SECTION VII

GREEN ECONOMY

The word "green" has been used for years as a vague placeholder for taking care of, and improving, the world's natural resources. Our working group's goal is to make "green" quantifiable. A significant number of organizations are using technology to tackle the world's environmental problems; this working group has examined their work, documented the most relevant initiatives, and highlighted key topics to inform and recommend how those in the market can address these challenges moving forward.

DEFINING THE 'GREEN ECONOMY'

The International Chamber of Commerce (ICC) defines a green economy as "embedded in the broader sustainability development concept" and "as an economy in which economic growth and environmental responsibility work together in a mutually reinforcing fashion while supporting progress on social development."[177] More simply, a green economy is defined as an economy that is low carbon, resource efficient, and socially inclusive. The Organisation for Economic Co-operation and Development (OECD) has identified six strategic pillars in its Green Growth Strategy, including:

1. Climate change
2. Resource saving and management
3. Circular economy
4. Environmental protection
5. Ecosystem protection and recovery
6. Water conservation and natural disaster prevention.[178]

Regulatory changes across the developed world are obliging institutions to be more honest about carbon neutrality claims. Entities are now working to reduce carbon dioxide emissions or other greenhouse gases to compensate for emissions made elsewhere. This is known as carbon offset. The demand for voluntary carbon offsets is estimated to be at U.S.$50B by 2030; this is still in a very early growth phase.[179] The success of carbon credit offsets has been constantly hampered by two constant challenges:

1. The data available for buyers of carbon credit offsets does not meet sufficient due diligence standards for most global corporations; and

2. The supply of carbon credit offsets associated with removing CO2 from the atmosphere accounts for only around 5% of the market.

Many expect carbon credit offsets related to removal of CO2 to become the most dominant part of the market given the correct governance framework.[180] Where will these offsets be found? According to Drawdown by Paul Hawken, the top solutions to global warming (with a total potential carbon savings of 584 Gigatons of CO2e by the year 2050)[181] will be found in refrigeration, wind turbines, reduced food waste, plant rich diet, tropical forest, women's education, family planning, solar farms, silvopasture, and rooftop solar.

Because CO2 emissions in these areas are harmful, organizations are working together to target net-zero carbon emissions. While carbon credits are not the only solution, they have a quantifiable impact and identify core principles that are critical to driving such an impact.

GREEN MARKETPLACE

For this paper, "green" is defined as an aggregate of players from both the supply and demand side who want low energy consumption and less waste; they use sustainable materials, follow environmental laws and regulations, and want to both quantify and verify their valuations in an auditable way. A "green" product, service or solution is one that contributes to the marketplace by reducing or offsetting carbon/pollution footprints. This can often be achieved

by purchasing Renewable Energy Certificates (RECs), Carbon Credits, or using other systems – such as 24-hour renewable power procurement.

The cost of offsetting corporate carbon emissions is expected to surge over the next decade.[182] As more organizations take on "green" initiatives, the growth in demand for carbon credits will outpace the supply of measurable and verifiable offsets. In addition to the demand for carbon credits, organizations are looking to offset energy usage with RECs. Corporate giants like Microsoft have recognized that "while we can't control how our energy is made, we can influence the way that we purchase our energy."[183]

Electricity currently generates 25% of the world's greenhouse gas emissions.[184] A carbon-free electricity sector, is considered the foundation for decarbonizing other sectors of the economy, establishing net-zero emissions, and creating a green global economy.[185]

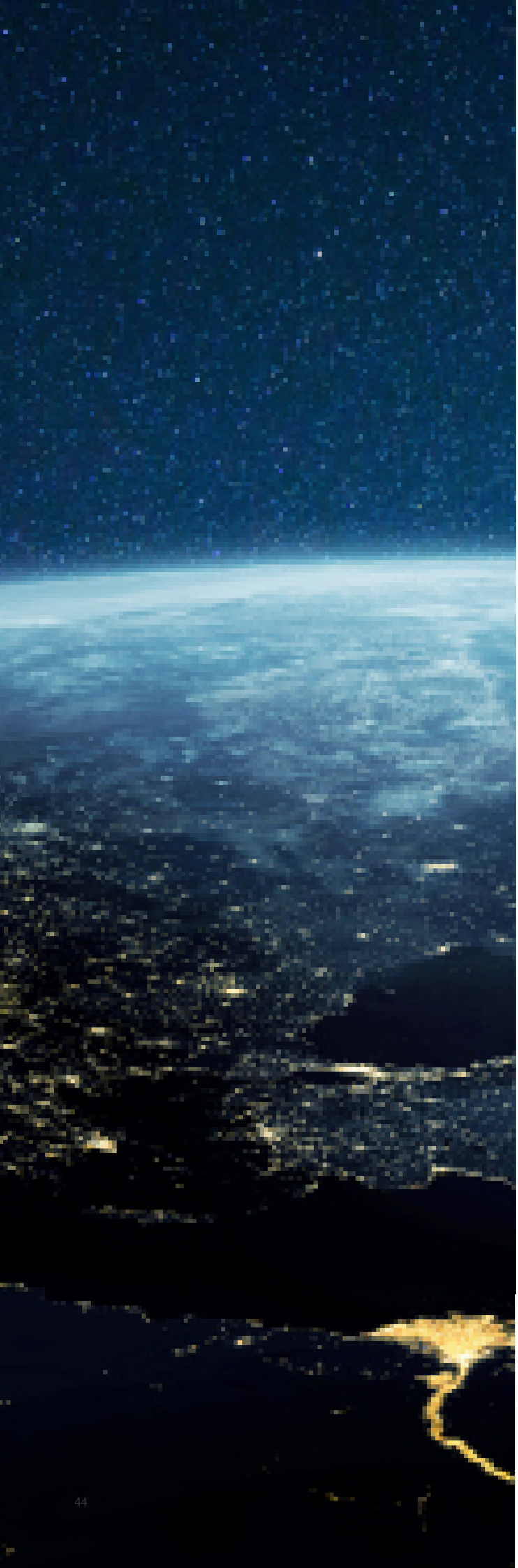
Traditionally, matching energy supply and demand has been one of the largest problems of the transition to renewable energy.[186] Today, technologies facilitate 24/7 carbon-free energy,[187] which focuses on matching the temporal and spatial particulars of clean energy and an organization's energy load profile.[188] The new trend of 24/7 energy procurement will pave the path to true net-zero emissions for many.

There are two major types of carbon markets: voluntary and regulated. The voluntary markets are not under any governmental agency or regulatory control or sanction, which means participants are active based on natural market forces or social responsibility to the consumers in the market. For example, environmental, social and governance (ESG) criteria, defined by socially conscious investors, are used to screen potential investments based on company operations. Regulated markets, on the other hand, require a governmental agency, either a nation-state or treaty, to enforce industry compliance.[189]

ROLES AND RESPONSIBILITIES

To effectively impact communities and focus recommendations, it is important to understand participants in the global marketplace. Key players and their roles in the marketplace include:

- **Supra-national organizations**
  Agenda setting and global initiatives and commitments
- **Governments**
  Regulations, task force investigations into "green" systems and enhancement, as well as Voluntary Carbon Market Investment Promotion Agencies (IPAs), branches of existing investment agencies or as new institutions, helping countries attract private investment from the VCM and support national climate objectives.
- **Producers/Project Developers**
  Carbon offsetting and renewable energy procurement solutions, following market and technical standards organizations (IWA, TSVCM, ISO, EWF, RMI, AIR, CCA, VCS, "The Gold Standard", CAR, ACR)
- **Financial Institutions/ Exchanges**
  Providing a way to easily trade carbon credits/ tokens, creating tokens to trade.
- **Financiers**
  Providing energy projects finance (e.g., sequestration project funding, Rabo Carbon Bank).
- **Standards Organizations**
  Managing measurement standards, additionality, permanence, preventing leakage.
- **Registries**
  Institutions that can record and validate if an organization has followed specific protocols.
- **Verifiers/Auditors**
  Individuals who have the authority to determine if the claims of an organization are correct.



- **Retailers**
  Using carbon offsets in their production and other operations.

- **Consumers**
  Purchasing from retailers who are following green standards.

- **Decarbonization consultants**
  Working with businesses on supply chain and Scope 3 emissions (the result of activities from assets not owned or controlled by the reporting organization[190]), measurement, reduction, and offset.

- **Tech companies**
  Providing trackers (including trackers integrated with bank account or spending data), as well as bilateral offset solutions.

- **HR/Employee solutions**
  Offsetting for businesses in terms of their employee and operational footprint.

HOW DO THESE ROLES FUNCTION WITHIN THE VOLUNTARY AND MANDATORY MARKETS?

The Voluntary Carbon Market (VCM) offers tools to estimate and measure GHG emissions and removals, and - by utilizing a range of standards, protocols, and greenhouse gas (GHG) crediting programs - enables the creation of tradable carbon credits. The VCM enables private actors to drive climate benefits beyond their own operations. The VCM typically complements the United Nations Framework Convention on climate change known as the Kyoto Protocol, and other regulated carbon markets, with VCM project developers filling gaps left by the mandatory market.

Both the direct and indirect economic impacts of the VCM and their subsequent contributions to the Green Economy can be significant. A study from the Imperial College and the International Carbon Reduction & Offset Alliance (ICROA) estimates that each ton of emission reduction from a voluntary project creates value two orders of magnitude greater than the average carbon price.[191] These benefits include local employment

in the projects, the use of local products and services when implementing and operating projects, provision of services or products for the local economy, conservation of domestic ecosystems, technology transfer, capacity building using new technologies, and empowerment of local communities.

Entities engage in the VCM to identify cost-effective solutions to reduce their corporate carbon footprint or to meet carbon neutrality or net-zero goals. While some companies prefer to purchase carbon credits from small, locally owned mitigation projects, corporations typically look to purchase credits from larger-scale (often "charismatic") projects. These projects generate high volumes of credits, thereby reducing buyers' transaction costs, while providing social and environmental co-benefits. Corporations also seek to avoid reputational damage by requiring robust environmental integrity of the carbon credits they purchase.[192] The surge in companies seeking to offset both direct and indirect carbon generation has precipitated a supply and demand issue. Trends worth noting include:

- Carbon pricing (sufficiently high) is considered part of the essential framework for creating real value implications for high carbon activity, thereby changing business and consumer behavior
- Business, consumer, finance, and investment product development around carbon offsets and markets is increasing
- Incentives include the ability to connect with consumers, maintain social responsibility, and improve the effects of climate change
- Voluntary blockchain-based carbon projects include DOVU, puro.earth, REDD+, UPCO2, Nori, CarbonX, Moss.earth, AIR Carbon, and Xpansiv; these projects are in the early stages of development; many have secured significant financial backing to support their efforts – most are contributing market requirements to develop correct mapping for standardization.

Carbon registries and standards vary in diligence and stringency. Requirements and obligations between parties must be contractual to ensure the necessary standards are met. Carbon registries have their own terms of use and explicit provisions limiting their liabilities. Arguably, a better regulated market would provide for greater environmental integrity, transparency, and legal certainty.

Mandatory Markets are used by entities required to show proof of offsetting carbon emissions. The United Nations Framework Convention on Climate Change (UNFCCC), formed in 1992, established the foundation upon which the Kyoto Protocols of 1997 and the subsequent Paris Agreements of 2016 were built. These internationally binding agreements created the Nationally Determined Contributions (NDC) by which Countries party to the U.N.'s Framework Convention on Climate Change (UNFCCC) may set up mandatory reporting programs to improve national inventory estimates.

NATIONAL, REGIONAL, AND SUBNATIONAL JURISDICTIONS WITH MANDATORY AND PROPOSED MANDATORY REPORTING REQUIREMENTS INCLUDE:

Australia	National Greenhouse and Energy Reporting Scheme
California	Mandatory GHG Reporting Program
Canada	GHG Emissions Reporting Program
China	Proposed national reporting program
European Union	E.U. Emissions Trading System
France	Bilan d'Emission de GES
Japan	Mandatory GHG Accounting and Reporting System
Mexico	National Emissions Registry
Norway	Emissions Trading System
South Africa	Proposed national GHG reporting program
Turkey	GHG Reporting Scheme
United Kingdom	GHG Reporting Program
United States	GHG Reporting Program

In the U.S. in 2009, GHGs that represent the largest drivers of human-caused climate change (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) were ruled to endanger public health by the U.S. Environmental Protection Agency (EPA). They are thereby subject to the Clean Air Act. Starting in 2010, large emitters of greenhouse gases were required to begin collecting data under a new reporting system. In 2011, fossil fuel and industrial GHG suppliers, motor vehicle and engine manufacturers, and facilities that emit 25,000 metric tons or more of CO2 equivalent per year began to report GHG emissions data to EPA annually; these metrics have formed the basis of NDC reporting under the Paris Agreement in the U.S.[193]

These NDCs help to develop economy-wide or sector-specific programs that address national and subnational priorities and objectives. The Paris Agreement is one of the most prominent examples of a mandatory market and is the basis for most demand metrics. Its goal is to limit global warming to well below 2 (preferably 1.5) degrees Celsius, compared to pre-industrial levels. This is the basis for most demand metrics. The Paris Agreement provides a framework for financial, technical, and capacity building support for interested countries.

IT'S NOT EASY BEING GREEN

The latest Intergovernmental Panel on Climate Change (IPCC) report stated that climate change is "widespread, rapid, and intensifying."[194]

> Stabilizing the climate will require significant, sustained reductions in greenhouse gas emissions.

If green or carbon markets are going to be used as the primary vehicles for responding to climate change, certain issues must be addressed. Organizations including the Science Based Targets Initiative, Science Based Targets Network, Natural Climate Solutions Alliance, Oxford Principles for Net-Zero Aligned Carbon Offsetting, Greenhouse Gas Protocol, Climate Disclosure Standards Board, and Task Force on Climate-Related Financial Disclosures agree the following climate principles are critical to aligning carbon markets with the ambitions of the Paris Agreement:

- **Science-based action**
  Companies align with science-based mitigation hierarchy – emission reductions should be first-order priority in value chains
- **Comprehensive action**
  Climate targets and action are built on accurate and complete greenhouse gas inventories in-line with the requirements set out in the GHG Protocol
- **Equity oriented**
  Climate targets should be consistent with achievement of broader sustainable development goals and the concept of a "just transition"
- **Nature-positive**
  Efforts should prevent or mitigate nature and biodiversity loss; move toward a nature-positive state of recovery and renewal
- **Rapid action**
  Goals should target immediate action on climate, recognizing this decade is critical if we are to avert potential tipping points
- **Scaled up action**
  Ambitions must be raised to make significant investments in climate mitigation outside of immediate value chains
- **Transparent action**
  The scope, boundary, use of carbon credits, and terminologies used in commitments must be transparent; progress and learnings are publicly reported
- **NDC enabling action**
  Companies contribute to the finance flows needed to achieve climate ambition in Nationally Determined Contributions (NDCs) under the Paris Agreement
- **Consistent action**
  Companies require climate action plans that fully align their businesses with net zero, including everything from investments, governance structures, lobbying efforts, and the advocacy of affiliated industry associations
- **Collective and predictable action**
  Companies align VCM engagement with host country policies and work in partnership with other corporations, NGOs, and local stakeholders

THE CHALLENGES - *DIFFERENT, SILOED STANDARDS AND METHODOLOGIES*

Though reputable carbon standards seek to verify carbon credits, there is not yet a formalized standard for real and verified carbon credits regarding common quality features: (i) robust baselines; (ii) additionality; (iii) permanence of emission reductions or removals; (iv) addressing leakage; and (v) absence of double counting. VCM registries enable the public to view some details about projects and carbon credits, but differences in methods used to collect and organize data make comparison difficult. Data is not always

detailed enough to conduct independent assessments of carbon credit quality features, and the price may not always be indicative of the quality of carbon credits.

VALIDATING CLAIMS - *NET ZERO, CARBON NEUTRAL CLAIMS OR ASPIRATIONS*

It is critical to ensure claims are true, clear, and relevant to their target audience and substantiated with objective, transparent, and up-to-date data. Additionally, they should not overstate their beneficial environmental impacts and avoid creating a false impression or hiding trade-offs.

HOW DO WE SCALE UP HIGH QUALITY CARBON PROJECTS TO ACCELERATE OUR TRANSITION TO NET-ZERO, AND HOW CAN BLOCKCHAIN HELP ACHIEVE THESE GOALS?

Some companies make environmental or ecological claims regarding environmentally friendly practices they follow. To push companies in the right direction while making green practices easily adoptable, organizations like the Taskforce for Scaling Voluntary Carbon Markets (TSVCM), Crypto Climate Accord (CCA), and others have published standards to reduce carbon in our atmosphere. Blockchain can help solve these problems. However, it is important to note that energy use is an increasing problem for the climate. Although the Proof-of-Work (PoW) consensus, popularized by Bitcoin, provides immense security and decentralization, it uses much more energy than other consensus mechanisms like Proof-of-Stake (PoS). The Bitcoin blockchain has about the same carbon footprint as the country of Chile.[195] Several blockchain protocols are being developed that address this problem; it is critical that blockchains are interoperable and allow for multi-party interaction so that they do not contribute to this problem.

ALIGNMENT, SCALE, AND SOLUTIONS

The problems outlined above cannot be addressed if technology solutions are not aligned for specific use cases. Many legacy technology solutions are not working because they are not scalable, measurable, or results are not tangible, leading to incentives that are not aligned. But blockchain is proving to be a powerful technology because it can facilitate an ecosystem of value exchange across

industries.

Robert Opp, Chief Digital Officer for the United Nations Digital Program, stated that blockchain can play a significant role in creating digital ecosystems by understanding the ecosystems, identifying their core use cases, and validating the areas they can impact by providing a scorecard on impact toward the SDGs[196].

The results can be measured, promoted, and funded. Blockchain technology is either introducing or improving the following digital ecosystems: digital identification, supply chain traceability, energy, remittances, financial inclusions, and land registries by:

Allowing for efficient multi-party tracking, traceability, and proof of green reporting, making it possible to track the journey of the carbon credits and carbon in the atmosphere

Preventing "double-spending," a vital piece when it comes to offsetting carbon

Enhancing transparency, security, and creating a trustless environment.

Green Standards Organizations are also defining and aligning basic taxonomy, especially around tokenization, which is covered in depth in the technical and taxonomy sections of GSMI 2.0.

DEFINING AND TRADING DIGITAL VERSIONS OF TANGIBLE ASSETS

An example of this is TSVCM's Core Carbon Principles for tokenization of digital assets. TSVCM published this blueprint to create a large-scale, transparent carbon credit trading market. A large-scale voluntary carbon market is critical to reaching the goals of the Paris Agreement as it enables companies to turn net-zero commitments into action through investments in emissions abatement projects.

For a voluntary market to flourish, a standard must be defined for the tokenization of assets.

On the demand side for removals via credits, IWA mapped an open source, interoperable token that aligns with the TSVCM's Core Carbon Principles (CCP). The CCP defines a "token" as representing a specified volume of metric tons of GHG emissions reduced or removed by a project. The technique for reduction or removal of GHGs in a project, its measurement, and verification methodology are found in the Verification Contract and the issuing standard registry.

The CCP is a tradeable digital asset whose price is determined by the market using the associated information. The CCP has standard data elements that represent the shared view required by the parties in the carbon market from suppliers, buyers, validation and verification bodies (VVBs), registries, and exchanges. These standard data elements are based on the recommendations from the TSVCM.

Working together with TSVCM, IWA introduced its tokenization recommendations in May 2021. Every CCP must be unique to derive value in a market. The following is an overview of the artifacts of data that are unique and valuable. Public blockchains make these features applicable and useful within a green market. The CCP Token has the following behaviors and properties: It is a fungible token (think of this as a quantifiable asset for exchange) that represents one metric ton of CO2 (mtCO2) or 1 mtCO2e that validates either a reduction, avoidance, or removal.

- It is divisible, transferable, encumbered, revokable, delegable, offsetable, and mintable with role support
- It includes a Unique identifier (ID) that is assigned when issued and sets this specific asset apart and gives it unique value; established and anchored on a public blockchain along with any relevant static data about the asset and any dynamic "events" associated with the asset
- Includes an Owner: The ID of the account that is the owner of the token

- Includes an Issuer: The ID for the issuing standard registry or record of activity

It must also validate the following Core Carbon Attributes (CCA), or a set of properties where the values can differ significantly between CCPs and allows comparisons and groupings of like CCPs together. Core Carbon Principles will contain some or all of the following:

- **AssetID**
  The serial number or unique identifier of the referenced credit on the standard registry that the token represents, where this identifier is established and anchored on a public blockchain along with any relevant static data about the asset and any dynamic "events" associated with this asset.
- **Issuance Date**
  The date of creation.
- **Verification Standard:**
  VCS, GS, etc.
- **Reference to Project/MBP/Claim**
- **Reference to Contract/Verified Claims**
- **Date Range**
  The verified period of the benefit claim.

Only through public blockchains can the market confirm that the token is a unique representation of the actual data and cannot be corrupted. Furthermore, it can be trusted because it is decentralized and distributed with a consensus or agreement through the technology and not through extraneous or onerous touchpoints. This in turn gives the token a unique value that is more secure and can be quickly settled between parties. Several blockchain projects are already implementing this token framework in their product specifications. Future work on these standards includes an MRV (Management, Reporting, and Verification) framework based on international standards for environmental management or ISO 14064-1:2018. This will improve and provide additional implementations for tokenization certification.

This is just one example of how a business problem is identified, creating a large-scale, transparent carbon credit trading market, in which blockchain technology is used to capture significant value through tokenization. There are numerous use cases following a similar model - identify a problem, map a blueprint solution, and use an open source, technology neutral standard that scales on any platform.

RECOMMENDATIONS

Invest people and funds into voluntary markets

Voluntary markets are not under governmental control, which means participants engage because of natural market forces or social responsibility. Regulated markets, on the other hand, require a governmental agency to compel industry compliance.

- Identify a specific use case that can make a tangible difference to solve a problem area.
- Understand and Invest in ESG Standards Working Groups to engage and align ESG investments.
- Make a commitment to a working group backed by a financial investment and man-hours. By having a more robust voluntary market we can go to the mandatory markets with specific, detailed requests for alignment, and help drive impactful ecosystem development.

DIGEST - READ AND LEAD

We recommend the following readings

- COP26 Explained
- Paris Agreement Explained
- Ceres Roadmap 2030 |
- The InterWork Alliance's Voluntary Ecological Markets Overview
- White & Case LLP
- VCMI Synthesis Report

WHAT IS YOUR ESG STRATEGY

Review the Sustainable Development Goals (SDGs) and communicate your accountability and alignment

- Do not assume understanding; take time to understand and educate constituents
- Measure your results and be accountable - communicate goals to constituents
- Invest in technology that offers impact; solutions should be quantifiable and interoperable

Organizations can remove or reduce harmful greenhouse gas emissions, improve data required to measure and validate, reduce the cost of bringing solutions to markets, and increase the speed of this work through these steps. By mapping this level of detail, the marketplace can derive a value and focus investors' minds on the sustainability strategies of the companies and institutions in which they invest across the globe. The usefulness of carbon credits depends on liquidity and consistent price generation in the markets on which they are traded, which in turn depends on reliable and consistent data, taxonomies, and benchmarks. GSMI has set out concrete steps to accelerate and scale up the development of these markets as the axis for generating liquidity, pricing, data, taxonomies, and benchmarks — ultimately achieving real and swift mitigation of climate change.