Increasing Carbon Footprint and Opportunity of Intelligent Employment

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Abstract:

Excusing carbon had been one of the major challenges faced by all the sectors of human empowerment. It covers gentle aspects covering economics, pharmaceuticals, manufacturing, data science and medical fields. Despite of removing the greenhouse emissions, we can deny its effects through the application of awareness through contiguous improvement methodologies.

Here we covered the obtaining of the total carbon footprint and then curing it through various means. As plants are the only organic source through which we can reduce and judge the carbon footprints, therefore we discussed the various aspects of reforestation and also the startups and employment we can get through it.

Introduction:

Carbon footprint is the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organization, or community.

In most cases, the total carbon footprint cannot be calculated exactly because of inadequate knowledge of data about the complex interactions between contributing processes, including the influence of natural processes that store or release carbon dioxide. For this reason, Wright, Kemp, and Williams proposed the following definition of a carbon footprint:

A measure of the total amount of carbon dioxide (CO_2) and methane (CH_4) emissions of a defined population, system or activity, considering all relevant sources, sinks and storage within the spatial and temporal boundary of the population, system or activity of interest. Calculated as carbon dioxide equivalent using the relevant 100-year global warming potential (GWP100)

Discussion:

Carbon footprint

Carbon footprint is the total greenhouse gas emissions caused by an individual, event, organization, service, place or product, expressed as carbon dioxide equivalent (CO_2e). Greenhouse gases, including the carbon-containing gases carbon dioxide and methane, can be emitted through the burning of fossil fuels, land clearance and the production and consumption of food, manufactured goods, materials, wood, roads, buildings, transportation and other services

The global average annual carbon footprint per person in 2014 was about 5 tonnes CO_2 equivalent. Although there are many ways to calculate a carbon footprint, the Nature Conservancy suggests that the average carbon footprint for a U.S. citizen is 16 tons. This is one of the highest rates in the world.

A carbon market allows investors and corporations to trade both carbon credits and carbon offsets simultaneously. This mitigates the environmental crisis, while also creating new market opportunities. New challenges nearly always produce new markets, and the ongoing climate crisis and rising global emissions are no exception. The renewed interest in carbon markets is relatively new. International carbon trading markets have been around since the 1997 Kyoto Protocols, but the emergence of new regional markets has prompted a surge of investment. The advents of new mandatory emissions trading programs and growing consumer pressure have driven companies to turn to the voluntary market for carbon offsets. Changing public attitudes on climate change and carbon emissions have added a public policy incentive. Despite an ever-shifting background of state, federal, and international regulations, there's more need than ever for companies and investors to understand carbon credits.

The Kyoto Protocol of 1997 and the Paris Agreement of 2015 were international accords that laid out international CO_2 emissions goals. With the latter ratified by all but six countries, they have given rise to national emissions targets and the regulations to back them. With these new regulations in force, the pressure on businesses to find ways to reduce their carbon footprint is growing. Most of today's interim solutions involve the use of the carbon markets.
What the carbon markets do is turn CO_2 emissions into a commodity by giving it a price. These emissions fall into one of two categories: Carbon credits or carbon offsets, and they can both be bought and sold on a carbon market. It's a simple idea that provides a market-based solution to a thorny problem.

Carbon Offsets, The terms are frequently used interchangeably, but carbon credits and carbon offsets operate on different mechanisms.
Carbon credits, also known as carbon allowances, work like permission slips for emissions. When a company buys a carbon credit, usually from the government, they gain permission to

generate one ton of CO_2 emissions. With carbon credits, carbon revenue flows vertically from companies to regulators, though companies who end up with excess credits can sell them to other companies. In the United States, no national carbon market exists, and only one state – California – has a formal cap-and-trade program.

Offsets flow horizontally, trading carbon revenue between companies. When one company removes a unit of carbon from the atmosphere as part of their normal business activity, they can generate a carbon offset. Other companies can then purchase that carbon offset to reduce their own carbon footprint. The two terms are sometimes used interchangeably, and carbon offsets are often referred to as “offset credits”. Still, this distinction between regulatory compliance credits and voluntary offsets should be kept in mind.

How are carbon credits and offsets created?

Credits and offsets form two slightly different markets, although the basic unit traded is the same – the equivalent of one ton of carbon emissions, also known as CO_2e.

It is worth noting that a ton of CO_2 does refer to a literal measurement of weight. Just how much CO_2 is in a ton?

- The average American generates 16 tons of CO_2e a year through driving, shopping, using electricity and gas at home, and generally going through the motions of everyday life.
  To further put that emission in perspective, you would generate one ton of CO_2e by driving your average 22 mpg car from New York to Las Vegas. Carbon credits are issued by national or international governmental organizations. We've already mentioned the Kyoto and Paris agreements which created the first international carbon markets.

In the U.S., California operates its own carbon market and issues credits to residents for gas and electricity consumption. The number of credits issued each year is typically based on emissions targets. Credits are frequently issued under what's known as a "cap-and-trade" program. Regulators set a limit on carbon emissions – the cap. That cap slowly decreases over time, making it harder and harder for businesses to stay within that cap. We can think of carbon credits as a "permission slip" for a company to emit up to a certain set amount of CO_2 that year. Around the world, cap-and-trade programs exist in some form in Canada, the EU, the UK, China, New Zealand, Japan, and South Korea, with many more countries and states considering implementation. Companies are thus incentivized to reduce the emissions their business operations produce to stay under their caps. In essence, a cap-and-trade program lessens the burden for companies trying to meet emissions targets in the short term, and adds market incentives to reduce carbon emissions faster.

Carbon offsets work slightly differently e.g. Organizations with operations that reduce the amount of carbon already in the atmosphere, say by planting more trees or investing in

renewable energy, have the ability to issue carbon offsets. The purchase of these offsets is voluntary, which is why carbon offsets form what's known as the "Voluntary Carbon Market". However, by buying these carbon offsets, companies can measurably decrease the amount of CO_2e they emit even further.

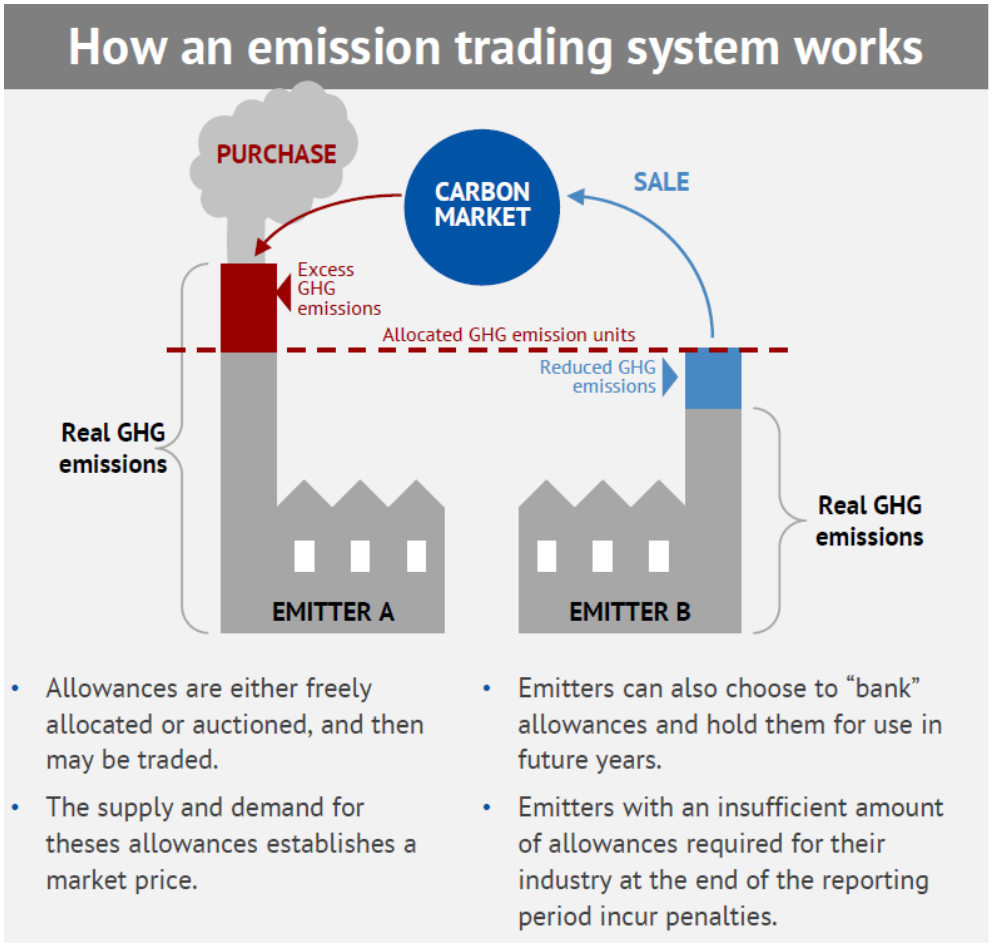
Carbon marketplace:

When it comes to the sale of carbon credits within the carbon marketplace, there are two significant, separate markets to choose from.

1. One is a regulated market, set by "cap-and-trade" regulations at the regional and state levels.
2. The other is a voluntary market where businesses and individuals buy credits (of their own accord) to offset their carbon emissions.

We can think of it this way: the regulatory market is mandated, while the voluntary market is optional.

When it comes to the regulatory market, each company operating under a cap-and-trade program is issued a certain number of carbon credits each year. Some of these companies produce fewer emissions than the number of credits they're allotted, giving them a surplus of carbon credits. On the flip side, some companies (particularly those with older and less efficient operations) produce more emissions than the number of credits they receive each year can cover. These businesses are looking to purchase carbon credits to offset their emissions because they must.

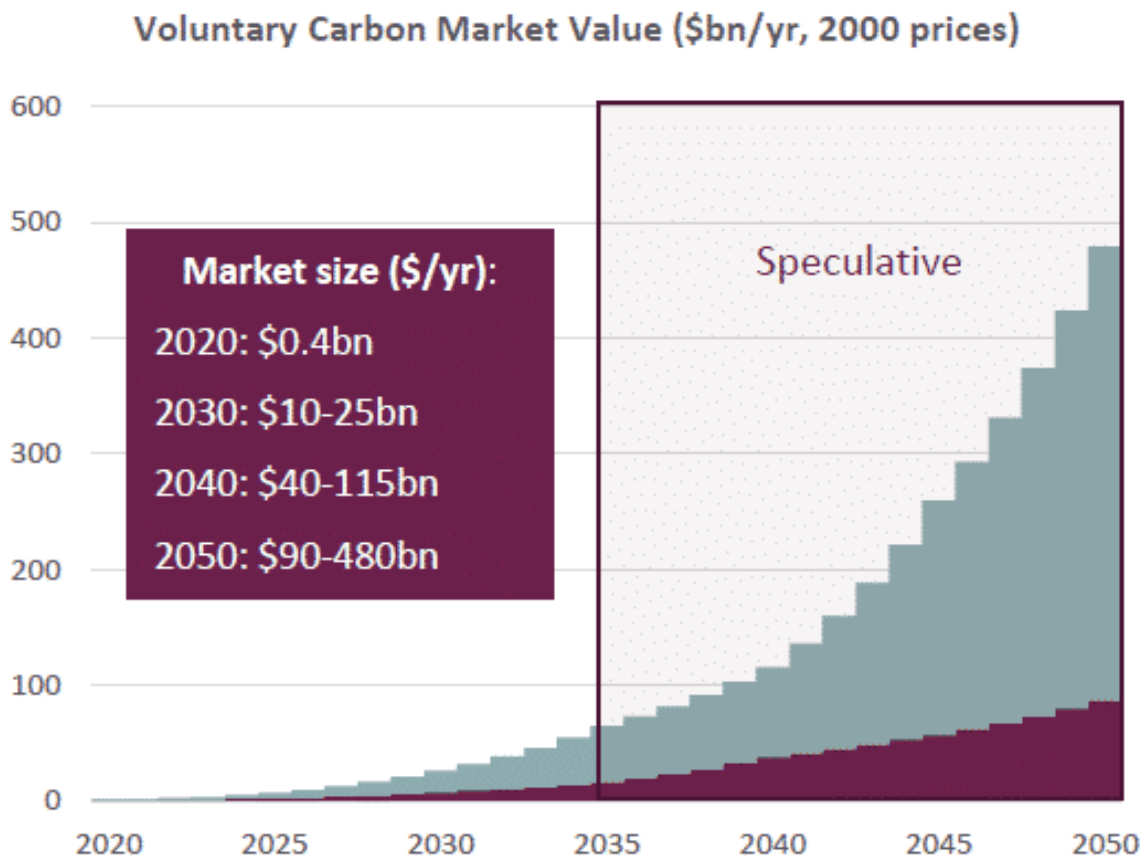


Most major companies are doing their part and will or have announced a blueprint to minimize their carbon footprint. However, the amount of carbon credits allocated to them each year (which is based on each business's size and the efficiency of their operations relative to industry benchmarks) may not be enough to cover their needs.

Regardless of technological advances, some companies are years away from reducing their emissions substantially. Yet, they still have to keep providing goods and services in order to generate the cash they need to improve the carbon footprint of their operations.
As such, they need to find a way to offset the amount of carbon they're already emitting. So, when companies meet their emissions "cap," they look towards the regulatory market to "trade" so that they can stay under that cap. Let us say two companies, Company 1 and Company 2, are only allowed to emit 300 tons of carbon. However, Company 1 is on track to emit 400 tons of carbon this year, while Company 2 will only be emitting 200 tons. To avoid a penalty comprised of fines and extra taxes, Company 1 can make up for emitting 100 extra tons of CO_2e by purchasing credits from Company 2, who has extra emissions room to spare due to producing 100 tons less carbon this year than they were allowed to.

The Difference between the Voluntary and Compliance Markets
The voluntary market works a bit differently. Companies in this marketplace have the opportunity to work with businesses and individuals who are environmentally conscious and are choosing to offset their carbon emissions because they want to. There is nothing mandated here. It might be an environmentally conscious company that wants to demonstrate that they're doing their part to protect the environment. Or it can be an environmentally conscious person who wants to offset the amount of carbon they're putting into the air when they travel. For example: In 2021, the oil giant Shell announced the company aims to offset 120 million tonnes of emissions by 2030. Regardless of their reasoning, companies are looking for ways to participate – and the voluntary carbon market is a way for them to do just that. Both the regulatory and voluntary marketplaces complement one another in the professional (and the personal) world. They also make the pool of buyers more accessible to farmers, ranchers, and landowners – those whose operations can often generate carbon offsets for sale.

The voluntary carbon market is difficult to measure. The cost of carbon credits varies, particularly for carbon offsets, since the value is linked closely to the perceived quality of the issuing company. Third-party validators add a level of control to the process, guaranteeing that each carbon offset actually results from real-world emissions reductions, but even so there is often disparities between different types of carbon offsets.
While the voluntary carbon market was estimated to be worth about $400 million last year, forecasts place the value of the sector between $10-25 billion by 2030, depending on how aggressively countries around the world pursue their climate change targets.



Despite the difficulties, analysts agree that participation in the voluntary carbon market is growing rapidly. Even at the rate of growth depicted above, the voluntary carbon market would still fall significantly short of the amount of investment required for the world to fully meet the targets set out by the Paris Agreement.

How to produce carbon credits

Many different types of businesses can create and sell carbon credits by reducing, capturing, and storing emissions through different processes.

Some of the most popular types of carbon offsetting projects include:

- Renewable energy projects,
- Improving energy efficiency,
- Carbon and methane capture and sequestration
- Land use and reforestation.

Renewable energy projects have already existed long before carbon credit markets came into vogue. Many countries in the world are blessed with a natural wealth of renewable energy resources. Countries such as Brazil or Canada that have many lakes and rivers, or nations like Denmark and Germany with lots of windy regions. For countries like these, renewable energy was already an attractive and low-cost source of power generation, and they now provide the added benefit of carbon offset creation.

Energy efficiency improvements complement renewable energy projects by reducing the energy demands of current buildings and infrastructure. Even simple everyday changes like swapping your household lights from incandescent bulbs to LED ones can benefit the environment by reducing power consumption. On a larger scale, this can involve things like renovating buildings or optimizing industrial processes to make them more efficient or distributing more efficient appliances to the needy. Carbon and methane capture involves implementing practices that remove CO_2 and methane (which is over 20 times more harmful to the environment than CO_2) from the atmosphere. Methane is simpler to deal with, as it can simply be burned off to create CO_2. While this sounds counterproductive at first, since methane is over 20 times more harmful to the atmosphere than CO_2, converting one molecule of methane to one molecule of CO_2 through combustion still reduces net emissions by more than 95%.

For carbon, capture often happens directly at the source, such as from chemical plants or power plants. While the injection of this captured carbon underground has been used for various purposes like enhanced oil recovery for decades already, the idea of storing this carbon long-term, treating it much like nuclear waste, is a newer concept.

Land use and reforestation projects use Mother Nature's carbon sinks, the trees and soil, to absorb carbon from the atmosphere. This includes protecting and restoring old forests, creating new forests, and soil management. Plants convert CO_2 from the atmosphere into organic matter through photosynthesis, which eventually ends up in the ground as dead plant matter. Once absorbed, the CO_2 enriched soil helps restore the soil's natural qualities – enhancing crop production while reducing pollution.

How companies can offset carbon emissions

There are countless ways for companies to offset carbon emissions. Though not a comprehensive list, here are some popular practices that typically qualify as offset projects:

- Investing in renewable energy by funding wind, hydro, geothermal, and solar power generation projects, or switching to such power sources wherever possible.
- Improving energy efficiency across the world, for instance by providing more efficient cook-stoves to those living in rural or more impoverished regions.
- Capturing carbon from the atmosphere and using it to create bio-fuel, which makes it a carbon-neutral fuel source.
- Returning biomass to the soil as mulch after harvest instead of removing or burning. This practice reduces evaporation from the soil surface, which helps to preserve water. The biomass also helps feed soil microbes and earthworms, allowing nutrients to cycle and strengthen soil structure.
- Promoting forest re-growth through tree-planting and reforestation projects.
- Switching to alternate fuel types, such as lower-carbon bio-fuels like corn and biomass-derived ethanol and biodiesel.

Monitoring emissions and reductions can be a challenge for even the most experienced professional. When it comes to the regulated and voluntary markets, there are third-party auditors who verify, collect, and analyze data to confirm the validity of each offset project.

However, we have to be be careful when shopping online or directly from other businesses – not all offset projects are certified by appropriate third parties, and those that aren't, generally tend to be of dubious quality.

Ways to reduce industry's carbon footprint

A product, service, or company's carbon footprint can be affected by several factors including, but not limited to:

- Energy sources
- Offsite electricity generation
- Materials

These factors can also change with location or industry. However, there are some general steps that can be taken to reduce carbon footprint on a larger scale.

In 2016, the EIA reported that in the US electricity is responsible for roughly 37% of Carbon Dioxide emissions, making it a potential target for reductions. The cheapest way to do this is through improvements energy efficiency. The ACEEE reported that energy efficiency has the potential to save the US over 800 billion kWh per year, based on 2015 data. Some potential options to increase energy efficiency include, but are not limited to:

- Waste heat recovery systems
- Insulation for large buildings and combustion chambers
- Technology upgrades, i.e. different light sources, lower consumption machines

Carbon footprint from energy consumption can be reduced through the development of nuclear power (a zero carbon emissions energy source) and alternative energy projects, such as solar and wind energy, which are renewable resources.

Reforestation, the restocking of existing forests or woodlands that had previously been depleted, is an example of Carbon Offsetting, the counteracting of carbon dioxide emissions with an equivalent reduction of carbon dioxide in the atmosphere. Carbon offsetting can reduce a overall carbon footprint of companies by offering a carbon credit.

Supply chain emissions are on average 11.4 times higher than operational emissions, more than double previous estimates, due to suppliers improving their emissions accounting. Therefore, there is an increasing focus on companies reducing their emissions coming from their suppliers as a way to reduce risks and capture opportunities.

A life cycle or supply chain carbon footprint study can provide useful data which will help the business to identify specific and critical areas for improvement. By calculating or predicting a carbon footprint of a process high emissions areas can be identified and steps can be taken to reduce in those areas. Collecting real data from suppliers emissions, setting a strategy focused on hot-spots and incentivizing suppliers are still barriers for companies. Nevertheless, solutions exist and the focus should be on improving year-on-year basis.

Carbon Footprint Management Market Analysis and Insights:

The Global Carbon Footprint Management market is anticipated to rise at a considerable rate during the forecast period, between 2021 and 2027. In 2020, the market is growing at a steady rate and with the rising adoption of strategies by key players, the market is expected to rise over the projected horizon.

The following report contains market size and forecasts of Carbon Footprint Management in United States, including the following market information:

- United States Carbon Footprint Management Market Revenue, 2016-2021, 2022-2027, (USD millions)
- United States top five Carbon Footprint Management companies in 2020 (USD)

The global Carbon Footprint Management market size is expected to growth from USD 8834.8 million in 2020 to USD 13800 million by 2027; it is expected to grow at a CAGR of 6.1USD during 2021-2027.

- The United States Carbon Footprint Management market was valued at USD million in 2020 and is projected to reach USD million by 2027, at a CAGR of % during the forecast period.

- Researcher has surveyed the Carbon Footprint Management Companies and industry experts on this industry, involving the revenue, demand, product type, recent developments and plans, industry trends, drivers, challenges, obstacles, and potential risks.
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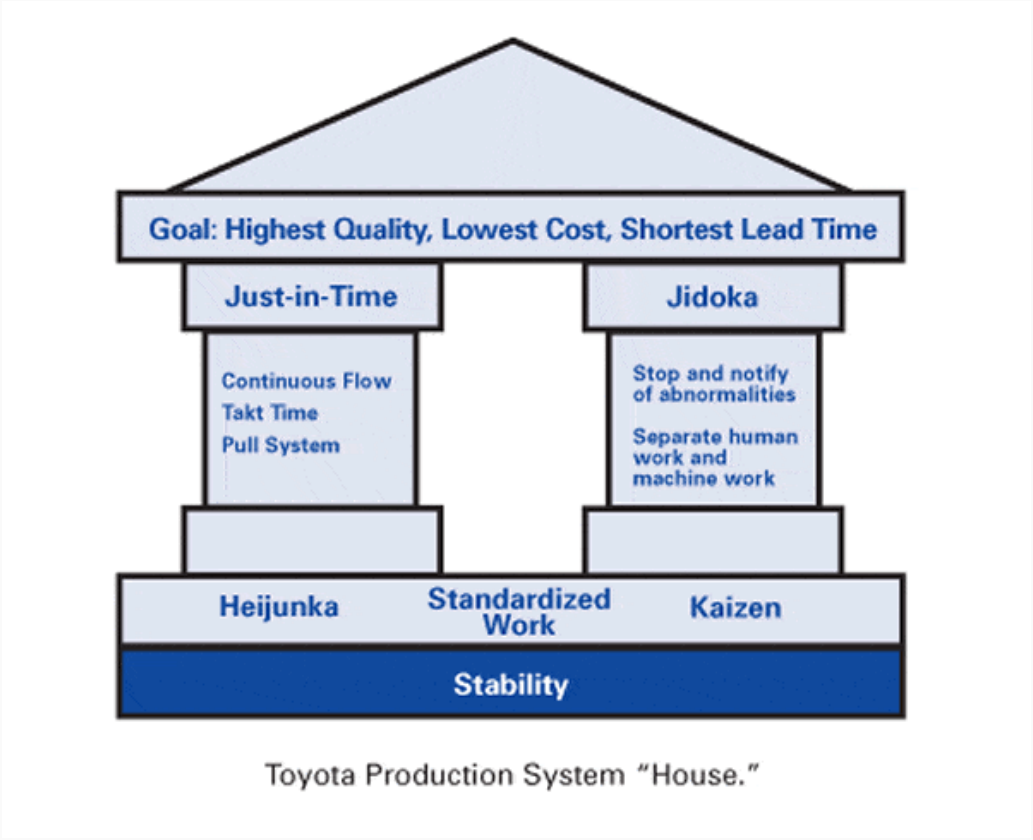
Qualitative Analysis:

Reduction of carbon footprint through contiguous improvement methodologies:

Continuous Improvement Methodologies #1: Lean

Lean is a management system designed around the premise of maximizing value to the customer while minimizing waste in the processes used to create value. The term "Lean" was coined by James Womack in his 1991 book titled "The Machine that Changed the World." It is based on the set of philosophies, tools, and way of working developed by the Toyota Motor Company, which is widely regarded as the greatest manufacturing company in the world. However, it should be noted that Toyota does not use the term "Lean" and constantly evolves their management system to address immanent challenges.

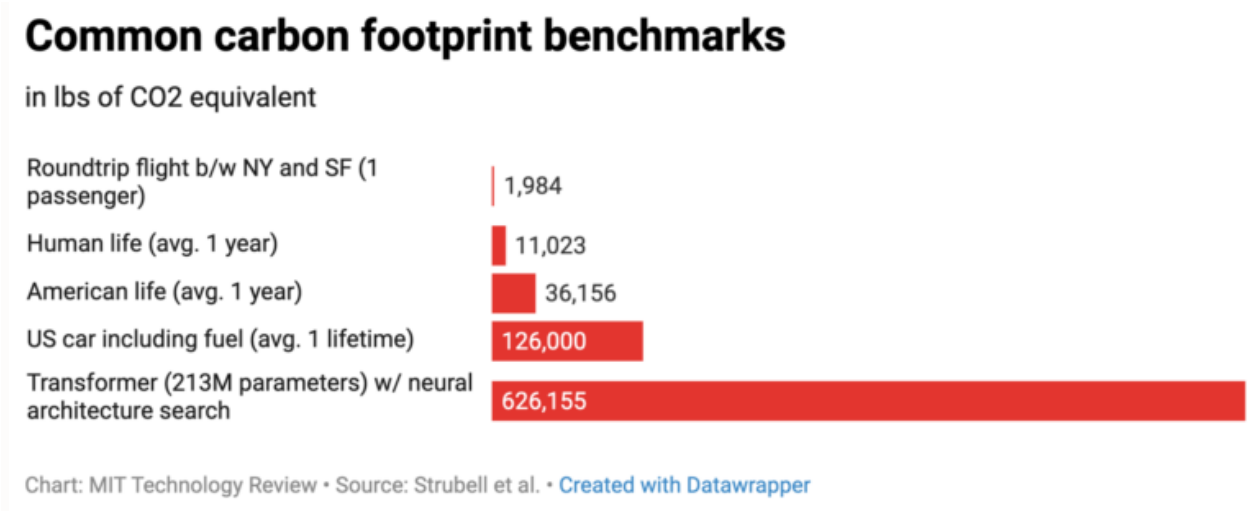


Toyota Production System "House."

1. Optimize the whole

Every business operates through a value stream, a system of activities and processes that take place in order to deliver the end result to the customer. A Lean business identifies those value streams and figures out how to optimize them as a whole. This is different from only looking at those that are not working.

Through this mechanism we can optimize the whole carbon footprint through artificial intelligence techniques.



Carbon footprint of data:

'Data is The New Oil'

According to Gerry McGovern's book 'World Wide Waste', 90% of data is not used – merely stored (which is cheap). He argues that because of this, the IT landscape is ~90% waste: 91% of pages analyzed got zero traffic from Google and more people have been to the top of Everest than the 10th page of search results. It is no surprise that companies are seeking to capitalize on this unprecedented amount of data collection. AI provides a way to make sense of massive amounts of data, but the current state-of-the-art requires a massive amount of data for training & validation. The more weights a model has, the more data it needs.

It has to be changed into gas, plastic, chemicals, etc., to create a valuable entity that drives profitable activity; so data must be broken down, analyzed for it to have value." These are the words of famous British mathematician and data science entrepreneur Clive Humby, who coined the phrase "data is the new oil"

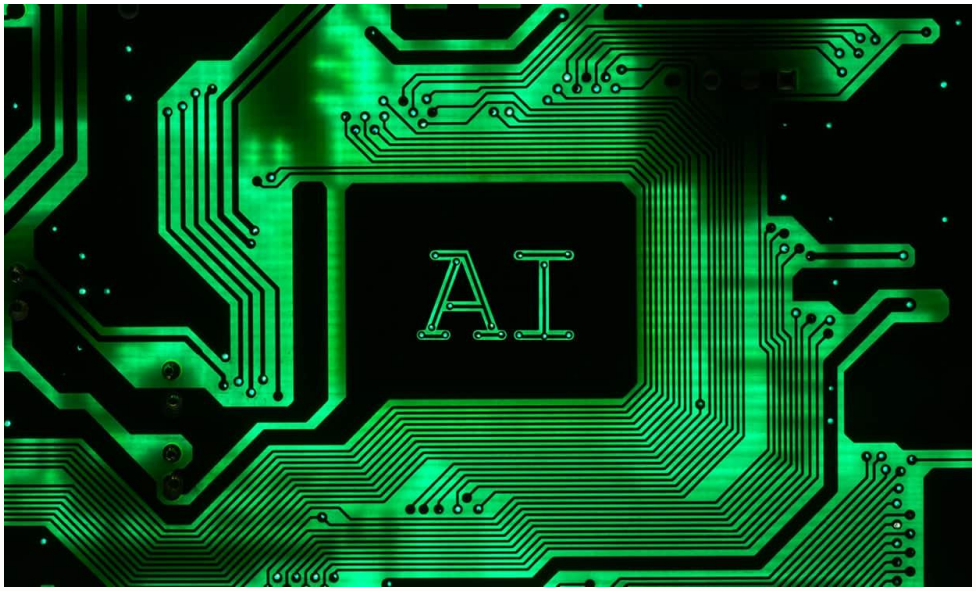
2. Eliminate waste

In knowledge driven work process, waste can mean too much work in process, or time spent manually completing a task that could be automated. A Lean business eliminates any activity that does not result in value for the customer.

Green AI:

There are ways to make machine learning greener, a movement that has been dubbed 'Green AI', initiated by Natural Language Processing researchers. This community is pushing for efficiency as a core metric. Some conferences (below) now require submissions to fill out forms that include information about the computational budget used to generate the reported results.

Green AI is in its infancy, and presents both numerous research opportunities and industry partnership potential. By bringing visibility & accountability into our ML efforts, we can begin to prioritize reporting and efficiency measures to incentivize sustainable AI practices. In future posts, I will dive into particularly promising approaches (such as reporting & efficiency methods). In the interim, here are some resources that can get you started in the community:



3. Build quality in

   A Lean business uses strategies like testing and pair programming to ensure quality in the process. Rather than checking for quality at the end of a process, it is built in as early as possible as an ongoing focus throughout.

   Leveraging AI in Quality Assurance

   When it comes to digital transformation, most enterprises have a vision around customer experience, efficiency, agility and profitability that involves modernizing infrastructure, processes and applications. Quality assurance (QA) is often an afterthought.

   However, every digital program invariably runs on the agile development framework or on Dev-Ops and translates to shorter release cycles with additional pressure to deliver quality code within much shorter timeframes. To help this, organizations plan for additional controls on the Dev-Ops side and overlook the QA strategy. There is a need for change in the way quality assurance operates in organizations. Broadly there are two driving forces - agility in the way testing is done (continuous quality assurance) and faster time to market. For QA teams to keep pace with the agile mode of development, traditional test automation is no longer adequate, making AI in test automation inevitable.

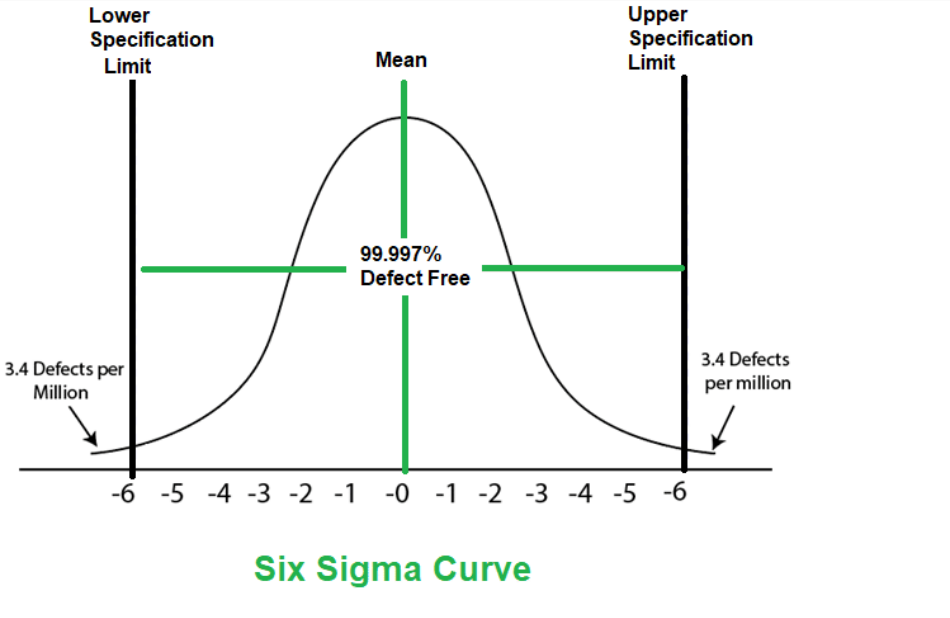
   Testing organizations are being compelled to innovate with new and emerging technology solutions around automation.

4. Create knowledge

   Learning is a top priority in a Lean business environment and can be done through small, incremental experiments throughout a process. It is crucial to create an infrastructure to document and share these learnings across teams and organizations.

   Artificial intelligence (AI) is intelligence demonstrated by machines, as opposed to natural intelligence displayed by animals including humans. Leading AI textbooks define the field as the study of "intelligent agents": any system that perceives its environment and takes actions that maximize its chance of achieving its goals.

Continuous Improvement Methodologies #2: Six Sigma



Six Sigma is a quality control methodology that seeks to reduce product defects to within 3.4 defects for every 1 million units produced. This method was introduced by Motorola engineer, Bill Smith, in 1986 and popularized by Jack Welch, who made it central to the company's management system during the successful run of General Electric during the 1990's.

Nowadays for business owners, acting sustainably can integrate with almost all aspects of operations. New hires look for it, current employees love it and customers and partners value it. There are many ways to go about sustainability, of course, but one of the easiest ways to boost your effort as an organization is to give back to the environment by planting trees.

A Benchmark: Six Sigma Methodology helps in improving process metrics. Once the improved process metrics achieve stability; we can use Six Sigma methodology again to improve the newly stabilized process metrics. For example: The Cycle Time of Pizza Delivery is improved from 60 minutes to 45 minutes in a Pizza Delivery process by using Six Sigma methodology. Once the Pizza Delivery process stabilizes at 45 minutes, we could carry out another Six Sigma project to improve its cycle time from 45 minutes to 30 minutes. Thus, it is a benchmark.

Ways to reduce carbon footprint:

Using Lean principles, Six Sigma can also help eliminate waste in all its forms. When we talk about Six Sigma and waste, it is usually intangible waste, such as over-processing or time-related waste. But environmental waste also tolls heavily on efficiency and profits. Waste results from a high carbon footprint, producing a negative effect on the environment. By reducing yours, you can ensure your business stays efficient, profitable, and green. Today, learn how we can safeguard the environment by calculating your carbon footprint.

Six Sigma is incredibly useful here as it enables us to make lasting changes to your operations through intensive project work. Create a project team, including Yellow, Green, and Black Belts, targeted at reducing waste and inefficiencies. Techniques like DMAIC and root cause analysis will shed light on issues of waste and why they arise. For example, none-

value-adding processes may be contributing to a buildup of waste, sapping cash, and reducing efficiency. If you don't know what to look for, you may not even notice these issues, which will then go unchecked.

Perhaps we too should move to create those results for your company, because plenty of companies already have: Converse just recently launched its Renew collection, which features sneakers made from plastic bottles and up-cycled denim. The hype and anticipation around that move translated to exciting press coverage for the brand.

How to Calculate our Carbon Footprint?

Calculating your carbon footprint will give you a better idea of how your business operations affect the planet. It will also show you which of these actions are most damaging, many of which have a negative effect on your success. Our method for calculating carbon emissions focuses on the consumption of several key resources. These include electricity, natural gas, fuel oil, and water, as well as the level of waste produced. For electricity, the calculation is as follows:

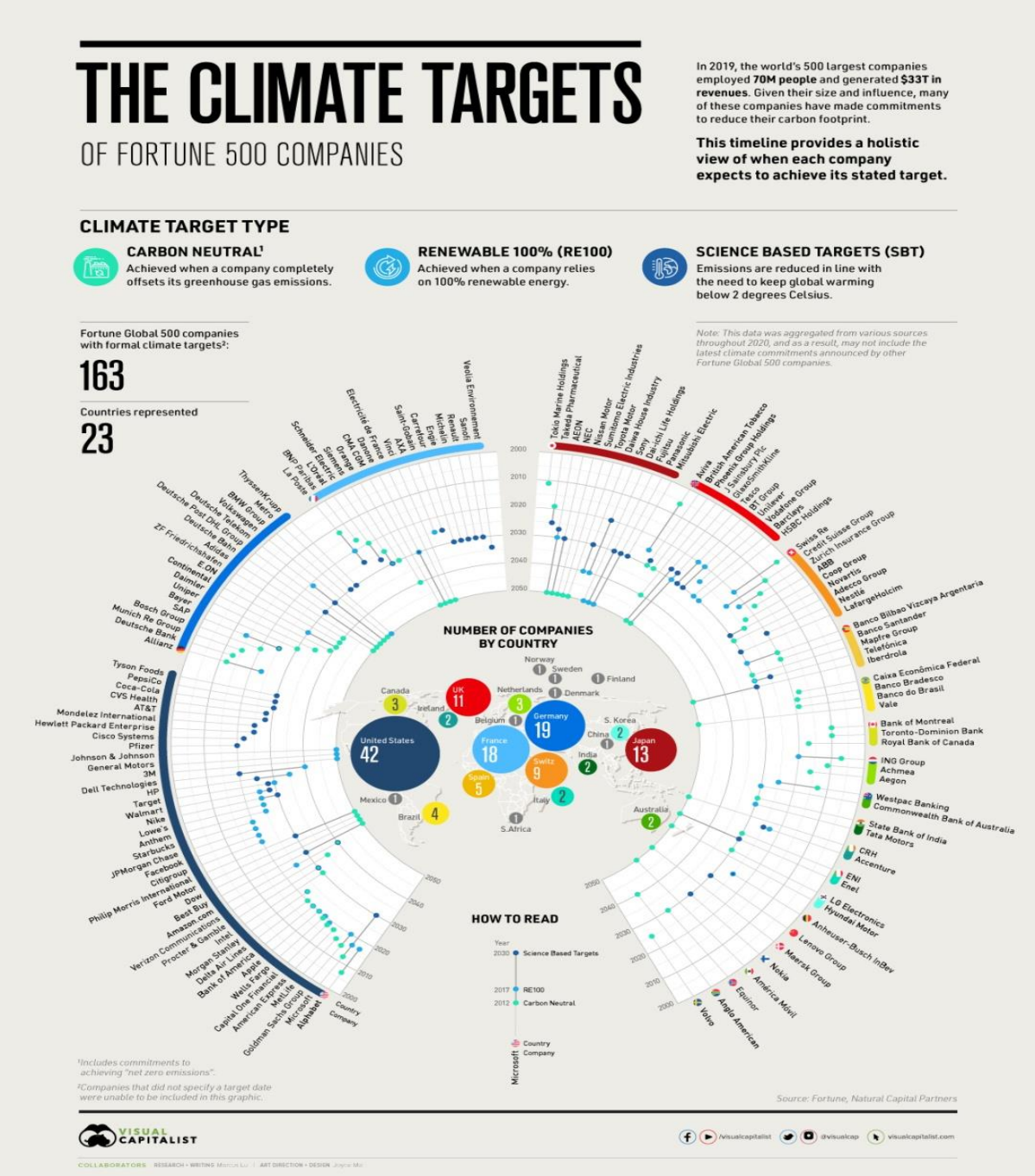
(kWh/yr) x EF (kg CO_2e/kWh) = your emissions for the entire year (kg CO_2e/yr).

If we wish to calculate our footprint for other resources, such as natural gas or water, simply alter the above figures appropriately. Kilowatts per hour would become therms per year for natural gas, and liters per day for water. Similarly, you would need to multiply your water figure by 365 before multiplying again by your EF.

Case study:

Recapture:

Recapture is a carbon project developer. It is pioneered as the first systems-designed carbon removal project model that removes 10-times more CO_2 than fragmented, nature-based approaches while generating net-positive financial, environmental, and community returns.



By utilizing sustainable timber harvesting as a financial mechanism, the Recapture Dedicated Carbon Removal System (CRS) can remove more than 100 tCO_2e from the atmosphere per hectare per year at a sequestration rate 10 times more efficient than standard reforestation alone, enabling a shift in carbon removal implementation from a line item to a profit area, and supercharging the scaling of Direct Air Capture infrastructure to meet global demand. These results are significant, and render the previous avoidance-based carbon offset model obsolete.

Conclusion:

Not every carbon credit market is created equal, and it's easy to find flaws even with tightly regulated programs like California's. Carbon allowances in those markets might not actually be worth as much as they say on the tin, but since participation is mandatory, it's hard for

companies to control their own impact. In theory, purchasing carbon offsets gives companies a more concrete way to reduce their carbon footprint. After all, carbon credits only deal with future emissions. But, carbon offsets let companies address even their historical emissions of CO_2e right away.

Companies can also select the types of projects that provide the greatest impact – like Blue Carbon projects, for example.

Blue Carbon are special carbon credits derived from sites known as blue carbon ecosystems. These ecosystems primarily feature marine forests, such as tidal marshes, mangrove forests and seagrass beds.

Yes, forests can grow in the ocean! Examples include the mangrove forests in sea bays, such as Magdalena Bay in Baja California Sur, Mexico.

Mangroves are trees (about 70 percent underwater, 30 percent above water) that have evolved to be able to survive in flooded coastal environments where seawater meets freshwater, and the resulting lack of oxygen makes life impossible for other plants.

- **Key Fact: Mangroves cover just 0.1% of earth's surface**

  Mangrove trees create shelter and food for numerous species such as sharks, whales, and sea turtles. And thanks to their other second-order effects such as the positive impacts on corals, algae and marine biodiversity that have been so negatively impacted by activities such as over-fishing and farming, mangroves are considered to be extremely valuable marine ecosystems.

  Over the past decade scientists have discovered that blue carbon ecosystems like these mangrove forests are among the most intensive carbon sinks in the world.

  According to scientific studies, pound for pound, mangroves can store up to 4x more carbon than terrestrial forests.

This means that blue carbon offsets can remove enormous amounts of greenhouse gases relative to the amount of area they occupy. On top of that, they also provide a whole slew of other side benefits to their local ecosystems.

Accordingly, a blue carbon offset project will have its carbon offsets trade at a premium.

Second Order Effects of Blue Carbon Credits

Other positive second-order effects of mangrove forests include:

1. Their importance as a pollution filter,
2. Reducing coastal wave energy, and
3. Reducing the impacts from coastal storms and extreme events.

Blue carbon systems also trap sediment, which supports root systems for more plants.

This accumulation of sediment over time can enable coastal habitats to keep pace with rising sea levels.

In addition, because the carbon is sequestered and stored below water in aquatic forests and wetlands, it's stored for more than ten times longer than in tropical forests.

- **The significant positive second-order effects attributed to each blue carbon credit are why many believe they will trade at a premium to other carbon credits.**

Blue Carbon and the Food Footprint

There is a land-use carbon footprint of 1,440 kg CO_2e for every kilogram of beef and 1,603 kg CO_2e for every kilogram of shrimp produced on lands formerly occupied by mangroves. A typical steak and shrimp cocktail dinner would potentially burden the atmosphere with 816 kg CO_2e if the ingredients were to come from such sources.

It's estimated that over 1 billion tons of carbon dioxide is released annually from degrading coastal ecosystems.

There are around 14 million hectares of mangrove aquaforests on Earth today. And many are under attack by the deforestation practices caused by intense shrimp farming

Are the shrimp you eat part of the problem? Soon, these shrimps will be labeled, and consumers will know and be required to cover the offset costs for the environmental damage.

To put things into perspective, 14 million acres of wetlands would absorb as much carbon out of the atmosphere as if all of California and New York State were covered in tropical rainforest.

Think of blue carbon as the "high grade" gold mine at the surface.

Oceanic Blue Carbon

In addition to coastal blue carbon mentioned above, oceanic blue carbon is stored deep in the ocean within phytoplankton and other open ocean biota.

The infographic below shows the typical blue carbon ecosystem:

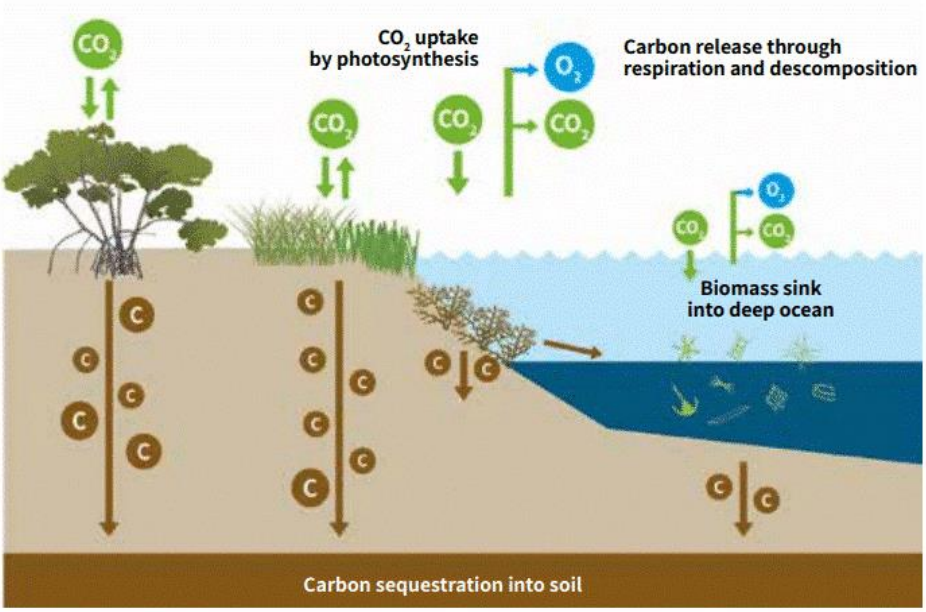


Figure 3: Graphic illustration of carbon uptake of blue carbon ecosystems via photosynthesis and subsequent long-term sequestration into biomass and soil, or respiration. Adapted from: Howard *et al.*, 2017, Frontiers in Ecology and the Environment.

There are many factors that influence carbon capture by blue carbon ecosystems. These include:

- Location
- Depth of water
- Plant species
- Supply of nutrients

Improving blue carbon ecosystems can significantly improve the livelihoods and cultural practices of local and traditional communities. In addition, restoring blue carbon regions provides enormous biodiversity benefits to both marine and terrestrial species.

If you're a corporation, there are plenty of compelling reasons as to why you should be seriously considering investing in carbon credits and offsets. For a detailed list of these reasons, to access our special guide, The Eight Major Business Advantages of Buying Carbon Credits or Offsets.

If we as an individual looking to buy carbon credits, we are likely interested for one of two reasons:

The first reason is that we are environmentally conscious**,** and looking to do your part in combating climate change by offsetting your own greenhouse gas emissions, or those of your family. If that is the case, then we have to rest assured – carbon offsets from a reputable vendor such as Native Energy are the perfect way for you to negate your own carbon footprint.

The second reason is if we are interested in buying carbon credits is because you think it represents an investment opportunity. The global carbon market grew 20% last year and that strong growth is expected to continue as climate change becomes an increasingly relevant concern to the world at large. If we fall into the latter category, then head over to our carbon investor centre where we showcase some of the best investment opportunities in the carbon sector right now.

Used correctly, carbon offsets are a way for companies to earn extra PR credit and achieve a more measurable reduction in carbon emissions. Since there's no regulatory body overseeing carbon offsets, standards companies like Verra have become influential in vetting the carbon offsets market.

There is one more big advantage of carbon offsets.

If we are the company selling them, they can be a significant revenue stream! The best example of this is Tesla. Yes, that Tesla, the electric car maker, who sold carbon credits to legacy car manufacturers to the tune of $518 million in just the first quarter of 2021. That is a huge deal, and it is single-handedly keeping Tesla out of the red. If the market for carbon credits continues to go up, and the pricing of credits keeps increasing, Tesla and other environmentally beneficial businesses could reap huge dividends.

We can create great startups that can withstand our carbon demands by maintaining the lean six-sigma principles.

- Support and commitment of the executive management team for Lean and Six Sigma efforts
- Understanding what resources are available prior to the start of the project
- For example in reforestation: Reforestation is one of the best ways to help the planet -- along with its humanity and wildlife -- thrive, and it's one of the easiest ways for businesses and startup founders to give back to nature, in part offsetting things like their own energy use.
- The amount of training received by the staff

On an internal level, something like planting trees (or pursuing other philanthropic actions) allows employees to connect with the company for a bigger mission. Engaging in sustainable efforts helps to increase morale, employee retention and overall workplace happiness.

- Staff acceptance of Six Sigma and Lean concepts
- The size and scope of the projects

Based on One Tree Plantings simple donation model (one dollar plants one tree) brands are able to share reforestation metrics based just on dollar amounts. If our startup donates $10,000, for instance, you now have tangible results.

Hence we discussed the various ways to increase employment through reducing carbon footprint.

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