



WE DROPPED THE BALL ON
CLIMATE CHANGE...
NOW WHAT

Business Implications and Strategies for a Changing World

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Climate change has become one of the primary challenges which must be addressed today to avoid significant disruptions in our current ways of life, economies, and the very ecosystems that support all other life on our planet. Current studies indicate that we have a long way to go if we are serious about stopping climate change. Individuals, businesses and governments alike have been seeking solutions to increase sustainability measures to combat the progression of climate change. Innovative technologies such as blockchain are being looked at to help in this effort, but frankly, up to this point have resulted in limited success due to inadequate deployments at scale.

However, there are still significant opportunities for those who can unlock the hidden value associated with pursuing Climate Conscious Strategies (CCS). Effective CCS can include tangible business benefits focusing on developing sustainability-driven sales strategies, improving employee attraction and retention, as well as mitigating risks in global supply chains. Further, discovering and unlocking this hidden value in a world increasingly impacted by climate change will quickly transition from a 'nice to have' to a 'key differentiator' distinguishing leaders from laggards.

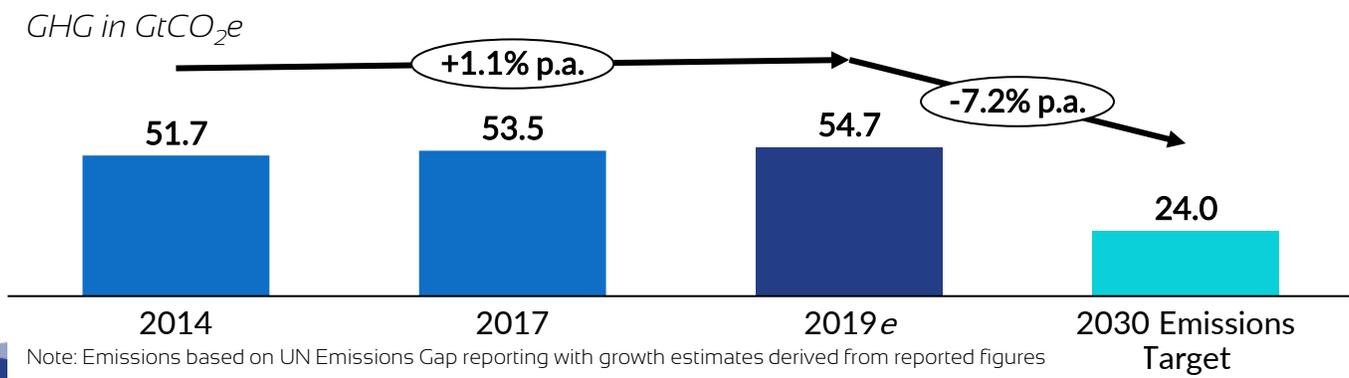
The Current State of Efforts to Fight Climate Change

To say that current efforts to stem the effects of climate change have been lackluster up to this point is an understatement at the very least. The UN Intergovernmental Panel on Climate Change (IPCC), an international collaboration of countries and scientists from around the world, found that to prevent catastrophic consequences of climate change, the world must limit temperature increases to no more than 1.5°C over pre-industrial levels by 2030. This 1.5°C temperature goal was adopted in the 2015 Paris Climate Agreement. If the world exceeds this target the group projects a variety of global scale disruptions, including an increase in extreme weather events, rising sea levels, drastic shifts in weather patterns, and more. The impact of these changes will bring untold costs driven by climate-driven migrations, damage to critical infrastructure, and disruptions to whole industries.

Despite these dire predictions and growing attention towards this issue, global greenhouse gas (GHG) emissions have been slow to decline. In fact, GHG emissions have actually been trending upwards, as seen in figure 1 below. Moreover, signatories to the Paris Agreement have not met their emissions targets. In an apparent reversal from its commitments, China, the world’s largest carbon emitter, appears now to be ramping up the development of new coal-fired power plants.

As per the United Nation’s Emissions Gap reporting, global GHG emissions in gigatons of equivalent carbon dioxide (GtCO₂e) have increased from 51.7 in 2014 to 53.5 in 2017. This change signifies a 1.1% year on year increase of annual emissions. Taking this same trend forward to 2019 provides an estimated 2019 GHG emissions of 54.7 GtCO₂e.

Fig. 1: Current global GHG emissions from 2014 – 2019e compared to the UN 2030 1.5°C emissions target





Is it Still Possible to

Stop Climate Change

It's not hard to see that with the current trajectory of increasing emissions by 1.1% annually, we are nowhere close to reaching 24 GtCO₂e by 2030. In fact, at this point to reach the 2030 target would require an annual emissions reduction of ~7% per year starting in 2019. While it is good to maintain a positive attitude towards efforts geared towards reducing global emissions, it is also crucial to keep an honest perspective as to what is a realistically feasible goal in our world today. This brings us to two conclusions moving forward:

1. We must continue to drive efforts to stem an even more significant change through greater focus on emissions reduction efforts.
2. In parallel with global efforts to reduce emissions, we must now deploy Climate Conscious Strategies and actively plan for the impending effects of climate change to mitigate a variety of new operational risks.



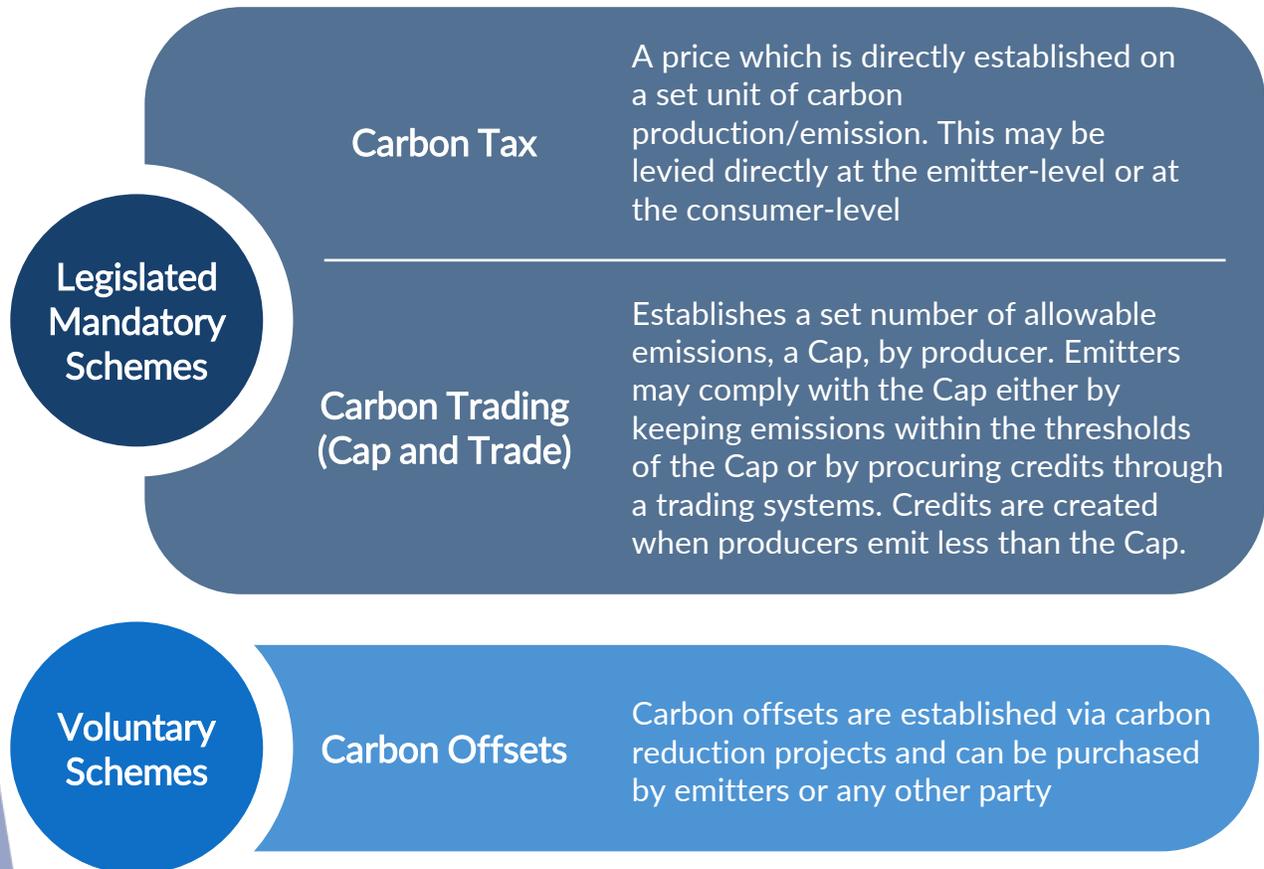
Global emissions reductions of ~7% per year are required to hit the 2030 target, brace for impact

Understanding the Mechanisms to Reduce Carbon Emissions

Governments, economists, activists, and scholars across the world have sought out a multitude of solutions to mitigate or prevent the impacts of climate change. One such solution is to disincentivize carbon emissions via carbon pricing systems. Carbon pricing systems seek to allocate economic costs to activities that result in harmful emissions, such as carbon dioxide (CO₂), which contributes to climate change.

Carbon pricing systems are deployed either as a result of a legislative mandate or as a voluntary scheme. Broadly speaking, these systems are classified into three categories, as seen in figure 2; carbon tax, carbon trading or cap and trade, and carbon offsets. Depending on the category of the scheme, some systems may include market-based trading elements that seek to track and distribute value gained from sustainable behavior regarding emissions.

Fig. 2: Types of carbon reduction mechanisms

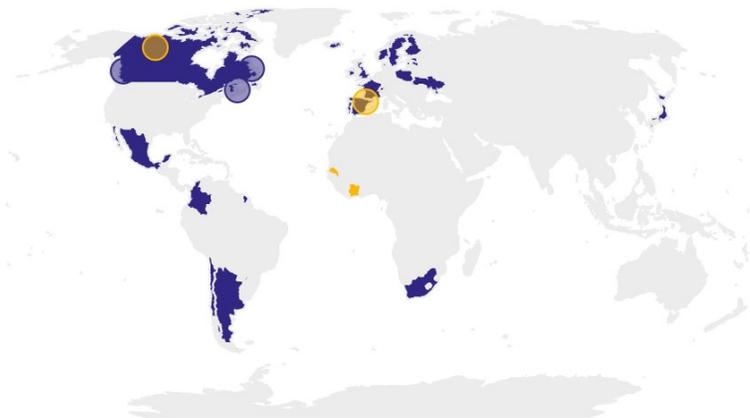


Countries Around the World Actively

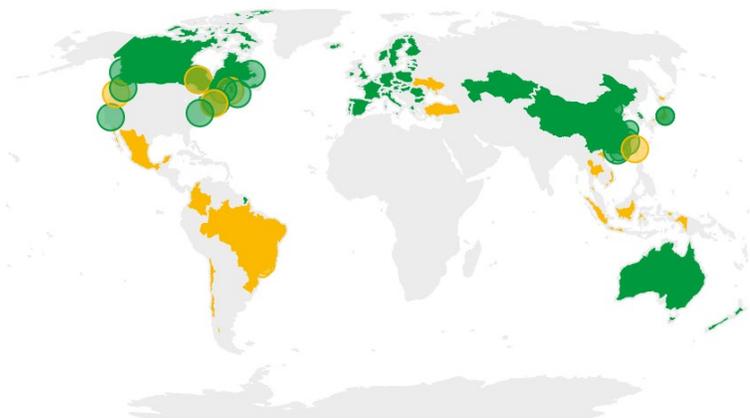
Explore Collaborative Solutions

Fig. 3: The World Bank’s Carbon Pricing Dashboard showing the reach of carbon taxes and emissions trading schemes

Global Carbon Tax Schemes



Global Emissions Trading Schemes



Legend

- ETS implemented or scheduled for implementation
- Carbon tax implemented or scheduled for implementation
- ETS or carbon tax under consideration
- ETS and carbon tax implemented or scheduled
- ETS implemented or scheduled, tax under consideration
- Carbon tax implemented or scheduled, ETS under consideration

Legislative mandatory schemes are regulatory programs that can be international, national, or regional. Examples are the European Union Trading System, the California emissions trading system, and the Regional Greenhouse Gas Initiative (Northeast United States). Most involve cap and trade systems that establish emissions maximums and credit trading mechanisms. These are referred to as Emissions Trading Systems (ETS). Today, Refinitiv estimates that the total value of credit markets in 2019 was valued at \$215 billion.

Carbon pricing systems are by no means new concepts, with the first carbon tax imposed on fossil fuels by Finland in the early 1990s at a rate of \$6.10 per ton of carbon emissions. Explorations around the feasibility of cap and trade programs kickstarted after the 1997 formation of the Kyoto Protocol, a collaborative collective of countries around the world assembled to explore ways to stem the progression of climate change. To this effect, we can see in figure 3 how the initial Kyoto Protocol members influenced other countries to explore ways to develop and deploy cap and trade programs within their respective purviews.

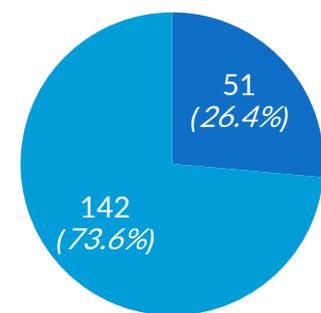
Only Selected Parts of the World

Use Legislated Mandatory Schemes

These efforts to reduce global emissions by putting a price on carbon, however, continue to face a fierce uphill battle as the markets push back on the introduction of extra costs into their systems. Today, 25 national jurisdictions have deployed or have scheduled carbon tax programs, and 38 national jurisdictions have launched or have scheduled emission trading schemes. As seen in figure 4., when accounting for country overlaps, this only equates to 51 countries who have launched or scheduled one or more forms of carbon pricing mechanisms. The problem is that the total emissions of these 51 countries only accounts for ~21% of total global emissions. To complicate matters further, despite these programs being in place, the actual reduction targets of the respective programs typically do not aim to reduce country-level emissions to zero. As such, even this estimated 21% of global emissions covered is an overstatement. Moreover, based on the current studies from the UN, the scale of deployed legislatively mandated carbon systems is insufficient to reach 24 GtCO₂e by 2030 with an estimated target gap of ~30 GtCO₂e.

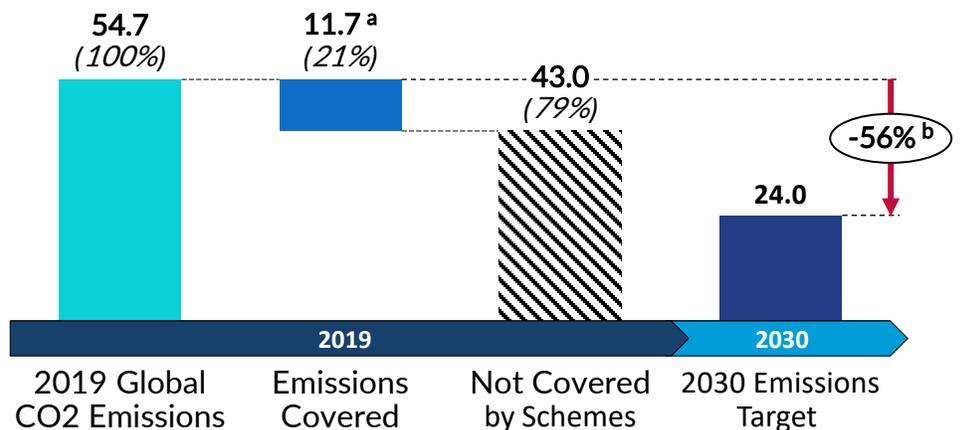
Fig. 4: Emissions covered by carbon pricing schemes

Countries with Carbon Pricing Schemes



■ With schemes
■ No schemes

Amount of 2019 Global CO₂ Emissions Covered by Carbon Pricing Schemes in GtCO₂e



Notes:

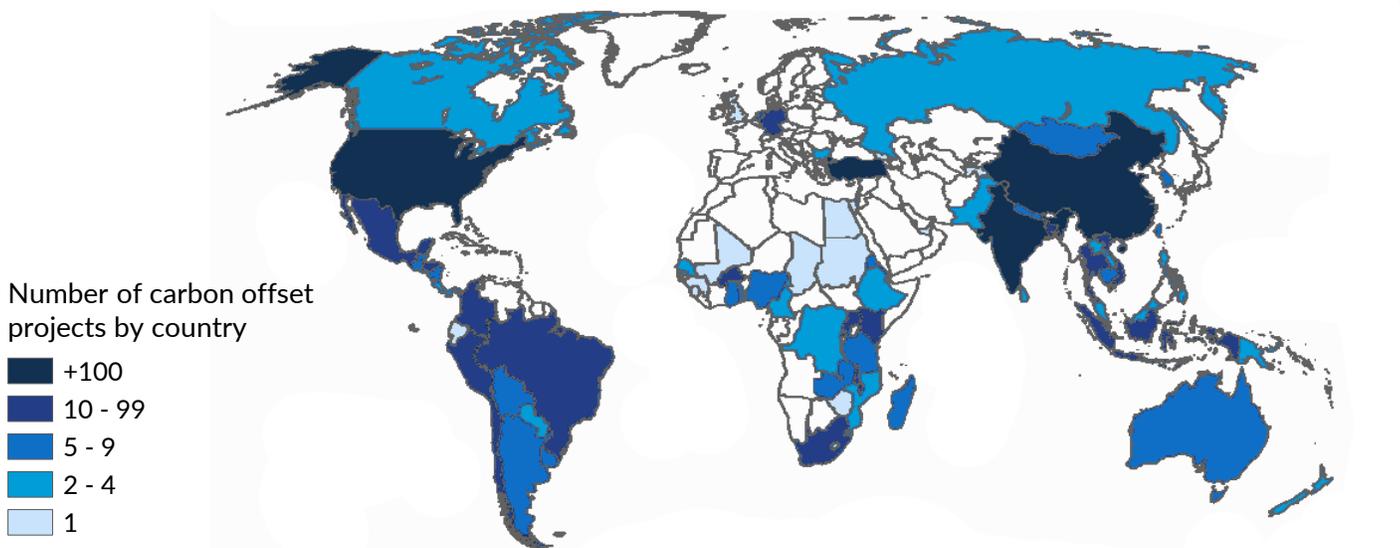
- a) Despite the coverage of 11.7 GtCO₂e, actual targets may not seek to eliminate 100% of respective emissions by 2030
- b) To reach a 56% reduction of 2019 carbon emission requires an annual reduction of around 7.2%

Apart from Mandatory Schemes, Voluntary Schemes Deploy Carbon Offsets to Price Carbon

In addition to legislatively mandated programs, voluntary schemes have come into existence that play on the more altruistic natures of humankind to supplement reduction shortfalls. A common example of this type of scheme is when an individual buys carbon offsets under a defined program to compensate for a personal carbon intensive activity such as flying. Participants in these systems are diverse and can include corporations, institutions, governments, and individuals. Also, note that some of the regulated cap-and-trade systems allow limited use of carbon offsets.

Carbon offsets are created through diverse projects that can take on many forms which ultimately reduce greenhouse gases, including carbon emissions. The World Bank has stated there are over 2,000 offset projects worldwide. Forest Trends, a D.C.-based environmental research organization, has estimated that offset projects accounted for about 98 MtCO₂e in 2019. This is only 0.2% of worldwide emissions of 54.7 GtCO₂e noted earlier. Low hanging fruit examples include planting trees and installing more energy-efficient lightbulbs to reduce power consumption. More complex examples include renewable energy, livestock waste management, and even improved cookstoves in developing countries. Due to this diversity, and the inherent difficulty in measuring sustained impacts of some of these types of efforts, carbon offsets are sometimes criticized for not being real or for being a value given to something that does not exist. That's why validation and measurement standards are so critical in establishing carbon offsets as an environmental commodity.

Fig. 5: Locations of voluntary carbon offset projects, 2008 – 2018



Up Until this Point

Voluntary Programs have Yielded Limited Success

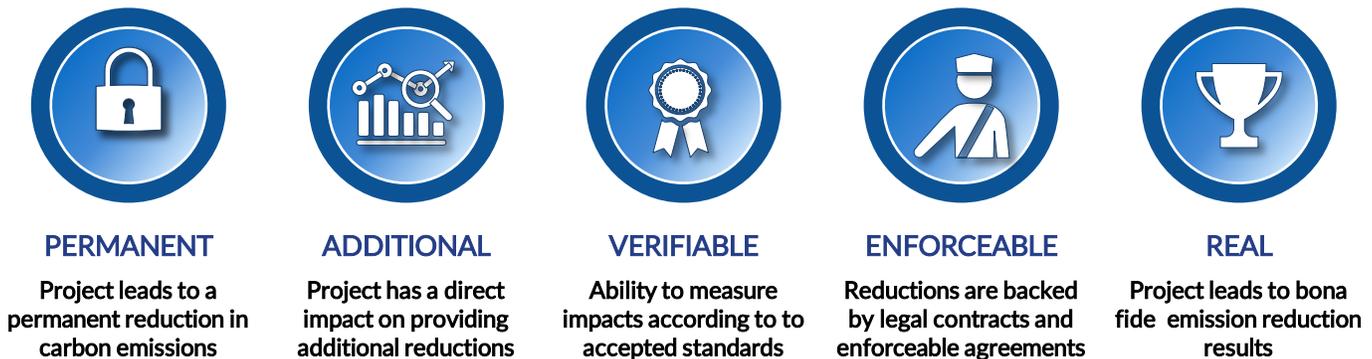
As expected, the demand for carbon offsets is lower than the demand for legislatively mandated carbon credits because they are voluntary. System and program inefficiencies caused in part by fragmentation and unclear standards further complicate wide adoption. Voluntary carbon offsets have traditionally been traded via a network of buyers, sellers, brokers, and dealers. However, there is no centralized global marketplace in part because voluntary offsets are not identical or fungible. It is also a reason why most offset transactions are done through bilateral contracts with large corporations; it has been mostly a wholesale market. However, retail carbon offset products are now becoming increasingly available to businesses, consumers, and perhaps in the near future, prosumers.

The concept of measuring carbon reductions as the result of a carbon offset project versus a baseline without the project in practice sounds very simple; however, validation is exceptionally complex. This complexity is in part due to lacking centralized regulations or accepted standards for defining measures, impacts, and value. To be effective, standards covering the myriad of different offset projects must be in place and trusted by would be deployers of such projects. As an example of these differences and complexities, the offsets from a wind project can be estimated by looking at the carbon breakdown of the electric grid. This estimate would include a variety of location-specific attributes, but the methodology of value attribution could be more easily standardized. Estimating the carbon reduction as a result of efforts to remediate a rainforest, on the other hand, is also possible; however, the measurement standards are more challenging to define, and it may require extra work and ongoing validation to ensure the permanence of the efforts.

To Improve Voluntary Programs, it is Necessary to **Develop and Promote Carbon Standards**

A framework for evaluating carbon offsets as depicted in figure 6 is P.A.V.E.R., which includes the attributes Permanent, Additional, Verifiable, Enforceable, and Real. Permanent means the offsets will result in a permanent reduction or sequestration of carbon; there is little or no risk that the removals would be reversed in the future. Additionality means the offsets were created or added because of the project; it is additional if this would not have happened under a "business as usual" scenario. Verifiable refers to verification and measurement of the project's emission reductions by an independent third party. Enforceable means that the reductions must be backed by legal contracts that are enforceable. Real means the calculated reductions are a bona fide result of the project.

Fig. 6: P.A.V.E.R. framework



This is not the only framework; in fact, numerous third-party registries have been created to validate carbon offsets for projects in the voluntary market. The largest of which is the Gold Standard (established in 2003 by the WWF and international NGOs), the Verified Carbon Standard (VCS), the Climate Action Reserve (CAR), and the American Carbon Registry (ACR). These are centralized databases or registries that seek to quantify, verify, track and retire carbon offsets created by the offset projects.

Some of these third parties register offset projects from around the world and a wide range of project types while some deal in specific types. For example, the ACR is wide-ranging while the Gold Standard deals with offsets from energy efficiency and renewable energy. The result of the verification process is offsets measured in metric tons of carbon dioxide equivalent (CO₂e). Yet, as noted earlier, carbon offsets are not created by the same process; they are not yet fungible and freely traded.

Emerging Technology Seeks to Innovate to Overcome Carbon Roadblocks

As the realization sets in that legislatively mandated carbon reduction systems will not be enough to make a sufficient impact in the fight against climate change, we must look to alternatives. One of these alternatives is to find better ways to enable, promote, and incentivize voluntary carbon pricing schemes. Technology may be one avenue to help address these and some of the issues highlighted above. In fact, there have already been a host of technologically driven concepts showing some initial promising solutions, specifically blockchain technology.

Five key features of blockchain technology are decentralized databases, data security, transparency, immutability, and smart contracts. These structures can help to resolve many of the issues involved in verifying offset projects. It is unlikely that a single blockchain would replace all of the third-party registries because of the complexity and number of project types. Instead, the registries could utilize blockchain technology to create a point of consolidation, aggregating and standardizing outputs and results from efforts geared towards reducing carbon emissions or driving sustainability. With a system like this, registries can utilize this to begin tapping into the broader carbon trading market. Tokenizing may also play a role in standardizing carbon reduction and sustainability outputs. In this instance, a token or coin can serve as a unit of measure representing a certain amount of carbon offsets, likely on a per ton basis.

Companies exploring blockchain to improve carbon offset markets



CarbonX, a Toronto-based startup is exploring concepts tokenizing carbon offsets utilizing the Ethereum blockchain. The company plans on purchasing third-party offsets from registries and use its Zerofootprint (ZFP) tokens for trading. Also, they allow companies to reward consumers by providing tokens through its GOODcoins customer loyalty program.



Poseidon Foundation, a non-profit based in Malta, uses blockchain to determine the carbon footprint of consumer products down to the gram. It also purchases carbon offsets and ties them to a blockchain platform in a retail point-of-sale system. The company has run a pilot at a Ben & Jerry's ice cream store in London to track such information. When an ice cream sale is rung up, a carbon offset charge is added to the price.



Hong Kong startup Veridium Labs is developing a tokenized trading platform for carbon credits. Veridium partnered with IBM in October 2017 and looks to use the Stellar blockchain. Its first token, the Verde, will represent carbon offsets created by a rainforest reforestation project in Borneo.

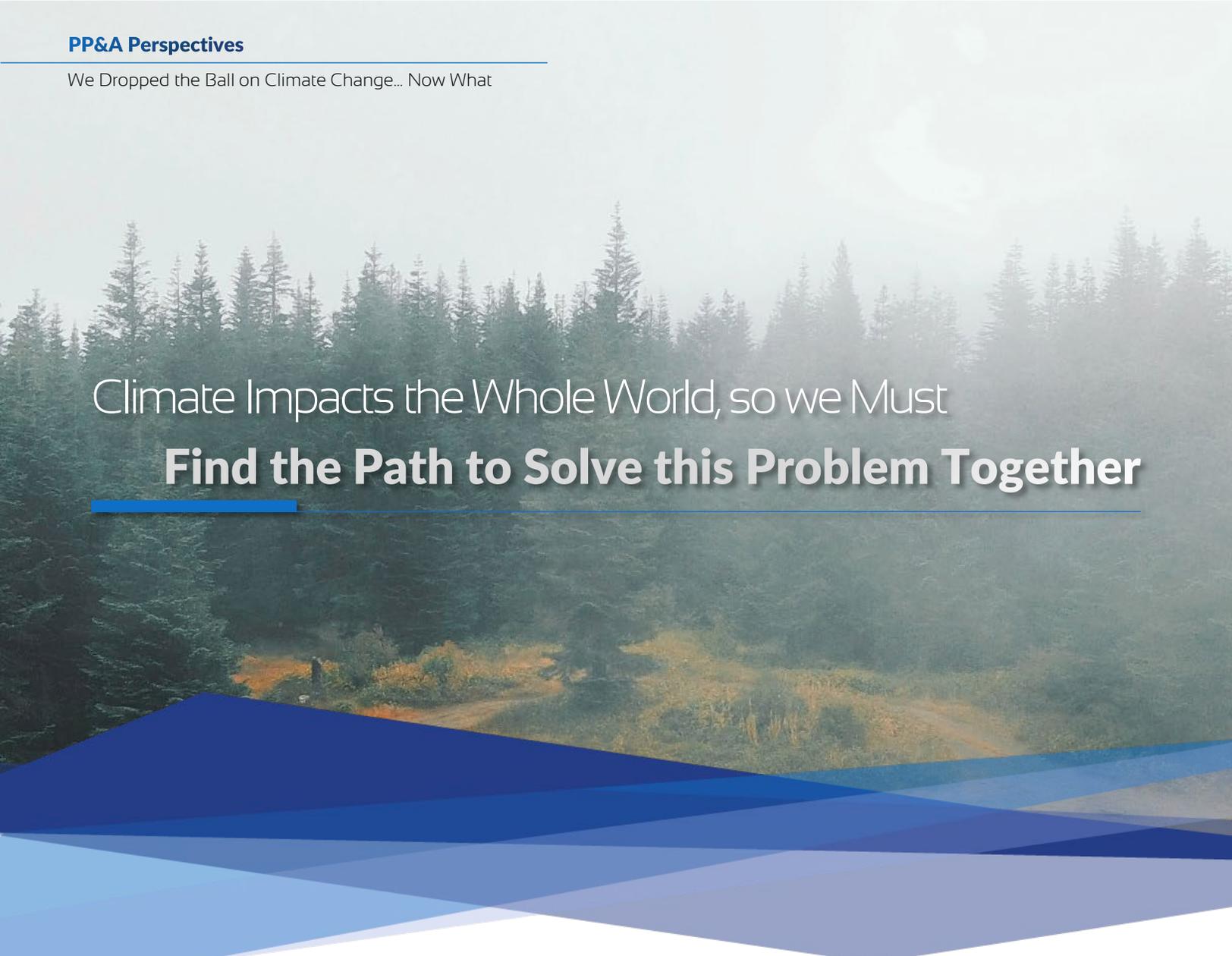
Many Options Exist and Must be Used to **Address the Climate Challenge in Multiple Ways**

The markets for carbon offsets are evolving and blockchain technology could be a catalyst for the commoditization of carbon pricing systems. Only a selected few regulated carbon trading markets allow for a limited use of carbon offsets. The main challenge here surrounds the verification of the validity of carbon reductions claimed by the offsets. This is one of the reasons why many of the existing regulated carbon trading systems are now looking at blockchain technology and the use of tokens. The features of blockchain help to solve the main challenge of verifying that each certificate or token accurately represents a ton of carbon offsets. In other words, the use of blockchain helps to create a more fungible product.

A more fungible offset makes it easier for businesses and consumers to purchase offsets and simplifies the integration into new product and service offerings. Going back to the Ben & Jerry's ice cream example, it's not hard to imagine the expansion of a similar concept in the near future where most products and services include information about the associated carbon footprint. As such concepts continue to evolve, consumers will become more aware of the implications of their consumption behaviors and how organizations and governments factor into that equation. With this awareness will also come a changing set of expectations.

Like many other efforts surrounding the fight to stop climate change, offsets face a considerable amount of pushback. Critics of carbon offsets argue that they are a license to pollute. Others may even see offsets as a form of carbon taxation. The bottom-line however, is that legitimate offset projects reduce the amount of carbon that would otherwise exist and help fund transitions to more sustainable products, facilities and processes.

Blockchain technology can certainly be used to help legitimize carbon offsets however, it is not the only way companies are innovating to address the problem of high carbon emissions. In fact, many companies are already establishing climate and sustainability targets and finding ways to reduce or account for their organization's footprint. UPS for example has a program called CarbonNeutral® where participating customers can pay a small incremental charge to offset the carbon impact of the delivery of their packages. This particular system does not use blockchain, but as such it is constrained to customers within a specific sphere of activity, in this case when shipping a package with UPS. In any case, in a world where carbon emissions seem to be out of control, carbon offsets are an option that should be explored and expanded on as part of a larger solution.



Climate Impacts the Whole World, so we Must **Find the Path to Solve this Problem Together**

Whether broader support for legislatively driven carbon reduction schemes emerges, or innovation serves as a conduit to encourage larger scale deployments of voluntary carbon reduction schemes, the message is clear that change is coming. Despite the best efforts so far, the sub-optimal results from current studies suggest that our world is set to undergo a significant change in the near future as the impacts of climate change begin to take effect. In 2019, this can be seen in the damage caused by severe weather events and climate driven catastrophes, such as storms, floods, and fires. The estimated costs of these events to businesses and governments around the world in 2019 are estimated at \$150 billion. These costs are expected to continue to rise of for the foreseeable future, as indicated by insurance providers like Munich RE who have long monitored the risks and costs associated with climate-driven disasters. As such, organizations and governments alike are now in the position to respond to these changing circumstances. This means taking a more proactive approach to not just understand the changes set to impact the environments of the world, but also find ways to minimize further detriment at the same time.

Smart Organizations Today

Build Value with Climate Conscious Strategies

Sustainable organizational success hinges upon the ability to adapt to these changes by employing Climate Conscious Strategies (CCS). As seen in figure 7., there is a lot which can be gained from an effective CCS. On the business development front, customer expectations and future brand imaging will be impacted by an organization's positioning in terms of the environment. Likewise, this image and perception translate directly to an organization's ability to attract and retain talent as trends of employee activism increase. Tech companies in Silicon Valley have already experienced similar disruptions as a result of other hot button topics such as the protests in Hong Kong and contracts with military and defense organizations resulting in employee walkouts and boycotts.

Operationally, there is also an opportunity to use CCS to streamline supply chains, reduce costs, and mitigate risks of disruption. The deployment of sustainability measures in production and manufacturing processes creates significant opportunities to boost business value. Market leaders of tomorrow are finding ways today to do more with less and reduce the reliance on unsustainable and risk exposed supply chain elements.

Fig. 7: Business value of Climate Conscious Strategies (CCS)

CUSTOMER PERCEPTION AND SALES

- Changing customer demographics are creating shift in consumer expectations
- Social responsibility is more important than ever as millennials shift to the primary consumer group
- Maintaining positive social standings, can create opportunities from premium product placement and attractive pricing models

EMPLOYEE ATTRACTION AND RETENTION

- Like consumers employees are also increasingly looking for organizations to act socially responsible
- This includes conscious efforts made on the part of organizations to minimize environmental impacts
- Organizations looking to attract and retain socially conscious talent must align values with these principles

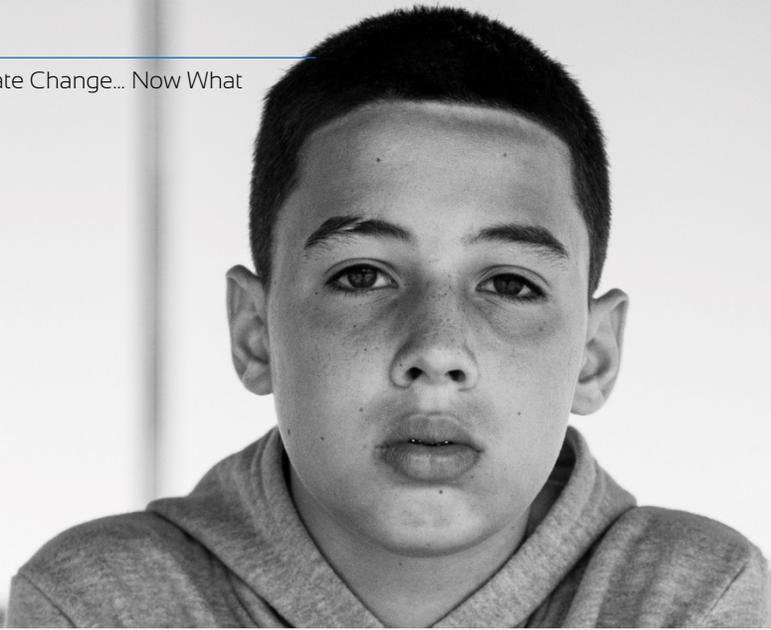


SUPPLY CHAIN RESILIENCE

- Firming up supply chains with the ability to operate sustainability in a world impacted by climate change
- Impacts such changing weather patterns, natural disasters, and other implications can quickly alter the make-up of a supply chain
- Finding sustainable solutions to production, logistics, and storage processes becomes key to ensuring business continuity

OPERATIONAL EFFICIENCY

- Mitigating climate-driven operational risks through sustainable processes and a focus on business continuity
- Identifying and removing inefficiencies with sustainability in mind to improve operating performance with financial incentives
- Whether through optimized energy consumption or lean processes, best in class organizations leverage sustainability for market advantages



As the World sits now Change is Coming, and **As a Result, We Must Act Now**

Based on the current projections around climate change and the trajectory of the progress being made by the world to address this topic, it is clear that things are poised to change in the near future. Already we can begin to see the impacts in the form of changing weather patterns and higher frequencies of weather-based disasters both in the United States and abroad. Technologies such as blockchain and programs such as innovative carbon pricing and market mechanisms are only part of the greater solution required to bounce back from our current scenario. However, it will be incumbent upon everyone to affect the changes necessary whether it's personal behavior, corporate responsibility, or government policy. We have collectively as humans dropped the ball on climate change, and as a result we will likely have to deal with the consequences for generations to come. However, that doesn't mean that we can't pick the ball back up, rather it is now more important than ever to do so. In closing ask yourself this, are my actions now helping to pick the ball up, or am I now looking to kick it down the road? The choice is ours.

It's Time to Pick up the Ball

About the Authors

Chris Peoples

Chris is the Founding and Managing Partner of Peoples Partners and Associates (PP&A). Professionally, he has gained more than ten years of industry and strategy consulting experience working with leading companies. As a Management Consultant, Chris works closely together with clients to develop innovative strategic approaches to solve complex problems and find new ways to generate value.

As PP&A's Managing Partner, Chris structures and leads consulting engagements by developing work plans focused on addressing client-specific issue sets and ensuring the subsequent execution of work plans according to specifications. Actively guiding multiple consultant and client teams in data collection, synthesis, and analysis efforts he derives and implements data-driven solutions.

In addition, Chris serves on the Advisory Council of the Maryland Clean Energy Center, an organization focused on developing mechanisms to usher in an advanced clean energy economy in the state of Maryland. He also serves as the Energy Working Group Lead at the Government Blockchain Association in Washington DC, exploring the implications of distributed ledger technologies and other emerging innovative technologies on energy markets.



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Ed is a senior-level strategy consultant working with PP&A in a variety of roles. He holds an MBA from

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As an active member of the PP&A General Editor Community, Ed is on the frontlines of researching and assessing the market viability and implications of blockchain and other innovative technologies impacting the energy and environment sector including implications of such technologies on carbon markets.

Earlier in his career, Ed successfully supported efforts in the northeast U.S. to develop strategies increasing natural gas use to displace coal-fired generation. Now his interest involves facilitating the transition from natural gas to a renewable future.





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