

Sustainability: from buzzword to lifeline.

The role of corporate innovation in the tech-driven journey to minimize carbon emissions.



Before we begin, Here are a few things to keep in mind.

Client discretion

For the sake of preserving our clients' confidentiality, all examples included were identified as part of our research. These don't disclose any of the interactions made between SOSA's clients and featured tech companies. Any resemblance to collaborations mentioned by SOSA in public announcements is purely coincidental.

Research scope

Sustainability affects and can improve every aspect of our lives; this report includes selected applications of a sustainable approach in industries SOSA is (but not exclusively) active in.

Applied structure

The first two chapters serve as an introduction to sustainability.

Chapter three presents frameworks and protocols already used by large organizations worldwide.

The chapters that follow will start with a general description of the current state of a featured industry, followed by one case study about a leading organization utilizing innovative technologies to reduce the carbon footprint of their activities in a meaningful and practical way.

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Forward

It's fall 2021 and the ozone hole over the South Pole that grows annually is now larger than Antarctica - the largest it's ever been. On the ground, we're still recovering from a summer that saw nearly 1 in 3 Americans experience a weather disaster - severe storms, fires, hurricanes and floods. The next climate catastrophe is imminent, and talk of climate change, and the harmful effects tied to the concentration of greenhouse gases in the earth's atmosphere, is front and center (it's quite literally raining down on us).

“ *The next decade offers opportunities for enterprises → to make an unprecedentedly strong and measurable impact which has been previously unavailable.*

Although **climate change** and **global warming** have been making almost every headline in 2021 (a number that has been steadily increasing since 2018), the terms have been around longer than one might think. Research to the origins of the terms point to a 1975 article by American geochemist Wallace Broecker: “Climatic Change: Are We on the Brink of a Pronounced Global Warming?”. Does this mean we're 40 years too late to the game?

Well, yes, but there's a sliver of hope and a silver lining thanks to the development of novel technologies. Once again, humanity finds a mode for survival - this time in the form of leveraging data science, modern communication infrastructures (5G and fiber optics connectivity), and IoT networks to monitor, analyze, and control large systems that cause detrimental environmental impact. These tools, which are now becoming readily available to corporations, are the lifeline to counteract environmental damage.

Given their large-scale impact, corporations have the responsibility and capabilities to be the greatest catalyst for change in a new planet-positive era. Undoubtedly, the 2030s will be characterized in history books as the decade of the global awakening to climate change, and this goes for corporations in particular.

The next decade offers opportunities for enterprises to make an unprecedentedly strong and measurable impact that has been previously unavailable. A first small step towards change is reading this report (congrats!). So let's get started. Here, we take a deep-dive into three major industries and the latest tech advancements that have proven successful at reducing carbon emissions.



Technology: from villain to hero

The relationship between technology and sustainability is complex and nonlinear.

At one point, technology allowed for critical developments and advancements that shaped the world before we realized this technology sets us back environmentally.

Using mining equipment to extract coal from the earth, for instance, led to steam-powered trains and boats that increased trade and brought on capital gains. Still, these same tools that fueled industrial revolutions were later discovered to be devastating for the planet. Consequently, pollution-reduction and environmental balancing tools were developed in response to this discovery. In this way, the relationship between technology and sustainability has been somewhat cyclical and response-oriented.

To reduce carbon emissions in the past, environmental protection officials would look for technology-based pollution. For example, officials may have put up a red flag and advised a chemical factory to reduce their use of polluting raw materials or stop dumping waste at sea. These efforts focused on “cleaning technologies” added to existing production processes to control and reduce pollution. For example, if we look at Japan, a legal framework was put in place as far back as the 1970s that focused on “end of pipe” and a cleaner way of disposing of waste. However, today, the focus has shifted from “cleaning technologies” to “clean technologies.” On a global scale, it was found that the more efficient planet-positive alternatives are technologies that alter production processes altogether, such as turning waste into biodegradable materials that could replace plastics or producing energy from the sun instead of coal.

When it comes down to it, cleaner production reduces the use of resources and pollution at the source, while end-of-pipe technologies only reduce pollution emissions as a “band-aid” approach.



Corporate sustainability: the metrics of becoming carbon neutral

ESG & SDG Frameworks

A key catalyst for change as well as measuring progress when it comes to corporations achieving carbon neutrality is a clear, actionable framework. Globally, organizations of all kinds are increasingly adopting two primary frameworks for environmental projects: ESG and SDG.

Environmental, Social and Governance (ESG) entails a set of standards for a company's operations that represent a responsible, ethical, and mostly more conscious state-of-mind to run businesses of all shapes and sizes.

Under the environmental chapter in ESG, we can find metrics, guidelines, and references for carbon emission reduction, water pollution and scarcity, air pollution, and deforestation. In addition, written guides, best practices, formulas, and third-party service providers are widely offered to corporations (internally or externally) who wish to implement company-wide policies that address ESG-related issues. As a result, corporations don't have to start from scratch and don't have to tackle ESG alone.

For governments and institutional organizations, the UN initiated the Sustainable Development Goals (SDG). It comprises 17 interlinked global goals designed to be a "blueprint to achieve a better and more sustainable future for all." Among these goals, eight items could arguably be associated with environmental causes. These include "Affordable and Clean Energy," "Responsible Consumption and Production," and "Climate Action," to name a few.



Data-driven frameworks

Over the past decade enterprises have implemented various performance measurement mechanisms to improve processes and become more cost and energy-efficient. Despite the many technological advances that makes it possible to collect and measure significantly more data, a major question related to sustainability remains: **how can an organization *actually* measure and control its carbon footprint?**

The answer to this question hasn't been straightforward until now because there isn't one standardized way to measure data regardless of the industry. Not to mention - the technology that allows for gathering the data wasn't quite there yet. Without measuring anything and applying tech to improve the chosen metrics, it's nearly impossible to make a real impact that could not only be sustained but also improved over time.

“ *The new developments in IoT technologies allow → for more data to be accumulated and provide a more accurate picture of which processes are emitting the most carbon emissions and, consequently, how these could be reduced.*

Enter the omni-sensing era

The accuracy of measuring environmental impact has changed with the development of recent sensing technologies, where data such as energy usage and air quality can be measured. Think: even a homeowner who uses a Dyson air purifier can monitor their air quality in real-time through the app. Likewise, those with smart homes can have detailed information on how much electricity they are using (and will appear on bills). Imagine what this can do on a large scale.

On an enterprise scale, for instance, constantly measuring and processing air quality data could help reach actionable insights. Technology provider BreezoMeter combines data from many sources to determine ultra-accurate air pollution levels. On top of traditional government weather readings, they process data from satellite measurements, meteorological and traffic data, as well as data regarding types of land cover, together with air quality models which provide “hyper local” information for their clients. For example, Breezometer partnered with automotive manufacturer Tata Motors for a project focusing on “Healthier driving experience with 360° Environmental Insights”, designed for a creative enhancement of in-cabin safety. Their joint service offers drivers the opportunity to see real-time information on their car dashboards regarding air quality in their vicinity. This allows drivers to make better health decisions based on the air pollution levels and individual sensitivities.

Energy optimization: sustainability in engineering and construction

Current state of the industry

Given that the construction industry is responsible for more than 30% of the world's greenhouse gas emissions, this industry might hold the most weight and, therefore, the most responsibility for lightening the climate change burden. The engineering and construction (E&C) sectors not only have a significant stake in global carbon emissions but the potential to deploy solutions able to generate a massive change by taking reasonable measures. In other words, considering that the construction industry is the largest global consumer of resources and raw materials (over 3 billion tons of raw materials are used to manufacture building products worldwide) - making a few small changes could have a major positive impact.

Our research found three main courses of action used to positively influence the reduction of carbon emissions throughout the lifespan of building projects:

1. Manage a sustainable construction site.

This includes developments and new concepts that support construction equipment and reduces machinery carbon emission on-site.



2. Utilize advanced eco-friendly materials.

Eco-friendly materials range from the incremental innovation of traditional materials and existing characteristics (i.e., concrete such as Carboncure and Carbon Upcycling) to new materials with additional multifunctional elements (e.g., Rammed Earth). It also refers to radically innovative materials with entirely new functionalities (e.g., Magnumer's magnetic ink that could improve recycling processes).

3. Design & operate an energy-efficient building.

Introducing relevant hardware and software-based components into a building's infrastructure could easily enable an energy-efficient operation by design, i.e., occupancy-based air conditioning automation.

By combining a selection of sustainable solutions developed for the E&C industry across each sub-sector above, the concept of a "Net Zero Carbon Building" can become a reality.

Case study: Balfour beatty's pledge to be net-zero by 2040

Founded in 1909, Balfour Beatty (BB) is a UK-based multinational infrastructure group with vast expertise in large-scale construction and infrastructure projects. With 26,000 employees mainly active in the UK, the US, and Hong Kong, BB finances, develops, builds, and maintains complex infrastructure such as transportation, power, utility systems, and residential and commercial buildings.

Key projects include the London Olympics' Aquatic Centre, Hong Kong's first Zero Carbon Building, the National Museum of the Marine Corps in the US, and the Channel Tunnel Rail Link in the UK. In December 2020, Balfour Beatty published an updated version of their sustainability strategy, "Building New Futures", expressing their ambitions to achieve net-zero emissions, generate zero-waste, and positively impact over one million people by 2040.



The problem

Construction sites are usually wasteful in energy and not optimized. For example, lights or vehicles may stay on even when there is no one at the construction site. Meanwhile, portable generators are used to fuel this idle equipment, making construction sites generally reliant on fossil fuels.

The solution

Through the practice of open innovation, BB co-developed and implemented software, off-the-shelf hardware, and rented equipment to create their own all-in-one solution suitable for construction sites.

In early 2020, BB launched EcoNet, its energy savings system, in partnership with construction equipment rental company, Sunbelt Rentals, and software developer, Invisible Systems. EcoNet is an energy-saving system for construction sites comprising both IoT sensors and software. EcoNet is configured to autonomously manage power demand by automatically turning appliances and equipment off when not in active use ([Video](#)). This solution autonomously manages the power supply of site compounds and reduces carbon emissions across their construction sites by up to 80%.



The tech behind the scenes

The technology provided by [Invisible Systems](#) included the energy management solution, which utilizes Power Line Communications (PLC) receivers and controllers to turn the equipment on and off based on its usage.

[Sunbelt Rentals'](#) contribution to the project included a highly portable, environmentally friendly lighting solution that safely lit the construction site with zero noise and lighting pollution. Sunbelt Rentals' LED-based [X-Chain Trime lights](#) are easy to set up, connect, and move around the compound as required.

The results

The EcoNet system was first deployed in the East Leeds Orbital Route project. Within the first six months of use, EcoNet resulted in an 83% reduction in carbon emissions across the site by running on a grid supply, actively managing electric vehicle charging, and optimizing the heating, hot water, and external lighting running schedules.

So far, 21 Balfour Beatty sites use EcoNet. It is expected that BB will save a minimum of 2,200 tons of carbon dioxide emissions per year, with individual sites reducing their carbon emissions by 30% to 80%.

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New materials: sustainability in consumer-facing brands

Current state of the industry

As public awareness of the perils around climate change is rising, there is a surge in consumers' preference to support eco-friendly brands. A 2020 survey revealed that 87% of consumers globally think companies should integrate environmental concerns into their products, services, and operations to a greater extent than they have in the past ([BCG, 2020](#)).

The wheels of leading brands worldwide have already been in motion. For example, 96% of the world's largest 250 companies now include [sustainability reporting](#) ([KPMG, 2020](#)) among their periodical reports, which provides transparency related to the organization's environmental and social performance.

While reporting on sustainability becomes a standard for the world's leading corporations, the actions needed to reach the goals set towards climate-friendly operations are vague and case-dependent, leaving room for interpretation and creativity. Sometimes this creativity leads to incredible inventions such as the charcoal-like material created by [Made of Air](#), an "almost pure carbon" composite made by burning wood waste, then capturing the CO₂ released in the process. However, in other cases, the ambiguity regarding what it takes to reach sustainability goals can lead to unsuccessful experiments or newfound materials that are expensive or difficult to bring to an industrial-grade scale.



Enter advanced tech

At the start of 2021, an [Accenture study](#) revealed that new value is increasingly being found at the intersection of digital technologies and sustainability. As a result, the companies leveraging the combination of sustainability and technology are 2.5x more likely than others to be among tomorrow's strongest-performing businesses.

For consumer-facing brands manufacturing products of many shapes and sizes, the challenges are manifold. Dealing with materials, waste management, packaging, and keeping a sustainable supply chain operation requires knowledge, skills, and resources that are sometimes no less complicated than producing the actual merchandise and shipping it worldwide. Today, consumer-facing brands are held accountable for the quality of a final product they produce, how it is made, and its impact on the environment and society across its product line and supply chain.

As of September 2021, roughly 1,800 tech companies globally address consumer product manufacturers with innovative, novel recycling methods, bio-based plastics alternatives, and sustainable packaging.

A focus on the automotive industry

Among the industries that invest heavily in R&D and apply novel solutions on their production lines is the automotive sector. Within this highly demanding manufacturing and distribution process, sustainability finds its place for growth.

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One such example is Ford Motor Company, which is leading the way in sustainability. Ford demonstrates highly ambitious sustainability goals and paves the way for innovation in materials by partnering with global brands like chemical giant BASF, looking to turn plastic waste into a secondary raw material and collaborating with HP to reuse waste powder from 3D printers for injection-molding vehicle parts. Among their goals, some material-related objectives include eliminating single-use plastics from their operations by 2030 and a near-term ambition to use 20% recycled and renewable plastics in their vehicles by 2025.

Other leading automotive brands dedicate time and resources to discover the next generation of sustainable, high-quality materials for the cars of the future, as illustrated in the following case study about the Daimler group.

Case study: Daimler as a role model for sustainable automotive manufacturing

The Daimler Group, mostly known as the parent company of Mercedes-Benz, is a Germany-based automotive engineering enterprise founded in 1926. With about 290K employees worldwide, Daimler develops, manufactures, and distributes cars, trucks, vans, and buses, mostly under their brand name and the Mercedes-Benz brand, alongside their top-tier premium brands - AMG and Maybach.

The Group, which focuses on innovative and green technologies, has invested in developing alternative propulsion systems with the long-term goal of total emission-free driving, from hybrid vehicles to electric vehicles powered by battery or fuel cell. In addition, Daimler is committed to climate protection and air pollution control through a plan to make a fleet of CO₂ neutral cars by 2039 and to have no relevant impact on inner-city air quality. While Daimler's sustainability goals include many aspects of the business, in this case study, we focus on one.

The problem

Today's plastics typically make up 50% of the volume of a new light vehicle, but the standard doesn't involve the use of significant recycled materials. Why? Because car manufacturers have traditional suppliers with long-standing relationships and finding the right quality bio-based or biodegradable alternatives has been difficult. Given that until now, there was no quality alternative, there was no motivation for change.



The solution

Daimler worked with UBQ Materials, a tech company producing bio-based plastics in the context of its “Startup Autobahn” innovation platform to create a sustainable car-trunk container for Mercedes-Benz. The Daimler research team tested UBQ under different conditions including extreme heat.

Furthermore, an [article published on Daimler’s website](#) suggested that UBQ could be used in the production of bus fenders, cable ducts, and load carrier boxes, depending on the results of further feasibility studies in 2021. By researching this new resource, Daimler is taking another step toward a sustainable circular economy.

“ *Frank Hirlinger, Daimler’s project lead responsible for material testing and approval, said that if successful, he foresees a scenario where → 25 percent of the plastics used in each vehicle will consist of recycled materials.*

The tech behind the scenes

[UBQ Materials](#) converts unsorted household waste diverted from landfills, everything from food residues and mixed plastics to cardboard, paper, and even dirty diapers. Their patented processing removes highly recyclable metals and minerals from this waste and sends them over to traditional recycling streams. All the waste that remains is transformed into UBQ. This new, fully recyclable thermoplastic material (UBQ) can be used in existing manufacturing processes to replace plastics, concrete, wood, and minerals without additional adaptation costs.

The results

UBQ has successfully passed the “heat test,” while additional tests are expected to continue throughout 2021. Frank Hirlinger, Daimler’s project lead responsible for material testing and approval, said that if successful, he foresees a scenario where 25 percent of the plastics used in each vehicle will consist of recycled materials.

Creative carbon reduction: sustainability in reinsurance

Current state of the industry

Insurance and reinsurance might not be the first industry one thinks of when it comes to sustainability, but the two are deeply linked. In the business of insurance, it's all about highly sophisticated risk management, using actuarial modeling, quantifying real-life problems to better understand implications of different scenarios (think: a global pandemic or forecasting real estate prices). Since insurance companies' core business is to mitigate risks, they are the best equipped to deal with the risks related to climate catastrophes as well.

Zooming in on reinsurance

Reinsurance provides insurance against loss for other insurance companies, often described as "insurance for insurance companies". Reinsurance companies have offered their services to insurance companies and have been developing tools to mitigate risks for decades. This vast experience allows them to have greater impact when it comes to addressing the climate crisis.

For example, traditionally, a reinsurance company would assess whether the construction site the insurance company is insuring is safe. Are the workers wearing helmets? Are all the safety precautions being taken? If the answer was no, a reinsurance company was unlikely to offer their services to the insurance company. Today, reinsurance companies may look into a construction site's environmental impact just as much as its safety. Is the construction site emitting greenhouse emissions? Is it depleting natural resources?



The insurance industry shows increasing signs of a red line forming when it comes to the environment - Zurich Insurance's Chief Executive Officer Mario Greco stated that the company already took steps to clean up its own house, cancelling coverage for around 100 corporate clients that had no intention of improving their sustainability impact.

Taking action

In July 2021, eight of the world's leading insurance and reinsurance companies launched an alliance with the UN to play an active role in the accelerated transition towards net-zero emissions economies.

The Net-Zero Insurance Alliance (NZIA) brings together global insurance brands under the joint commitment to endorse a list of statements. By committing to such statements, the insurance leaders will influence the businesses they insure to transition away from carbon-intensive sectors and shift their support toward climate-friendly organizations.

As part of this alliance, each member will set intermediate targets every five years, and report progress publically every year. Among the eight founding companies of the NZIA are SOSA's long-standing corporate clients Swiss Re and Zurich Insurance.

Aside from this critical initiative, which could be considered a result of a long process to formalize the decarbonization of large organizations, insurance companies use data processing technologies to better predict the risk of different industries.

One such example is Jupiter Intelligence, a climate risk analytics platform provider for insurance, banking, real estate, energy, manufacturing, retail, and agriculture. Their product provides forward-looking risk analysis from dynamic "earth system" models, combined with data-driven downscaling techniques to produce hyper-local hazard estimates based on projected changes in climate. Jupiter received strong validation from venture capital investors, including the corporate venture arm of insurance conglomerate MS&AD, another SOSA corporate client since 2019.

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Case study: Swiss re's creative path to net-zero

Swiss Reinsurance (Swiss Re) is a reinsurance company headquartered in Zurich, Switzerland. It is the world's largest reinsurer, as measured by net premiums written. Operating offices in more than 25 countries, the company offers reinsurance, insurance, and insurance-linked financial market products, as well as automobile, liability, accident, engineering, marine, aviation, life, and health insurance. Swiss Re also manages fixed-income and equity investments for itself and other insurance companies.

As part of their long-running activities for carbon footprint reduction, Swiss Re committed to reaching net-zero operational emissions by 2030 through their [CO2NetZero Programme](#). This goal will be achieved through two main courses of action: reducing their carbon footprint and removing any residual emissions.

The problem

For a business to become carbon-neutral, it typically has to do two things: reduce its carbon footprint and remove any residual emissions that don't necessarily have to do with its core business. If you're a factory with heavy machinery, the path to carbon-neutrality is more clear-cut. However, if you're a business like Swiss Re, with just an office, switching traditional power-intensive light bulbs to more sustainable LED lighting won't be enough to reach net-zero goals. Even if you operate an office - your impact has a more significant life cycle; think: how your employees arrive to the office each morning. Becoming net-zero goes beyond the office walls, and that's why Swiss Re needed to get creative to get to net-zero.



The solution

In mid-2021, Swiss Re and Climeworks (a company that captures and removes CO₂ directly from the air) announced their strategic partnership, signing the world's first 10-year carbon removal purchase agreement, worth USD 10 million. Both the length and total value of the partnership were unrivaled in the voluntary carbon market for this type of high-quality carbon removal.

As Climeworks stated in the [press release](#), the collaboration with Swiss Re is of integral importance to them: "The reinsurance industry is at the forefront of assessing complex risk structures including those of climate change. Swiss Re's unique long-term commitment sends a strong signal emphasizing that a pure and unfiltered climate solution like Climeworks' technology is important to reach the [Paris Agreement](#) climate targets".

The tech behind the scenes

[Climeworks](#) uses carbon dioxide capture plants which capture and remove CO₂ directly from the air. The captured CO₂ is then injected into the subsurface and processed in a chemical process that permanently turns it into stone. ([Watch Video](#))

To remove carbon dioxide (CO₂) from the atmosphere, Climeworks builds and operates CO₂ capture plants. Inside each plant, their proprietary machinery captures CO₂ through two primary actions. First, the air is drawn into a "collector" with a fan. Carbon dioxide is captured on the surface of a highly selective filter material that sits inside the collectors. Second, after the filter material is full with carbon dioxide, the collector is closed, and the temperature inside the collector is increased to between 80-100 °C. This releases the processed, highly concentrated carbon dioxide towards the next step of the removal process.

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After Climework's collectors have captured the CO₂, it is then handed over to their storage and monitoring partners, who proceed with underground storage of the CO₂.

Carbfix, an Iceland-based tech company, is a primary storage partner for Climeworks, which is able to permanently remove CO₂ by turning it into rocks underground.

Their technology imitates and accelerates natural processes usually done by trees and vegetation after drawing down the CO₂ absorbed by the plant's leaves. Their solution dissolves carbon dioxide in water placed underground, where it interacts with reactive rock formations, such as basalts to form stable minerals providing a permanent and safe carbon sink.

The results

Climeworks will remove approximately 125K tons of carbon dioxide on behalf of Swiss Re over ten years.

Conclusion

We have so much to say about sustainability, but if there's one key takeaway, let it be this:

The time is now.

The less organizations and corporations depend on fossil fuels and the more they work towards achieving net-zero (not just proclaiming the intention), the closer we are to reversing the detrimental climate crisis we find ourselves in.

If you're an enterprise or want to influence an enterprise to make a change regarding the climate crisis, tech is the most cost-efficient and impactful answer. As an individual, taking your plastic bottles (or better yet, replacing them with non single use) to the recycling bin may seem like the way forward, but this impact can only go so far. While every straw counts, the major change must be created at an enterprise level, where the implementation of tech and innovation will make the most significant impact. Sustainability is about the collective and about scale. When it comes down to it, there's strength in numbers, and that's what the combination of corporations + tech can provide.



Want to accelerate your sustainability journey? Take the next step to minimize your organization's carbon footprint.

[Book a consultation with a SOSA innovation expert here.](#)



SOSA The Open
Innovation Company.

SOSA is an open innovation company. We work with innovation teams and business units in corporations (like HP, Schneider Electric, RBC, Swiss Re), and governments (like Australia, Brazil, Canada and Taiwan). We scout and validate startups and technologies in order to bring our clients the solutions they need to solve use cases, identify opportunities, or build new products. Think noise-canceling headphones for the endless supply of startups.

Since 2014, we've literally been in the room facilitating discussions between large organizations and tech companies. From the first touchpoint all the way to pilots, implementations, and investments, we bring our clients precisely the technologies they need to advance innovation.