissions Management / Built Environment

Venture (<$50M raised)

Company	HQ	Core Offering
SINAI		Developer of an enterprise decarbonization platform intended to measure, monitor, price, and analyze risk and trade carbon emissions
nZero		Developer of a carbon management platform intended to offer round-the-clock carbon accounting and emissions tracking
Context Labs		Developer of a blockchain-enabled platform designed for deploying machine learning and AI-driven asset-grade analytics for context-driven insights
Gravity		Developer of an essential software platform intended for carbon management, purpose-built for companies with complex value chains and physical operations
accacia		Developer of a real estate decarbonization platform designed to track emissions in real-time
INRANGE		Developer of a renewable energy technology platform designed to transform renewable local energy markets
TANGIBLE		Developer of a unified software platform designed for sustainable building materials
Lumen Energy		Provider of clean energy alternatives services intended to accelerate the use of renewable energy in cities globally
cogo		Developer of a mobile application designed for sustainable manual and electric-powered vehicles
granular energy		Developer of clean energy marketplace system designed to allow certificate management for the energy sector
faradai		Developer of artificial intelligence platform designed to reduce energy consumption
VERDIGRIS		Developer of an artificial intelligence IoT platform designed to improve energy efficiency in large buildings

Company	HQ	Core Offering
SUSTAIN LIFE		Developer of sustainability management software designed to give companies the tools and guidance to operate more sustainably
CO2 AI		Developer of an end-to-end carbon management software designed to to offset the carbon footprint
Pathzero		Developer of an emissions management platform designed to help businesses understand and reduce their carbon emissions
Ento Labs		Developer of automated machine learning algorithms designed to help businesses optimize energy and climate performance
CLIMATE CLUB		Developer of a sustainability analytics platform intended to provide real-time sustainability performance for corporations
conduit tech		Developer of building tools intended to design, sell and install high-performance systems
BEND		Operator of a climate assessment platform intended to make CO2e emissions data programmable and query-able
Audette		Developer of an analytics platform designed to accelerate carbon reduction investment in commercial buildings
FLEXIDAO		Developer of a renewable energy tracking software designed to accelerate the transition toward a decarbonized and decentralized energy industry
enertiv		Developer of a real estate technology platform designed to transform building data into asset value
cove.tool		Developer of an end-to-end automated performance analysis platform designed to help architects, engineers, and developers design energy-efficient buildings

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Growth (>$50M raised)

Company	HQ	Core Offering
VALIDERE	Canada	Developer of a comprehensive data platform designed to offer quality intelligence for companies to know true product quality in real-time and optimize logistics and trading
PROJECT CANARY	US	Developer of continuous monitoring technology designed to help clear the air, and protect industries and the environment
SWEEP	France	Developer of a software platform intended for companies to understand, manage and reduce their carbon footprint
Carbon Direct	US	Provider of carbon management platform dedicated to combining scientific expertise and financial capital to scale carbon removal into a global industry
KAYRROS	France	Developer of environmental intelligence and asset observation technology platform designed to deliver actionable insight on energy-transition risk and climate impact
LOGICAL BUILDINGS	US	Developer of smart building software intended to unlock energy and IoT data inside buildings and use it to create continuous savings and sustainability achievements
INFOGRID	UK	Developer of an infrastructure management platform designed to automate and optimize facilities and building management

Carbon Accounting / Reporting

Market Segmentation	• **Trend:** fragmented market despite some recent M&A, with an expanding set of vendors adding monitoring and management capabilities. Global market size valued at $13B in 2022; projected to grow at CAGR of 23% to $64B in 2030 • **Adoption:** challenges with data accuracy and standardization have slowed the adoption of accounting technologies for scope 3 emissions – US: 31%, EU: 53% • **By Vertical:** primary verticals include energy / utilities (greatest market share), construction / infrastructure, tech / telecom, retail, healthcare, CPG / food, transportation / logistics, chemicals • **By Function**: 1) emissions measurement, 2) validation, 3) disclosures and reporting
Business Models	• **1) Full-Stack Measurement** – enable businesses to collect, track, analyze, and report carbon emissions (spend + activity) • **2) Certification / Verification** – independently verify compliance with specific standards • **3) Disclosures** – collect and analyze carbon data to generate reports for relevant stakeholders
Incumbents	• **Measurement**: IBM (Environmental Intelligence Suite), Salesforce Net Zero Cloud, Watershed, Carbon Graph • **Validation**: Net0, CarbonTrust, Carbon Analytics • **Disclosures / Reporting:** Persefoni, Thomson Reuters (OneSource), Sphera, Diligent, UL Solutions
Sample Vertical Use Cases	• **Real Estate** – Cushman Wakefield uses Salesforce's Net Zero Cloud to track its global carbon footprint • **Tech** – The Carbon Neutral Company provides "carbon neutral" validation for Microsoft, Logitech, VMWare • **Chemicals** – Eastman uses Sphera's lifecycle management solution for real-time tracking of their product portfolios • **Industrials** – CarbonTrust provides data verification services to GSK, Bentley, Siemens • **CPG** – Ecovardis quantifies up to scope 3 emissions for L'Oreal
Growth Drivers	• **Regulation** – SEC, CSRD (companies must apply the rules in 2024 for reports published in 2025) • **Consumer Equity** – consumers spend roughly one-third more on environmentally sustainable products • **Competitive Pressures** – the number of publicly-listed companies setting ambitious net zero commitment more than doubled to over 1,000 in 2022

Sources: Fortune Business Insights, Net Zero Stocktake, Pitchbook Data, Inc., Simon Kucher & Partners, WRI, Lazard VGB Insights

Carbon Accounting / Reporting

Emerging Innovators

Venture (<$50M raised)

Company	HQ	Core Offering
Normative	Sweden	Developer of an emission accounting engine designed to help companies calculate their total carbon dioxide emissions
greenly	France	Developer of a carbon tracking technology aimed at allowing everyone to track their carbon footprints
planA	Germany	Developer of a corporate carbon accounting, decarbonization, and economic, social, and governance (ESG) reporting software provider designed to provide personalized sustainability action plans and compliance tracking services
Emitwise	UK	Developer of automated carbon tracking and accounting software designed to help businesses track and manage carbon footprint
PLANET FWD	US	Developer of a carbon management platform intended to help consumer brands reduce their carbon footprint
Cleartrace	US	Developer of energy and carbon accounting technology designed to accelerate and scale renewable production without massive subsidies
Carbon Chain	UK	Developer of a carbon accounting platform intended to help organizations track greenhouse gas emissions
Net0	UK	Developer of a carbon accounting platform intended to empower businesses to measure, monitor, offset and reduce carbon emissions
ALTRUISTIQ	UK	Developer of a sustainability impact management platform designed to help large companies increase their impact on sustainability functions
minimum	UK	Developer of a carbon accounting platform designed for corporate sustainability management
vaayu	Germany	Developer of automated software designed to track, reduce and offset carbon emissions in real time
CHOOOSE	Norway	Developer of a platform offering tools to integrate climate action such as high-precision emission calculations and carbon removal transactions
ECOHEDGE	UK	Developer of carbon accounting software designed to help businesses to measure and reduce their carbon footprint

Growth (>$50M raised)

Company	HQ	Core Offering
PERSEFONI	US	Developer of a carbon footprint management platform designed to measure, analyze, plan, forecast, and report carbon footprint
Watershed	US	Operator of an environmental platform intended to help businesses reduce carbon emissions through information and necessary actions

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Batteries / Storage	
Market Segmentation	• **Trend:** increasing hardware demand drives performance and data management capabilities; the battery energy storage systems (BESS) market is maturing and moderately consolidated, valued at ~$60B in 2022 globally, with more than $5B invested in globally in 2022 (3x increase YoY) • **Adoption:** 2022 global BESS penetration by region**:** US: 28%, EU: 20%, Asia: 40% • **By Vertical:** 1) power, 2) utilities, 3) transportation, 4) energy providers • **By Function**: 1) performance, 2) design, 3) operations, 4) data
Business Models	• **1) BESS Performance Optimization** – controls and enhances the systems, increasing their value over time • **2) Battery Management Systems Software** – safeguard rechargeable battery performance and longevity through intelligent monitoring and control solutions • **3) Simulation and Modeling** – models battery degradation and enables predictive simulations
Incumbents	• **Performance Optimization:** Voltaiq, Liminal, Ifesca, Storlytics, Vault Bidder • **Management Systems:** Stem (Athena), Wartsilla GEMS, Powin, Doosan, Autogrid Flex,Tesla AutoBidder • **Modeling and Simulation:** Energy Toolbase, Ansys, Energy Vault
Sample Vertical Use Cases	• **Power / Utilities** – Altus Power uses Stem's Athena to optimize Solar Plus storage systems across Massachusetts; AutoGrid's Flex platform enables Asia-Pacific power generator CLP Holdings to manage DERs; Green Mountain Power uses Tesla Autobidder software to balance state grid at Vermont • **Construction / Engineering –** Energy Toolbase's iEMS was installed alongside an engineering client's storage system to capture demand savings • **Auto / EVs** – Lithium Balance A/S uses Ansys to develop functional safety features for automotive battery management systems
Growth Drivers	• **Regulation** – US: 30% tax credit for storage batteries with more than 3 kWh of storage, ITC for 25% of total project cost; EU: REPowerEU Plan • **Capital Availability** – private investments in battery technologies have materially increased since 2010; US: $19B since 2020; EU: $16B since 2020; China: $29B since 2020 • **EV Demand** – demand for EVs is expected to rise 6x from 2021 through 2030, with annual unit sales growing from ~6.5 million to ~40 million over that period • **Declining Costs** – cost of Li-ion batteries fell ~80%, from $732/kWH in 2013 to $151/kWH in 2022 and is expected to fall below $100 by 2026 • **Increasing Capacity** – US battery storage capacity increased from ~20x, from 573MWh in 2020 to 11GWh in 2022

Sources: Lazard VGB Insights, BNEF, EIA, McKinsey, Pitchbook Data, Inc., RystadEnergy

Batteries / Storage

Emerging Innovators

Venture (<$50M raised)

Company	HQ	Core Offering
BREATHE	UK	Developer of an electric vehicle battery charging control software designed to adapt the charge to every battery's condition
ASTERRA	Israel	Developer of leakage detection software designed to detect underground leaks in potable water supply systems
Brill Power	UK	Developer of novel battery management, control, and monitoring tech designed to increase the lifetime performance of batteries in stationary energy storage and EVs
volytica diagnostics	Germany	Developer of a telematics diagnostics platform designed to analyze and forecast battery systems in the field of e-mobility
VOLTAIQ	US	Developer of an analytics platform designed to drive innovation and improve the devices that power the electrified world
WATT MORE	US	Developer of a comprehensive predictive planning tool that enables optimal design of battery storage projects during the development phase
AIONICS	US	Developer of a materials informatics platform intended to support the development of a decarbonized global economy
zitara	US	Developer of cloud and embedded battery management software designed for enterprises with large deployments
PowerUp	France	Developer of an analytics platform designed to limit the economic and ecological cost of batteries
ACCURE	Germany	Developer of battery analytics software designed to assist companies worldwide in making batteries safe, reliable and sustainable
Entrix	Germany	Developer of an optimization and trading platform designed for grid-scale battery storage that accelerates the transition toward a clean energy future
PEAK ENERGY	US	Developer of giga-scale energy storage technology solutions designed to lower the cost of energy storage
liminal	US	Developer of an ultrasound and data analytics platform designed for inspection and metrology during battery manufacturing

Growth (>$50M raised)

Company	HQ	Core Offering
FLEXGEN POWER SYSTEMS	US	Developer of energy storage technology and software created for the utilities and industrial sectors as well as government agencies
TWAICE	Germany	Developer of predictive analytics software designed to optimize the development and operation of lithium-ion batteries
PEAK POWER	Canada	Developer of an artificial intelligence-powered energy optimization software designed to serve building owners, project developers, and utilities
PEAXY	US	Developer of modular cloud-based software platform intended for predictive analytics
Qnovo	US	Developer of advanced battery management software designed to improve the consumer mobile experience by enhancing battery performance

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

EVs / Mobility	
Market Segmentation	• **Trend:** concentrated set of leaders yet overall market still in growth mode; global market size valued at \$29B in 2023 (application software 43.5% of total market value); expected to grow at a CAGR of 17% to \$117B in 2032 • **Adoption:** adoption barriers persist with 8% penetration in the US, 23% in the EU, and 29% in China • **By vertical**: 1) autonomous driving systems *(perception software, localisation software, V2X),* 2) EV charging / management, 3) vehicle-to-grid (V2G) integration, 4) other smart mobility • **By Function**: 1) GHG management, 2) asset performance, 3) connectivity
Business Models	• **1) Asset Management / Security** – manage performance and protection of EVs and charging infrastructure • **2) V2G** – enable bi-directional energy flow between electric vehicles and the power grid • **3) EV-Specific GHG Management** – provide insights necessary to forecast CO_2 emissions reduction • **4) Other Smart Mobility** – provide real-time route optimization and charging locations
Incumbents	• **Autonomous Driving Systems:** Mobileye, Nvidia Drive, Valeo ADAS, Leddartech, Matroid, Aeye • **EV Charging:** Chargelab, MobilityHouse, EnelX • **Vehicle to Grid (V2G):** Nuvve, Synop, ChargeScape • **Asset Security:** C2A security, Qualcomm (V2X) • **GHG Management:** Uptake, Virta, Fermata Energy, Cobli, Molecule.io
Sample Vertical Use Cases	• **OEMs** – C2A's EVSec software manages cybersecurity vulnerabilities for Valeo's parts • **DER Providers** – Fermata Energy provides performance analytics on battery utilization to EnergyHub • **Fleet Operators** – Fedex uses Brightdrop Core to monitor battery performance and track emissions • **Manufacturing** – Mercedes Benz, Jaguar use Nvidia Drive to solve AI challenges in autonomous driving • **Real Estate** – Enel X's JuiceApp provides a SaaS solution for managing Power Electric's EV charging stations
Growth Drivers	• **Capital Availability**– increase in private investments in the last decade has driven innovation and lowered costs in battery technology; US: \$212B since 2020; EU: \$60B since 2020; China: \$63B since 2020 • **Regulation** – US: 50% of all new vehicle sales to be electric by 2030 (8% penetration in 2022, up from 1% in 2019); EU: all new vehicles registered to be zero-emission by 2035 (23% penetration in 2023, up from 3% in 2019); China: 50% of all new vehicle sales to be electric by 2035 (30% penetration in 2023, up from 3% in 2019) • **Consumer Preferences** – globally, 52% of car buyers prefer an EV for their next purchase; a 3x growth in preference for fully electric cars from 7% in 2020 to 20% in 2022

Sources: EY, Pitchbook Data, Inc., Precedence Research, Lazard VGB Insights

Emerging Innovators

EV / Mobility

Venture (<$50M raised)

Company	HQ	Core Offering
smartcar	US	Developer of a connected car platform designed to link cars with mobility applications
CHARGELAB	Canada	Developer of EV charging software designed to operate and optimize electric vehicle charging equipment
ChargerHelp!	US	Developer of an EV charging reliability management platform designed to offer an on-demand repair of EV charging stations
Recurrent	US	Developer of battery report tools designed to provide transparency and confidence in pre-owned electric car transactions
AMPECO	Bulgaria	Developer of a software technology platform designed to manage a network of electric vehicle charging stations

Company	HQ	Core Offering
Flipturn	US	Developer of cross-system visibility designed to accelerate electrification for fleet EV and charger operations
Kopperfield	US	Operator of a home electrification platform intended for contractors and consumers designed to make electric vehicle charging, solar, and heat pump installations simple and accessible
noodoe	US	Developer of electric vehicle charging software designed to accelerate the world's transition to electric transportation
ampcontrol	US	Developer of an EV charging services software designed to accelerate the transition to zero-emission vehicles
volteras	UK	Developer of an electric vehicle software designed for connected cars

Growth (>$50M raised)

Company	HQ	Core Offering
CHARGE ZONE	India	Developer of electric charging networks software intended to provide electric vehicles to get charged anytime, anywhere
WeaveGrid	US	Developer of electrification software designed to connect electric vehicles to the grid
mojio	Canada	Developer of a modular SaaS platform designed to build, launch, and scale connected mobility services
MONTA	Denmark	Developer of an operating platform designed to power the electric vehicles ecosystem serving drivers, companies, cities, and the electricity grid
loop	US	Operator of a next-generation energy network intended to provide sustainable, equitable access to EV charging systems for all
ev.energy	UK	Developer of energy intelligence software designed to make charging electric vehicles clean and cheap for utilities and their customers
SIBROS	US	Developer of an on-vehicle software system designed to provide vehicle data and improved life cycle management

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Grid / Distributed Energy (DER)	
Market Segmentation	• **Trend:** software is the fastest growing category within the global distributed energy resource management system (DERMS) market. Projected to grow from $1.2B in 2023 to $2.2B in 2028 • **Adoption:** outdated grid systems have limited DERMS adoption, primarily due to high initial installation / integration costs; US: 70% of grid infrastructure older than 25 years; EU: 50% of grid infrastructure greater than 30 years • **By Vertical:** 1) utilities, 2) real estate, 3) energy providers, 4) microgrid operators, 5) industrials • **By Function:** 1) virtual power plants, 2) data / asset management, 3) trading
Business Models	• **1) Grid Optimization** – enable grid efficiency and reliability through smart management of DER • **2) SaaS/PaaS** – enable grid integration and control • **3) Virtual Power Plants** – aggregate and optimize DER for reliable and cost-effective power supply • **4) Data / Asset Management** – leverage advanced analytics to proactively manage DER
Incumbents	• **Grid Optimization:** Autogrid, GE, Integral Analytics, Generac Grid Services, UL Homer, Gridpoint, Envelio, Schneider • **SaaS/PaaS:** Mitsubishi Smarter Grid Solutions, Connected Energy, Derapi, Xendee • **Virtual Power Plants:** Shifted Energy, ABB Optimax, Flexitricity, Hitachi • **Trading:** Next-Kraftwerke, Generac Concerto • **Data / Asset Management:** Rhythmos, Gridmarket, Eaton CYME, Tesla Opticaster, Yes Energy
Sample Vertical Use Cases	• **Microgrid** – Outlier Energy uses Bluepillar IIOT platform to monitor and manage its microgrids • **Utilities** – CPS Energy uses Autogrid Flex to manage 240MW of electricity across 900,000 customers • **Real Estate** – Generac Grid uses Posigen to manage optimize grid load balancing for its residential customers • **Industrials** – Kimberly Clark uses Aveva PI software at their plants to optimize the integration of distributed energy resources
Growth Drivers	• **Regulation** – US: FERC Order 841, State-level Renewable Portfolio Standards (RPS) • **Grid Modernization Initiatives:** • **Capital Availability**– private investments in grid/DER optimization technologies; US: $1.5B since 2020; EU: $300M since 2020; China: $425M since 2020 • **Renewables Expansion** – global wind and solar capacity to increase 3.7x from 125GW in 2021 to 459GW by 2030

Sources: Lazard VGB Insights, Pitchbook Data, Inc., McKinsey, Mordor Intelligence, S&P Global

Grid / Distributed Energy

Emerging Innovators

Venture (<$50M raised)

Company	HQ	Core Offering
leap	United States	Developer of an interface platform designed for generating new value from distributed energy resources (DERs) through integration with energy markets
Enode	Norway	Developer of digital infrastructures software as a service-based platform designed to connect energy hardware to applications
SparkMeter	United States	Developer of smart meters and grid management software designed to make it possible to access electricity in hard-to-reach places and underserved markets
Resync	Singapore	Developer of an intelligent energy management platform designed to control and monitor distributed energy resources
Singularity	United States	Developer of a carbon tracking platform intended to provide the data infrastructure needed for grid decarbonization
innowatts	United States	Developer of a digital energy platform designed to transform and streamline the energy value chain across power markets globally
ostrom	Germany	Operator of an energy platform intended to switch, manage, and reduce electricity consumption
Zaphiro	Switzerland	Developer of an electrical grid management system intended to provide a real-time view of the energy flows in the grid and accurately locate faults
Camus	United States	Developer of an open-source grid orchestration platform designed to distribute renewable energy resources
Gridware	United States	Developer of a grid monitoring system designed to detect and predict faults so that disastrous wildfires can be avoided
Buzz Solutions	United States	Developer of AI-powered actionable insights and predictive analytics platform designed to detect faults and anomalies on power line assets
enACT	United States	Developer of a single business platform designed for solar project management
Pearl Street Technologies	United States	Developer of a simulation, optimization, and design platform designed for power grid planning, with applications for grid operators, utilities, and project developers
WattCarbon	United States	Developer of an energy decarbonization market and measurement and verification platform intended for buildings and distributed energy resources
cleanwatts	Portugal	Developer of a cloud-based operating system designed specifically to address the evolving needs of energy communities
BluWave-ai	Canada	Developer of an artificial intelligence platform designed to optimize the operation of smart grids and microgrids
Xendee	United States	Developer of a microgrid decision support software designed to deliver optimal designs and business cases accurately
Utilidata	United States	Developer of a technology company designed to make the electric grids cleaner, smarter, more efficient, and more sustainable

Growth (>$50M raised)

Company	HQ	Core Offering
aurora	United States	Developer of engineering design and sales proposal software intended for distributed solar and storage enterprises
GridPoint	United States	Developer of a data-driven platform designed to provide smart building and grid software services
voltus	United States	Developer of a technology platform designed to connect distributed energy resources to electricity markets
GridX	United States	Developer of enterprise rate platform designed to rely on to usher in our clean energy future
bidgely	United States	Developer of an omnichannel engagement platform designed to offer analytics that can itemize consumers' energy data into individual appliances
Omnidian	United States	Developer of a proprietary technology designed to protect and accelerate capital invested in residential and commercial distributed energy assets
powerhive	United States	Developer of a cloud-based software application and proprietary technology platform designed to provide access to microgrid electricity in rural homes

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Carbon Offsets / Marketplaces	
Market Segmentation	• **Trend:** immature market with unproven track record; high proportion of offsets concentrated within a small subset of projects. Voluntary carbon markets are estimated to grow 5x, from $2 billion in 2022 to $10 billion by 2030. Global demand for voluntary carbon offsets could increase by a factor of 15 by 2030 and 100 by 2050 • **Adoption:** In 2022, China led with the largest ETS market (7.8B tons of CO_2e covered), followed by EU (1.5B tons), South Korea (580M tons), and California (320M tons) • **By Vertical:** 1) infrastructure *(energy, transportation, construction, chemicals, IT, manufacturing),* 2) healthcare, 3) retail, 4) agriculture, 5) technology, 6) real estate, 7) financial services • **By Function:** 1) interface, 2) exchange, 3) trading, 4) validation
Business Models	• **1) Exchange** – facilitate the trading of carbon credits • **2) Project Management** – nature-based and • **3) Validation** – certify that carbon credits methodologies comply with regulatory standards • **4) SaaS** – provide software for tracking and measuring carbon footprint and/or trading of carbon credits
Incumbents	• **Exchange:** Carbon Trade Exchange, Xpansiv, Airchange, FrontierClimate, Renewable Exchange • **Interface:** Carbon Future, Cleartrace, Blok-z, Indigo Ag • **Validation:** GoldStandard, Puro.earth, Nori, Verra
Sample Vertical Use Cases	• **Energy Providers** – Lundin Energy and Intertek used Xpansiv to launch Digital Crude Oil, enabling energy markets to differentiate crude oil based on GHG emissions and ESG performance • **Transportation** – International Business Aviation Council uses CTX platform to purchase carbon credits • **Technology** – Google purchased carbon offsets in 2020 to eliminate its entire carbon legacy pre-2007 • **Agriculture** – Indigo Ag enables farmers to sell carbon credits to corporations looking to offset carbon emissions • **Real Estate** – Brookfield Properties uses ClearTrace to digitally match property consumption with associated RECs
Growth Drivers	• **Regulation** – US: reduce GHG by 52% below 2005 levels by 2035; EU: reduce GHG by at least 55% by 2030, compared to 1990; Global: Paris Agreement. National policies governing net zero targets went from covering 10% to 65% of emissions over the past two years • **Consumer Reach** – categories of consumer spending including food, transportation, and entertainment, could easily incorporate an option to purchase carbon offsets as part of everyday purchasing decisions • **Corporate Net Zero Targets** – global count in 2023 was 4000 companies, up 4x from 2000 • **Emission Reduction Challenges** – corporations seeking to fulfill ambitious emission reductions targets seek viable alternatives rather than pursuing costly operational and supply chain alterations

Sources: Lazard VGB Insights, McKinsey, Pitchbook Data, Inc., Forbes

Emerging Innovators

Carbon Offsets / Marketplaces

Venture (<$50M raised)

Company	HQ	Core Offering
cloverly		Developer of a sustainability-as-a-service platform intended to connect the voluntary carbon markets to businesses, consumers, and organizations using real-time calculations powered by API
carbonplace		Developer of a settlement platform designed for secure and scalable transfer and settlement of voluntary carbon credits
CLIMATE VAULT		Developer of an immediate carbon reduction solution platform intended to help organizations achieve verifiable, scalable and immediate carbon calculations
Supercritical		Developer of an all-in-one platform that enables customers to get an accurate footprint, create a robust climate plan, and remove carbon to hit their targets
ISOMETRIC		Developer of verification and registry platform designed to confirm carbon removal claims are true, with all data transparently recorded in a publicly available registry
Flowcarbon		Developer of carbon token designed to accelerate decarbonization through nature-based climate operations

Company	HQ	Core Offering
Carbonfuture		Operator of carbon credit management platform intended to mitigate the climate crisis
CEEZER BEYOND NET ZERO		Operator of a digital carbon bank intended to guide companies through the complex voluntary carbon market
Cø c/naught		Operator of a carbon credit marketplace intended to help companies offset their carbon footprint
Nori		Operator of a blockchain-based marketplace intended to remove carbon dioxide from the atmosphere
CLIMATE TRADE		Provider of environmental services intended to offset carbon footprint and to invest in green financial products
Evergrow		Provider of offtake and capital services intended to ensure the acceleration of projects that reduces humanity's carbon footprint

Growth (>$50M raised)

Company	HQ	Core Offering
Patch		Operator of carbon offsetting API platform intended to manage and mitigate the carbon footprint
Sylvera		Developer of machine learning-based tools designed to track the performance of carbon offsets
BeZero		Operator of a global rating agency intended for the voluntary carbon market
Pachama		Developer of remote sensing platform designed to verify and monitor carbon capture by forests to help conservation and reforestation
Agreena		Developer of a soil carbon platform intended to scale regenerative agriculture through finance and technology
NCX		Operator of a forest carbon marketplace intended to provide carbon credits to manage forest carbon projects
RUBICON CARBON		Provider of emissions reduction services intended to meet the growing demand for carbon credits

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Energy Management / Optimization	
Market Segmentation	• **Trend:** highly fragmented market; global EMS market to grow at a ~14% CAGR from $36B in 2022 to $150B in 2035 • **Adoption:** US dominated the energy management systems market with a 35% penetration rate in 2022 • **By Vertical:** 1) infrastructure *(energy, transportation, construction, chemicals, IT, manufacturing),* 2) agriculture, 3) consumer, 4) real estate, 5) utilities, 6) defense • **By Function:** 1) usage/efficiency tracking, 2) intelligent energy management, 3) cybersecurity
Business Models	• **1) Asset Performance Management** – provide cloud-based tools to manage efficiency and optimization of DER assets • **2) Cybersecurity** – provide private data security for energy infrastructure • **3) Metering** – monitor energy consumption in real-time and offer energy-saving insights • **4) Project Management** – tools to implement energy optimization strategies for DER assets
Incumbents	• **Asset Performance Management** – Alsoenergy, Energycap, QOS Energy, Brightworks, DigitalClones, SparkCognition • **Grid Optimization** – Argand Solutions, Lancium, Enphase • **Energy Management** – Honeywell, Rockwell Automation, Schneider Electric, Powerfactor, Powerley, Energy X Solutions • **Cybersecurity** – Via, Micro Focus, Siemens, SentinelOne
Sample Vertical Use Cases	• **Energy Providers** – Lodestar Energy uses Powerfactors' Bluepoint software to manage their solar assets • **Manufacturing** – Blue Sea Foods uses Argand Solution's electrical monitoring system across their manufacturing sites • **Defense** – US DoD integrated Via into its system to enhance cybersecurity management of Impact Level 6 energy data • **IT** – Lancium Compute Cloud enables high-volume HTC and decarbonizes the Texas/New Mexico Power service territory • **Utilities** – SCPPA uses Energy X Solutions to power the efficiency programs of its member utilities
Growth Drivers	• **Declining DER Costs** – global solar PV Prices ($/W) have reduced by 50% from $6.65 in 2010 to $3.27 in 2023 • **Government Incentives** – US: IRA Act provides $11B for rural electric DER • **Renewables Targets** – ambitious renewable energy penetration targets; US: 80% by 2030; EU:32% by 2030 • **Capital Availability**– record $358B in global renewables investments executed in 1H '23

Sources: Lazard VGB Insights, Bloomberg, Global Newswire, Pitchbook Data, Inc., Research Nester, SEIA

Emerging Innovators

Energy Management / Optimization

Venture (<$50M raised)

Company	HQ	Core Offering
AMPERON		Developer of forecasting and analytics platform designed to deliver real-time energy data forecasts
DAVID ENERGY		Developer of an energy management platform intended to cater to and deal exclusively with customers with behind-the-meter (BTM) assets
SENSORFACT		Developer of an intelligent energy management system designed to help Industrial companies reduce their energy consumption
ENTOUCH		Developer of an energy management platform designed to optimize operations while reducing energy usage to drive profitability for multi-site businesses
BLOC POWER		Developer of climate technology intended to save energy, reduce carbon emissions and improve health outcomes in financially under-served communities
ENERGIENCY		Developer of an artificial intelligence-based analytics platform designed to detect and visualize new energy savings opportunities for manufacturing
piclo		Developer of an energy management platform intended to make electricity grids efficient, reliable, and sustainable
copper		Developer of an energy consumption monitoring system designed to provide utilities with actionable, real-time energy measurements and insights
Virtual Peaker		Developer of an energy assessment platform designed to monitor and manage residential electric demand
ostrom		Operator of an energy platform intended to switch, manage, and reduce electricity consumption
kapacity.io		Developer of smart energy grids with an electricity load balancing service designed to improve energy efficiency in the building and real estate sector
DABBEL		Developer of an AI-autonomous building management system designed to control the building more efficiently
RECURVE		Developer of a revenue-grade open-source platform designed to accelerate the transition to a clean energy economy

Growth (>$50M raised)

Company	HQ	Core Offering
Arcadia		Developer of a clean energy tech platform designed to facilitate easy access to clean energy
METRON		Developer of a data management platform designed to provide power intelligence for obtaining true energy efficiency
OhmConnect		Developer of an energy-saving platform designed to change the way energy is used
Origami		Developer of trading and automation software designed to help power traders manage distributed energy assets
BRAINBOX AI		Developer of heating, ventilation, and air conditioning technology designed to proactively optimize the energy consumption of buildings
uplight		Developer of energy management software intended to serve utility companies representing residential, commercial and industrial end-users in North America
tibber		Developer of an energy consumption management application designed to assist users in controlling their electricity usage
terabase		Operator of a solar technology company intended to reduce the cost and increase the scalability of solar

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Data Services	
Market Segmentation	• **Trend:** high-growth vertical propelled by pervasive climate- and energy-related data generated by hardware / infrastructure assets and development projects. Global climate data analytics software market estimated to grow at a CAGR of 32% to $6B in 2029 • **Adoption:** penetration rate by region – North America: ~40%, EU: ~30% • **By Vertical:** 1) infrastructure *(energy, transportation, construction, chemicals, IT, manufacturing),* 2) real estate, 3) utilities, 4) transportation, 5) federal, 6) financial services • **By Function:** 1) data management, 2) climate modelling, 3) energy optimization, 4) consumer and enterprise insights
Business Models	• **1) Environmental Intelligence** – provide cloud-based environmental, weather, and earth / satellite data • **2) Metrics / Reporting** – use standardized methodologies to analyze data for regulatory reporting requirements • **3) Analytics / Modeling** – predictive tools related to climate change impacts and carbon reduction strategies • **4) Validation / Certification** – facilitate development of renewable energy certificate (REC) contracts or credits • **5) Financial Insights** – provide broad-based alternative data sources for uncovering risks in markets
Incumbents	• **Consumer Insights:** Bidgely, MRI, Sunverge, Uplight, Arcadia • **Finance:** ESG Book, Carbon Laces • **Energy Optimization:** Eaton CYME, C3 AI • **Data / Analytics:** Kabaun, Planet Labs, Climavision • **Climate Modeling:** Cervest, Zesty AI, TCS Climanomics, Climateview
Sample Vertical Use Cases	• **Transportation** – US Air Force uses C3 AI's air logistics platform to conserve fuel use and increase flight efficiency • **Utilities** – Fusebox uses Arcadia to develop enhanced insights on its existing utility management platform • **Finance** – Dow Jones uses ESG Book to develop a news data model to guide ESG investing • **Real Estate** – Eaton uses Sunverge to dynamically manage loading of its EV charging infrastructure
Growth Drivers	• **Renewables** – record $358B in global renewables investments executed in 1H '23 • **Regulation** – ESG disclosure requirements have become stricter for public companies; US: SEC; EU: NFRD • **Rise of VCMs** – globally, there are 30 Voluntary Carbon Markets (VCMs), out of which 18 were established since 2020

Sources: Lazard VGB Insights, Maximize Market Research, Pitchbook Data, Inc., Bloomberg, Verdantix

Data Services / Asset Management

Emerging Innovators

Venture (<$50M raised)

Company	HQ	Core Offering
enervee		Operator of energy data and marketing platform intended to promote energy-efficient products and appliances
ClimateAi		Developer of cloud-based enterprise software designed to predict the physical risk of climate change on assets
transect		Developer of environmental due diligence tools designed to offer site selection and critical issue analysis for energy, real estate, and infrastructure projects
thread AUTONOMOUS INSPECTION		Provider of a turnkey asset performance management platform for the energy and utilities industry
netpurpose.		Developer of a data aggregation platform intended to make impact measurement effortless for investors
TEREN		Operator of a geospatial analytics platform intended to transform data that creates a safer and more sustainable planet
neara		Developer of cloud-based enterprise platform intended to serve the electric and power infrastructure industry
clir		Developer of energy asset management platform designed to understand the performance of renewable power plants and maximize electricity production
kevala		Developer of data-driven insights and analytics platform designed to make clean energy-related data meaningful, transparent, and accessible
FLINTpro		Developer of a data analysis platform designed for the global climate finance sector, carbon market developers, and ESG reporting
AKSELOS		Developer of software enabling high fidelity simulations of energy assets to optimize engineering processes and sustainability
ClimateView		Developer of a climate SaaS platform designed for local governments to plan, simulate, and execute their climate transition
RAPTOR MAPS		Developer of a lifecycle management platform designed to increase performance, reduce costs and standardize solar photovoltaic assets across a portfolio
sensat		Developer of a common visualization platform designed to capture and track infrastructure projects from anywhere
Risilience		Developer of a data analytics platform designed to help companies in climate and enterprise risk management
overstory		Developer of a planet intelligence tool designed to offer global-scale automated analysis of satellite imagery

Growth (>$50M raised)

Company	HQ	Core Offering
JUPITER		Developer of a data analytics platform designed to protect global assets that are endangered by weather change
sparkcognition		Developer of AI-based machine learning software designed to help organizations solve their critical problems and run a sustainable, safe and profitable business
SITETRACKER		Developer of a project management platform designed for high-volume, repeatable, and distributed projects
Orbital Insight		Developer of a deep learning-powered geospatial analytics platform intended to offer a clear understanding of societal and economic trends
Climavision		Developer of weather services and intelligence solutions intended to reduce the economic risks of climate change
pixxel		Developer of hyperspectral satellites designed to capture geospatial data of every location on the planet
Proof of Impact		Developer of a B2B SaaS ESG and Impact Data Intelligence platform designed to transform static impact data reporting into a digital solution
Urbint		Developer of a field risk management platform designed to empower utilities and infrastructure operators to make communities safe and resilient
4M Analytics		Developer of a subsurface-infrastructure geo-data platform designed to provide unprecedented access to what is happening underneath the surface
tomorrow.io		Developer of a hyper-local weather forecasting platform designed to improve weather forecasting with new micro weather information
STRATIO		Developer of a hybrid virtual data management platform designed for digital transformation
one concern		Developer of a resilient system designed to bring disaster science together with machine learning for better decision-making
PVcase		Developer of a PhotoVoltaic Computer Aided software designed to automate the designing of solar power plants
eSmart SYSTEMS		Developer of data analytics software designed to turn visual inspection data into actionable asset insight
SKYSPECS		Operator of renewable energy asset management by offering purpose-built tech and services that help customers deliver industry-leading productivity and returns

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Circular Economy / Supply Chain	
Market Segmentation	• **Trend:** highly fragmented, expanding market; circular economy digital solutions market valued at $594M in 2022 (difficult to truly quantify), expected to grow to over $1.7 billion by 2027 at a CAGR of 27% • **Adoption:** Italy and Netherlands are the leading countries in scored circular economy metrics • **By Vertical**: 1) consumers, 2) manufacturers, 3) retailers, 4) supply chain 5) energy providers • **By Function**:1) sustainable waste management, 2) product lifecycle management, 3) supply chain / logistics, 4) transportation, 5) materials, 6) manufacturing
Business Models	• **1) Sustainable Waste Management** – optimize waste recycling process • **2) Production Process Management** – provide insights on internal sustainability practices for product development • **3) Reverse Logistics** – manage the process of returning goods from their final destination back to the manufacturer or another point in the supply chain • **4) Sustainable Supply Chain** – estimate sustainability profile of suppliers in value chain
Incumbents	• **Recycling / Waste Management** – Aspire, Carbios, Too Good to Go, Loop Front, Diversys • **Insights** – Recyda, iNex Circular, Akanthas, Trinov • **Sustainable Supply Chain** – Sedex, Optoro, Optera, Kloopify, Cedara • **Returns / Reverse Logistics** – Arrive, Recurate, Archive Resale, ReBound
Sample Vertical Use Cases	• **Manufacturers** – Kao uses the Recyda platform to assess the recyclability potential of their packaging • **Retailers** – Yeti uses Arrive to facilitate "Rescue Yeti", a program that enables customers purchase returned or used Yeti products • **Energy** – TotalEnergies uses iNex to trace origin of recycled materials for its renewable energy project • **Industrial** – Cemex uses Trinov to manage waste from industrial facilities • **Technology** – Apple has set a goal to ensure by 2030 all of its suppliers use 100% renewable energy during product development
Growth Drivers	• **Consumer Pressure** – retail sales growth of companies with multi-faceted circular supply chains observed to be ~2.5x those with one claim (2018 - 2022) • **Infrastructure Development** – i.e. new carbon-friendly manufacturing and waste management facilities • **Resource Shortage** – by 2030, human demand on the earth's ecosystem estimated to exceed nature's capacity to regenerate by 100% • **Regulation** – US: IRA; EU: CEAP, CSRD

Sources: Lazard VGB Insights, Circularity Gap World, Knowledge for Policy, McKinsey, BCG, Pitchbook Data, Inc., Sustainability Magazine, Verdantix

Emerging Innovators

Circular Economy / Supply Chain

Venture (<$50M raised)

Company	HQ	Core Offering
muir.ai	US	Developer of advanced analytics platform designed to measure and reduce emissions
pledge	UK	Developer of accredited tools intended for supply chain leaders and freight forwarders to understand, report, reduce, and remove their logistics emissions
Guidewheel	US	Developer of a cloud-based manufacturing operations platform intended to provide real-time visibility into machine performance and identify problems
Makersite	Germany	Developer of data management software designed for the global manufacturing industry to manage product sustainability, cost and compliance
specright	US	Developer of a cloud-based enterprise specification management software designed to optimize for sustainability at any phase of the product life cycle or stage of the supply chain
Sourcemap	US	Developer of a supply chain mapping software designed to mitigate social, environmental, and financial risks affecting businesses
Rheaply	US	Developer of a resource exchange platform designed to catalyze the circular economy

Company	HQ	Core Offering
recurate	US	Operator of a resale marketplace intended to resell and promote used products directly in the store
Multiscale Technologies	US	Operator of a no-code artificial intelligence platform designed to accelerate research and development and materials innovation
EcoCart	US	Developer of sustainable shopping applications designed to make fighting climate change simple, cost-effective and accessible
Ecube Labs	South Korea	Provider of data-driven waste management alternatives intended to offer eco-friendly waste management services
twig	UK	Developer of a financial technology designed to empower consumers to get rooted in circular economy principles
Sievo	Finland	Developer of procurement analytics software designed for data-driven enterprises
Recycleye	UK	Developer of digital tools designed to detect and provide analytics on waste management

Growth (>$50M raised)

Company	HQ	Core Offering
Inspectorio	US	Developer of a quality inspection and compliance verification network platform designed to optimize quality, operations, and sustainability
worldly	US	Developer of a sustainability insights platform designed to deliver services for measuring, managing, and sharing supply chain performance data
Integrity Next	Germany	Developer of a supply chain compliance platform designed for supplier sustainability and compliance monitoring
Circulor	UK	Developer of a supply chain traceability platform designed to help businesses to demonstrate responsible sourcing, improve their ESG performance and reduce their environmental impact
loop	US	Operator of an exchange-first return platform intended to drive loyalty for e-commerce businesses
TROVE	US	Developer of an online resale software designed to improve the process of buying back and reselling used items for fashion and apparel
certa	US	Developer of an operational management platform designed to help with third-party workflow optimization
aPriori	US	Developer of digital factory solutions that enable the specification of energy sources to be included in any manufacturing simulation
Assent	Canada	Developer of compliance management software offering a suite of products to manage materials compliance, ethical sourcing, inspections, supplier management, and supply chain data collection
Altana	US	Operator of a global supply chain platform intended to offer trade data management services, including product traceability and ESG mapping features

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Climate Finance / Investment	
Market Segmentation	• **Trend:** highly fragmented FinTech market serving both energy stakeholders (financing solutions) as well as consumers and enterprises (investments); global climate FinTech market projected to grow at a CAGR of 23% to $324B by 2026 • **Adoption:** estimated share of global climate FinTech venture and growth companies by region – EU: 43%, US: 31% • **By Vertical**: 1) retail banking / wealth management, 2) consumer, 3) energy and infrastructure, 4) corporate finance
Business Models	• **1) Payments** – digital payments, carbon spending / tracking, sustainable e-commerce • **2) Banking** – offset deposits, credit cards, credit management systems, other “green” banking products • **3) Lending** – crowdlending / P2P, clean leasing programs, pay-as-you-go microgrids, credit analysis, project finance UW • **4) Investing** – equity crowdfunding, robo advisors, thematic fund creation, asset valuation • **5) Trading / Exchanges** – provide platforms for clients to invest in renewables projects, matching CDR initiatives, etc. • **6) Risk Analysis** –physical risk analysis, transition risk analysis, scenario modeling, ESG data • **7) InsurTech** – solar revenue puts, proxy revenue swaps, risk pricing, claims management • **8) RegTech** – regulatory reporting, shareholder advocacy, end-client (vertical-focused) impact reporting
Incumbents	• **Exchanges** – Changeblock, Senken, Toucan, Carbon X, Puro.earth • **Interfaces** – Global Climate, CoZero, Coolset, Ecochain, EcoVadis, Climatepartner, IBM Decarbonization Software • **Consumer CDR** – Reforestum, Climeworks, Chooose, Raise Green • **Banking** – SVB, Aspiration, Tomorrow, Novus, Helios, Green-Got • **Risk Analysis** – Acuity, Baringa, Bloomberg, Moody’s, Dow Jones, S&P Global
Sample Vertical Use Cases	• **Travel** – American Express uses Chooose to provide a portfolio of climate solution projects as investment opportunities • **Technology** – Microsoft signed a multi-year off-take agreement in a direct air capture plant using Climework’s platform • **Supply Chain** – Merck uses Ecovadis software to evaluate the sustainability ratings of its vendors and highlight decarbonization purchasing opportunities • **Retail** – Wayfair uses Climatepartner software to verify that a product's carbon footprint has been calculated, reduced and unabated emissions offset via CDR projects on its platform
Growth Drivers	• **Energy Price Trends** – market is nearing the inflection point where a selection of renewable sources now have predicted long-term cost savings and stable pricing relative to other energy sources • **Commercial Competition** – globally, the number of retailers setting science-based sustainability targets each year increased ~5x from 14 in 2019 to 66 in 2021 • **Regulation** – US and EU set targets to be climate neutral by 2050 • **Carbon Removal Price Trends** – nature-based carbon removal technologies are cheaper and more readily available than those that are engineered, leading to actionable investment opportunities

Sources: Lazard VGB Insights, Coherent Market Insights, New Energy Nexus, McKinsey, Pitchbook Data, Inc., BCG, Citi Ventures

Emerging Innovators

Climate Finance / Investment

Venture (<$50M raised)

Company	HQ	Core Offering
ever.green	🇺🇸	Developer of a clean energy projects marketplace designed to serve the renewable energy sector
ORENNIA	🇺🇸	Developer of commercial analytics and insights platform intended to help inform investment and capital allocation decisions for investors taking advantage of renewable energy opportunities
treecard	🇬🇧	Provider of eco-friendly debit cards intended to promote sustainability and environmental awareness among its users
Banyan Infrastructure	🇺🇸	Developer of a purpose-built project finance software designed to simplify, accelerate, and optimize the financing of sustainable infrastructure across the full life cycle
PEXAPARK	🇨🇭	Operator of a renewable energy investment platform intended to optimize solar, wind and hydro investments
crux	🇺🇸	Developer of an external data automation platform intended to help organizations scale their critical data delivery, operations, and transformation needs
amber	🇦🇺	Developer of an energy application that enables customers to track wholesale energy prices in real-time and see a 12-hour forecast
CapShift	🇺🇸	Developer of turnkey impact investing system designed to increase the flow of capital into ventures solving global and local challenges
carbon collective	🇺🇸	Developer of an online investment platform designed to offer sustainable and green investment services
ODYSSEY	🇺🇸	Developer of an investment and asset management platform intended to scale energy project development across all phases of planning, financing, procuring, and operating
ecolytiq	🇩🇪	Developer of climate action infrastructure intended to provide banks and financial institutions with the digital infrastructure for green finance
Connect Earth	🇬🇧	Provider of software enabling customers to estimate the carbon footprint of their financial transactions
optiwatt	🇺🇸	Developer of a spending monitoring application designed to monitor at-home Tesla charging costs and gas savings using real-time electricity rates.
Synop	🇺🇸	Developer of charging software intended for commercial EV fleets
fennel	🇺🇸	Developer of a mobile investing application designed to provide insight into how companies impact the world
RenewaFi	🇺🇸	Operator of a renewable energy marketplace to help renewable energy professionals source and price wholesale power transactions
CIRCA5000	🇬🇧	Developer of an impact investment application intended to generate social and environmental influence alongside a financial return
COMMONS	🇺🇸	Developer of consumer-facing carbon emissions tracking application designed to make it accessible for anyone to track, reduce, and offset the emissions of everything they buy

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

Growth (>$50M raised)

Company	HQ	Core Offering
ethic.		Developer of a platform that focused on investment consulting technology that creates sustainable portfolios
LevelTen Energy		Developer of a renewable energy transaction platform designed to connect corporate and institutional power buyers to offsite projects
Doconomy		Provider of digital tools and services intended to empower banks, brands, and consumers to measure, understand and reduce the environmental impact linked to consumption
P97		Developer of a global, cloud-based mobility services platform designed to transform the way people shop, save and conduct daily business
SOLFACIL		Developer of a solar fintech platform designed to unlock the distributed solar market
MOSAIC		Developer of a residential solar lending platform intended to provide crowdfunded loans for residential solar projects
sparkfund		Developer of an online energy subscription platform designed to provide access to the latest energy technologies without buying them

Sources: Lazard VGB Insights, Pitchbook Data, Inc.

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