



Technologies fighting climate change and biodiversity loss

An investor's guide

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The Earth's biodiversity is deteriorating at an alarming rate, causing damage not only to the natural world but to wider society and the global economy, which often relies upon it as a resource used directly by people and businesses.

Thankfully, innovations in engineering and digital technology is helping drive progress towards global climate goals. In addition, consumer momentum and government policy are helping to spur on the development of technologies able to make an impact.

For example, the introduction of the US *Inflation Reduction Act* (IRA) in August 2022 should spearhead a new wave of growth and innovation and go some way in helping the private sector—and investors—decarbonise energy, transportation, agriculture and other emissions-intensive sectors.

The legislation has earmarked billions in new spending and tax breaks designed to increase clean energy investment, cut healthcare costs, and raise tax revenues. Overall, some US\$43 billion in IRA tax credits will aim to cut emissions by making electric vehicles (EVs), energy-efficient appliances, rooftop solar panels, and home batteries more affordable.

Europe responded with its own Green Deal Industrial Plan, aiming to create a more supportive environment for scaling up the European Union's manufacturing capacity for net-zero technologies and products.

This backdrop should drive profits for the companies delivering game-changing tools which secure widespread adoption. Further, it will create opportunities for portfolios if investors can closely track some of the key areas where this impact can be greatest.

As well as protecting the planet, greater sustainability means more sustainable future economic growth, and this growth depends on technology. The following sections of this paper highlight some of the most exciting technological advances aiming to secure a net-zero future.

Low-carbon transport

Globally, the combination of robust policy support in key markets, a wave of new product launches and continued technological innovation is supportive of the rapid adoption of EVs.

Ditching combustion engines is vital, as passenger cars are the largest contributor to transport sector carbon emissions. Thankfully, many major automobile makers are taking notice. Ford and Jaguar Land Rover, for example, have committed to having all-electric ranges in the next decade.

Consumer appetite for EVs is accelerating. According to the International Energy Agency (IEA), more than 10 million EVs were sold worldwide in 2022, and sales are expected to grow by another 35% in 2023, accounting for 18% of the global car market.

The IEA expects EVs to account for 60% of total new car sales across China, Europe and the US by 2030, helping avoid the need for up to five million barrels of oil each day. Separate research shows that globally, revenues from EV sales are forecasted to hit an annual growth rate of 10.07% between 2023 and 2028.

What's more, the whole EV supply chain should benefit from an increasing adoption rate in the coming years—longer-lasting batteries, private and public charging stations, semiconductors which can minimise power loss and support performance, and so on.

Battery performance and longevity are often hurdles for EVs. Typically, vehicles can drive between approximately 100 to 300 miles [160 to 480 km]—model dependent—before recharging is required. However, specialists including Chinese group CATL, and Korean group Samsung SDI are pioneering technology [for batteries to increase the range of EVs].

The latter is currently developing a high-capacity solid-state battery that enables an EV to drive much further on a single charge, and it expects to commercialise this breakthrough soon, which could be a gamechanger for the industry. Only a few years ago, this seemed unrealistic.

Smart energy and renewables

Given the number of government commitments to achieving net-zero targets within the next three decades, the world would need to increase renewable energy capacity by three or four times. Thankfully, renewable energy costs are generally becoming cheaper than fossil fuels, and the backdrop for clean energy growth—for instance, wind, solar and batteries—is very positive.

We think growth in both technologies will be driven by their already-compelling economics—including continued improvements in efficiency and technology, and likely ongoing policy support from governments.

BloombergNEF expects annual wind installations to rise by circa 50% between 2022 and 2030, while solar should increase by even more, at around 85%.

Looking at solar power, one analysis valued the global market size at US\$197.2 billion in 2021 and anticipates it to grow to some US\$368.6 billion by 2030—a compound annual growth rate of 7.2%.

Among the leaders in this area is First Solar, the largest utility-scale solar photovoltaic (PV) systems [capturing and converting sunlight into electricity] manufacturer in the Western Hemisphere, which has developed a technology to increase the energy yield of its solar panels.

Then there are specialists in the residential solar sector such as Enphase, which uses cutting-edge microinverter technology to turn sunlight more efficiently into electricity at the household scale.

Ultimately, the long-term goal will be to see homes and businesses become independent from the traditional power grid. Current market penetration is low, but solar is the cheapest form of renewable energy and, as such, the growth potential is considerable.

The storage solution

Moving away from coal- and gas-fired power generation and adopting renewable energy sources means essentially transitioning the grid. But wind and solar are intermittent forms of energy, and it is not possible to control when they are on and when they are off. As such, large-scale storage is needed to even that out. This is where battery energy storage systems (BESS) offer a compelling solution, and the companies involved in this technology such as NextEra Energy and Sungrow are growing as hardware prices fall.

According to consultancy McKinsey, more than US\$5 billion was invested in BESS in 2022, nearly a threefold rise from 2021. It expects the global BESS market will reach between US\$120 billion and US\$150 billion by 2030, over double its current size—and that utility-scale BESS, which already accounts for the bulk of new annual capacity, will grow around 29% p.a. until 2030.

Agriculture and waste management

Corporations are developing products aimed at having a positive impact on biodiversity preservation—and the wider environment—and this is especially true in the agriculture, waste and sustainable materials sectors.

Agricultural technology (or 'agritech') describes the use of technology across the agriculture sector—from horticulture to aquaculture—with the aim of improving crop yields, farming performance and boosting profitability in a climate- and biodiversity-friendly manner.

The market is rapidly expanding. The global agritech market was valued at more than US\$22 billion in 2022 and expected to grow at an annual compound rate of 13.1% between 2022 and 2032. Globally, the sector is expected to reach US\$75.8 billion by 2032.

Agritech spans genetics, big data, machine learning and even artificial intelligence (AI). For example, UK animal genetics company Genus breeds pigs and cattle through selective breeding, which can produce high-quality meat and milk more efficiently and sustainably. The group is also using gene editing to help grow resilience to costly diseases in farm animals like porcine reproductive and respiratory syndrome.

Elsewhere, US group Valmont deals in precision irrigation where sensors look for signs of drought or heat stress in soil. US giant John Deere has developed its See & Spray™ Select system which, via computer vision and machine learning, specifically targets weeds in corn, soybean, and cotton.

AI has also been identified as a potentially crucial tool for streamlining the identification and processing of recyclable materials, with large potential productiv-



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The quote

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ity gains that could benefit investors. Norwegian group Tomra, for example, provides advanced collection and sorting systems, and food processing, by employing sensor-based sorting and grading technology which uses deep learning [A type of machine learning where computers are ‘taught’ to think like humans], a subset of AI.

US group Li-Cycle recycles lithium-ion batteries, which are used in EVs and battery energy storage systems, and should benefit from the trend of onshoring in the US. There have been big questions around circularity and recyclability of batteries, but this firm is providing a solution by recovering critical materials, including cobalt and nickel, from all types of lithium-ion batteries and reintroducing them back into the supply chain.

The next big thing

As time moves on, technologies will evolve. It may well be the real climate tech breakthrough is still on the horizon. There is exciting progress being made in several areas such as sustainable aviation fuel (made from cooking oil, municipal waste or woody biomass) and carbon capture and storage (CSS)—where CO₂ is caught before it goes in the atmosphere.

Most CCS companies are still small but some, like Norwegian firm Aker, have listed on stock exchanges, and others are either already part of a larger group or likely to be bought if they can prove efficacy.

Then there is direct air capture technology which extracts CO₂ directly from the atmosphere at any location. Another area of interest is green steel—steel manufactured by a process which emits fewer greenhouse gases than conventional steelmaking, often by using green hydrogen [created from renewable energy] instead of fossil fuels. This could help deliver the 50% reduction in emissions from steel manufacturing needed by 2050, though it remains a long way from being deployed at a substantial scale. All this technology is critical to reaching net zero.

Equally, analytical and big data technologies are supercharging our understanding of the complex and multifaceted ways in which biodiversity is being damaged, and helping guide how a response might best be structured.

Ultimately, there will not be a single technological ‘silver bullet’, but rather a multitude of solutions which truly take the fight to climate change and biodiversity loss. We believe all efforts which can improve processes, efficiency, design and construction across industries will add to CO₂ reduction efforts and, in turn, create new potential investment opportunities. **FS**

Note: References to companies are for illustrative purposes only and should not be viewed as investment recommendations.