VOLUNTARY CARBON MARKET LANDSCAPE GUIDE

AUGUST 2023

Introduction

We have until 2050 to stabilize the global climate. To achieve this goal, we need to reduce our greenhouse gas emissions (GHGs) by 420 gigatons annually and remove 10-13 gigatons of historic emissions annually (Source: RMI, How to Build A Trusted Voluntary Carbon Market). The Voluntary Carbon Market (VCM) – a market mechanism that enables private parties to buy, sell, and invest in carbon credits tied to avoided, reduced, or removed GHG emissions – has the potential to align the incentives, allocate the finance, and build the institutions required to stabilize the climate at the required speed and scale. However, for a myriad of reasons addressed in this Landscape Guide, the market is struggling to reach its transformative potential.

The VCM emerged as a reaction to the 1997 Kyoto Protocol's top-down international carbon trading mechanism and became the more informal, alternative trading mechanism. Over time, it evolved as a range of actors stepped in to shape different parts of the value chain: to pilot new methodologies, build ratings agencies, deploy new technologies, or serve as verification bodies. These voluntary actions give the VCM a dynamism and complexity that reflect both its tremendous potential to finance the required climate transition and its structural and governance limitations.

As a strictly voluntary market, no single entity is responsible for instilling accountability, establishing priorities, defining standards, settling complicated debates, or mandating information disclosure. Each participant's actions shape the market, and all challenges and responsibilities can be redirected. The result is a set of norms-enforced processes that rely on the actions of a loosely-connected set of actors who are struggling with how to define, measure, and verify carbon credits in a transparent, efficient, accurate, and reliable manner. To reach its full potential, the VCM needs to simplify its structures and strengthen two fundamental pillars: its process integrity and data integrity.

The Voluntary Carbon Market Landscape Guide unpacks the core challenges, interconnections, and innovations surrounding these two pillars. It illustrates why most data related to credit quality is currently subjective; how this has resulted in quality claims being mostly determined by process compliance and vetted in an uncertain landscape for buyers; and how innovations in digital technologies – particularly when paired with other process changes – will be instrumental in building a transformative VCM. It concludes with the levers and building blocks required to build a dynamic VCM capable of catalyzing global decarbonization.

Specifically, the Landscape Guide finds:

1. Two core pillars – **process integrity and data integrity** – determine the **identification, verification, and valuation** of carbon credits **based on their climate performance.**

2. **All credits depend on both objective and subjective data** – the integrity of **which is complicated by**: measurement uncertainty, subjectivity, opacity, and a lack of definitive metrics.

3. Currently, **interconnected limitations negatively impact the effectiveness of process integrity**: complex local realities, centralized methodology creation, a lack of accessible data, inadequate data and quality literacy, and a lack of clear buyers' guidance.

4. On the demand side, buy-to-retire and buy-to-trade actors perform a range of critical, but overlapping, market functions.

5. During their **transaction journey, all buyers face considerable risks at each stage of the procurement process** – some of which are being tackled by digital measurement, reporting, and verification (D-MRV) and Web3 technologies.

6. **Key challenges with process and data integrity hinder accurate valuation and pricing of carbon credits**: threadbare benchmarks, information asymmetry, specialized deals, and inconsistent market signals.

7. **Market-wide structural barriers** – information asymmetry, slow evolution of certification systems, and a lack of consensus building – **affect data and process integrity** at all stages of a credit's journey.

8. **Trends across specific VCM functions** – market infrastructure and transactions, coordination and communication, accounting and MRV, and purchase and project financing – **demonstrate a balance of risk mitigation and creative problem solving.**

9. **A transformative VCM (i.e., one with robust data and process integrity) requires building and activating four levers.** These levers will better facilitate market-driven linkages between supply and demand based on credit quality.

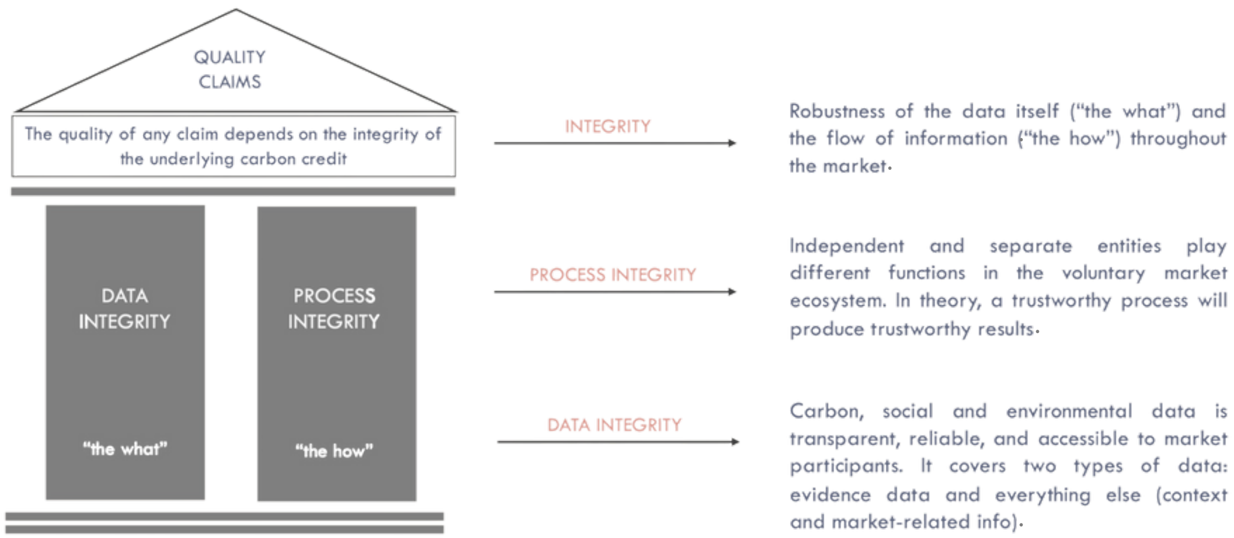
The Guide is intended to accelerate the VCM's ability to accurately and transparently develop and value carbon credits based on their climate performance. The key insights are summarized in the following pages, and more in-depth analysis and findings are discussed in the full guide attached.

Key Insights

1. Two core pillars – process integrity and data integrity – determine the identification, verification, and valuation of carbon credits based on their climate performance.

To reach its potential, the VCM must be able to accurately, transparently, and reliably value carbon credits based on their credit quality (i.e., climate performance). All credit quality is derived from the integrity of both the underlying performance data (i.e., data integrity) and the process through which it is developed, vetted, purchased, and claimed (i.e., process integrity) (see Figure 1).

Figure 1: Defining Data and Process Integrity



Neither data integrity nor process integrity are built in isolation: if the underlying data of a credit is flawed, a flawless process cannot compensate for the fundamental data shortcomings. Conversely, if a credit has near-perfect data, but the process is opaque, unreliable, or clunky, the market will struggle to connect a quality credit with buyers who are willing to pay a premium for those quality attributes. Consequently, the VCM's current struggles with effectiveness and performance are the aggregated results of – and interactions between – the flaws, strengths, and gaps of data integrity and process integrity.

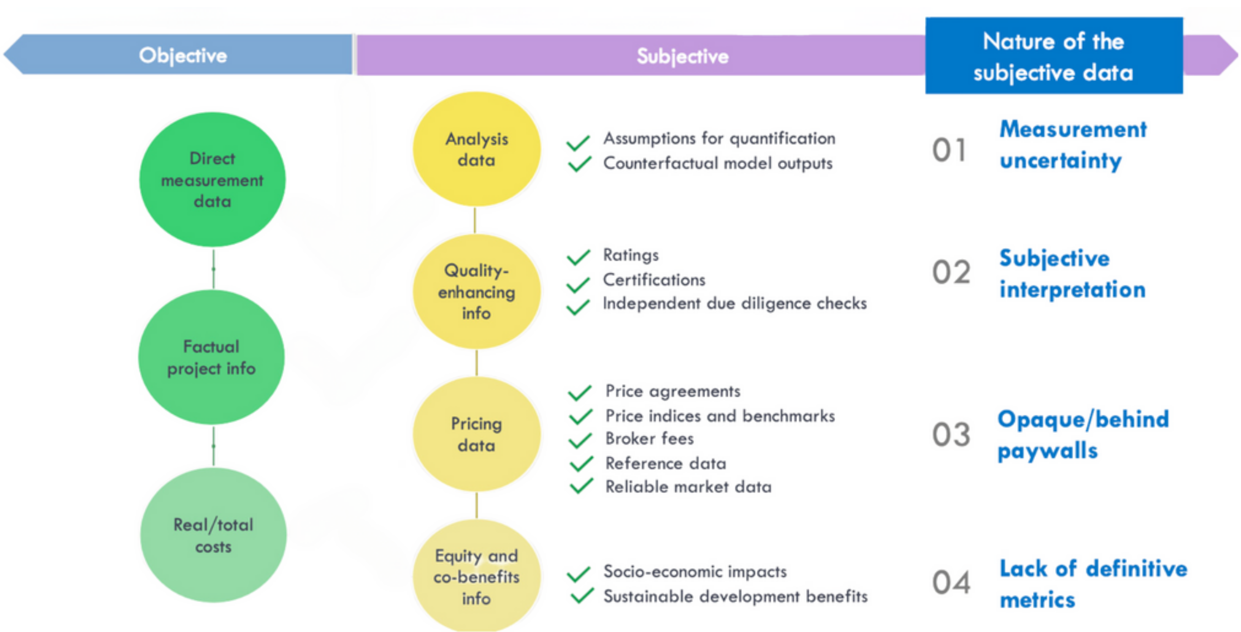
The Landscape Guide explores how data integrity and process integrity shape nearly all aspects of the VCM. It defines the current state of play of both data integrity (slides 28-40) and process integrity (slides 41-67). It examines how buyer interactions (slides

68-84), the transaction landscape (slides 85-87), and industry-shaping guidance (slides 88-102) are affected by entrenched data and process issues. It explores how D-MRV and Web3 technologies are simultaneously introducing critical innovations (slides 58-63, 103-108, and 119-127) and facing constraints with the current limitations of these pillars (slides 58-63).

The Landscape Guide goes searching for an explanation of how prices are set in the VCM and explains how price opaqueness links back to these foundational pillars (slides 109-117). The Guide concludes by identifying the four levers that need to be built and embedded to improve the integrity of each pillar, and ultimately unite them (slides 119-127).

2. All credits depend on both objective and subjective data – the integrity of which is complicated by: measurement uncertainty, subjectivity, opacity, and a lack of definitive metrics.

Figure 2: Anatomy of a Carbon Credit and the Four Challenges with Subjective Data



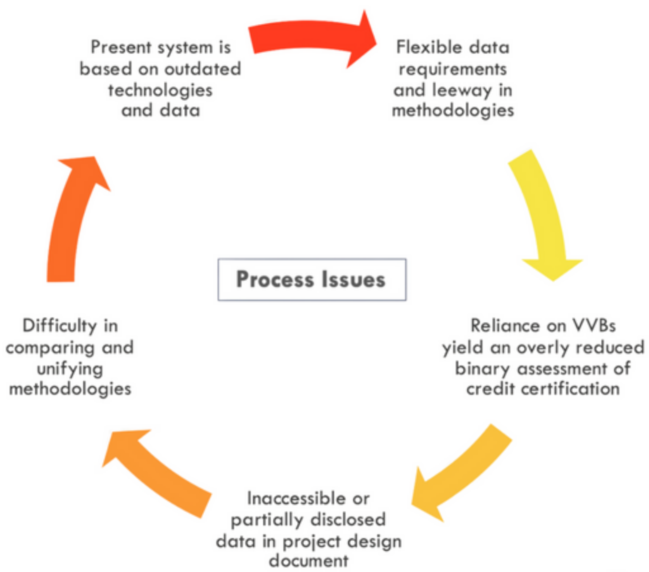
In the current VCM, data integrity is foundational to the market's performance and is riddled with complex data issues. While data integrity is comprised of evidence data (i.e., the data that directly relates to a credit's climate performance) and all other types of data (i.e. market data or qualitative assessments of quality and co-benefits), both categories rely on raw data that is either objective or subjective. Subjective data is a huge issue in today's VCM: it shapes all categories of data but is constrained by four entrenched data challenges (see Figure 2).

These complex data issues (unpacked on slides 28-40) weaken existing process integrity (slides 47-57). As a measure of how the market needs to shift, nearly all the innovations aimed at strengthening data integrity (slides 58-63) are aimed at either reducing the uncertainties and scope of these structural barriers, or making currently subjective data more objective. For example, digital and Web3 technologies are emerging through the data value chain to improve the types and amounts of raw data that feeds into the measurement, reporting, and verification of carbon credits.

3. Currently, the effectiveness of process integrity is negatively impacted by five interconnected limitations.

The existing credit certification system, a key feature of the process integrity pillar, was designed before satellite and remote sensing technologies or blockchain were widely available. Process integrity is built on the philosophy that organizational independence minimizes conflicts of interest, thus creating a trustworthy process whose results are reliable and reflect a balance between methodological rigor and data flexibility. Despite these aspirations, the VCM continues to struggle with inconsistencies, conflicts of interest, and a lack of transparency as highlighted in the five points (see Figure 3).

Figure 3: Five Cyclical Pain Points Limiting Process Integrity

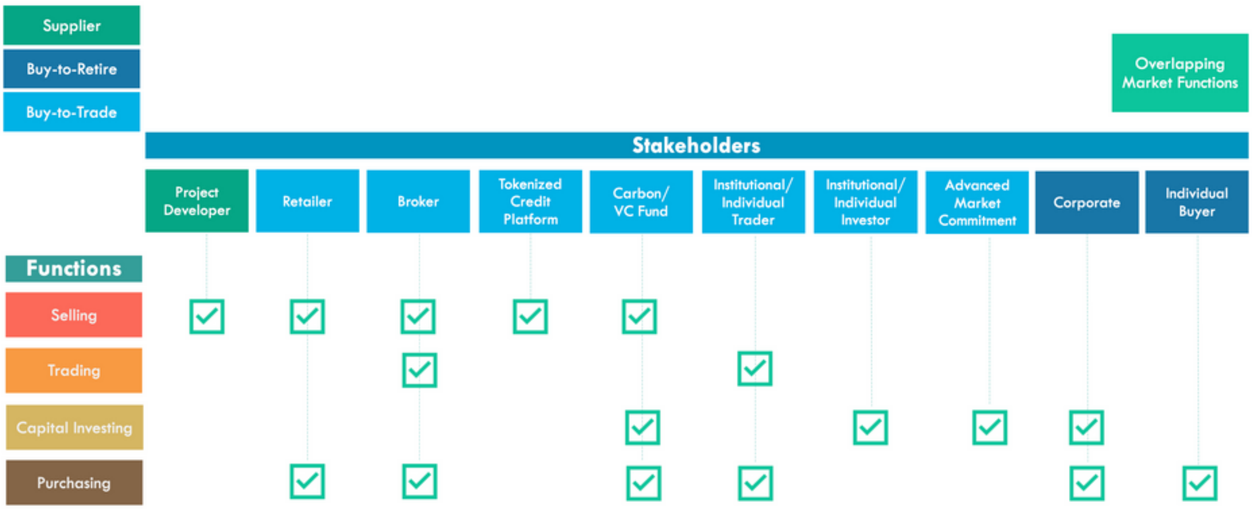


The Landscape Guide provides a deep dive into the current certification system (slides 41-67). It highlights the two central processes for quality control: methodology creation and independent verification (slides 47-57). Despite recent improvements, process integrity will only ever be as strong as its accompanying data integrity. Fortunately, Web3 and D-MRV technologies are playing an increasingly pivotal role in improving how data is collected, stored, produced, processed, and contextualized (slide 58-63). The Landscape Guide concludes with detailed steps on how to strengthen, then merge, process and data integrity (slides 64-67).

4. On the demand side, buy-to-retire and buy-to-trade actors perform a range of critical, but overlapping, market functions.

In the VCM, buy-to-trade actors (i.e., those who buy credits to trade them for a financial gain) and buy-to-retire actors (i.e., those who buy credits to claim the related environmental benefits) shape all market activity. Both buyers play critical, but overlapping, roles in financing and facilitating market interactions. For example, most buyers engage in purchasing (i.e., buying readily available credits), while only corporates and specialized buy-to-trade actors engage in capital investing (i.e., offtake agreements for customized delivery of credits) (see Figure 4).

Figure 4: Functions of Buy-to-Retire and Buy-to-Trade Actors



Due to these overlapping roles and motivations, the buyers' landscape can appear fractured and opaque (see slides 75-84). Specifically, buy-to-trade actors such as retailers, brokers, and institutional traders (i.e., trading desks at investment banks) aim to profit by purchasing credits at a lower price than they ultimately sell them. They typically do not get directly involved in project development or capital investing.

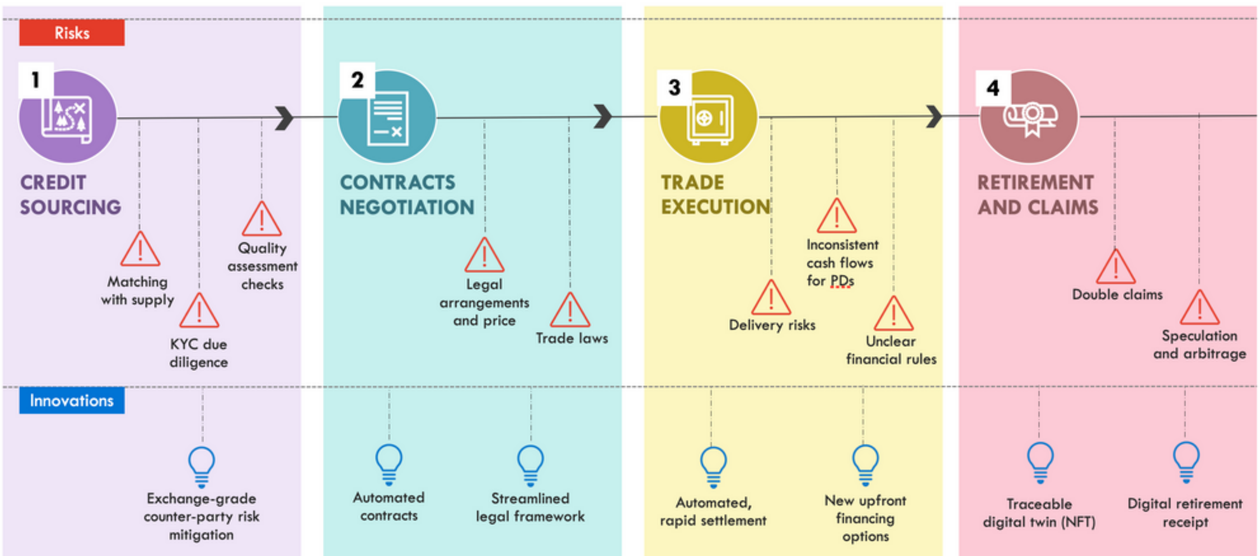
Buy-to-retire actors are either individuals who mainly purchase readily available credits or corporates who purchase credits, either as they become available on the market or through capital investing. Most Advanced Market Commitments (AMCs) or carbon funds and venture capital (VC) funds are built through a consortium of corporate buyers, who pool their resources and leverage their combined purchasing power to negotiate contracts for specific technologies or customize credit purchases (usually offtake agreements). These funds play an outsized role in shaping market activity: they provide critical, up-front financing to project developers and are one of the few concrete demand signals for technologies to scale (see slides 75-84).

5. During the transaction journey, all buyers face considerable risks – some of which are being addressed by D-MRV and Web3 technologies.

Regardless of their initial motivations, once buyers move to procure credits, they all face a complicated transaction landscape (slides 85-92) and significant uncertainty about how carbon credits can or should fit into an overarching net-zero strategy (slides 93-103). Specifically, at each stage of the transaction process, from credit sourcing to retirement, buyers must navigate a unique set of risks, incomplete information, and specific processes, all of which increase transaction costs for buyers (see Figure 5).

Fortunately, streamlining transaction processes is a task well suited to the capabilities of digital and Web3 technologies, and one where many tech-based innovations are breaking through. For example, the VCM is seeing the rapid emergence of decentralized trading platforms, which can transparently store large volumes of information about a credit's history and climate performance. Similarly, new digital and Web3 service innovations are improving the accessibility and traceability of credits, streamlining operations and contracting needs, reducing transaction costs, and providing risk mitigation services at each stage of the transaction process (slides 79-86 and 103-108 in the Landscape Guide).

Figure 5: Risks in the Transaction Journey for Buyers



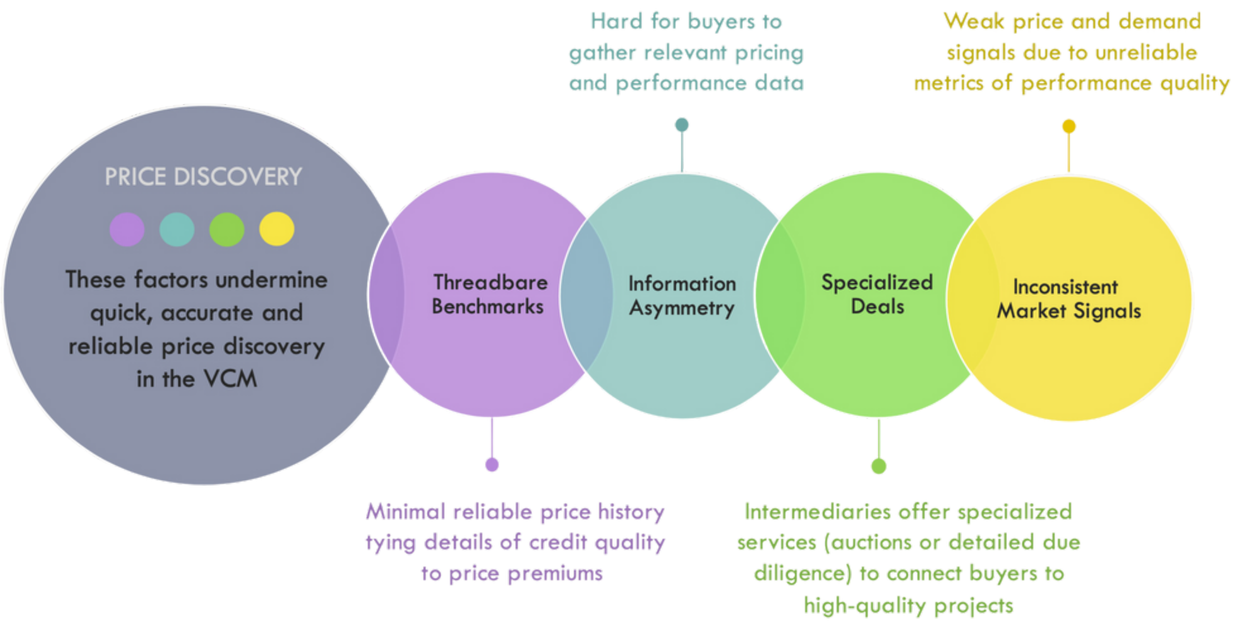
6. Key challenges with current process and data integrity hinder accurate valuation and pricing of carbon credits.

In today's VCM, prices do not serve their typical market function of providing a transparent, objective, and reliable metric of product quality, or even of buyers' preferences, due to four limitations (see Figure 6).

The raw data that underpins a credit's climate impact is neither transparent nor easily replicable. As a result, prices are opaque and largely disconnected from the credit's climate performance, costs of being brought to market, and/or prior transaction history (see slides 109-117 in the Landscape Guide).

Too often, the specifics about prices paid for credits or contracts remain either behind paywalls or kept proprietary to brokers and the growing number of intermediaries. This indicates that market fragmentation is incentivizing entities to profit from information asymmetry and cement the market's reliance on 'over the counter' (OTC) services rather than developing, surfacing, and selling higher quality credits based on a premium for the credit's unique climate and equity attributes (see slides 109-117).

Figure 6: The Four Challenges Hindering Efficient and Accurate Price Discovery



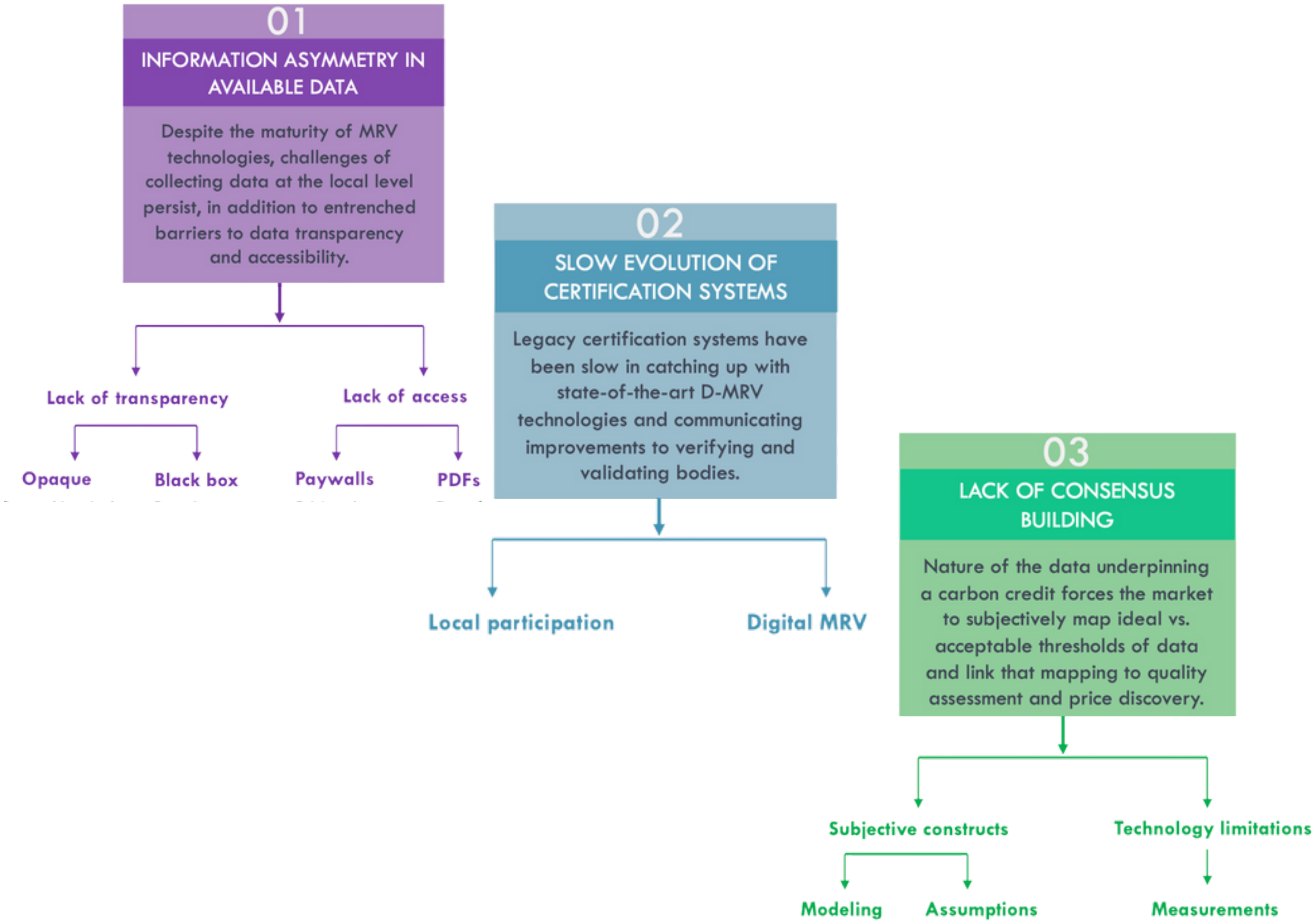
7. Market-wide structural barriers affect data and process integrity at all stages of a credit's journey.

The various limitations with process and data integrity impact nearly every stage of a credit's journey, from origination to retirement (see Figure 7). The Landscape Guide (slides 119-122) examines the three structural barriers (information asymmetry in available data, the slow evolution of certification systems, and a lack of consensus on the definition of quality) driving these limitations, and traces how these structural barriers hinder nearly every step of a credit's journey.

For example, information asymmetry undermines both data integrity – as proprietary models are instrumental to many assessments and ratings of evidence data – and process integrity – where these same models function like a black box in the processes created to certify, verify, and rate the credit's climate performance (see Figure 7 and slides 119-122 in the Landscape Guide). Similar dynamics play out across the slow evolution of certification systems and the market's inability to build consensus around the definition of credit quality.

Without agreement on fundamental issues like these, the VCM will continue to struggle in its efforts to attract more buyers and demonstrate stronger climate impact. However, the tools and technologies needed to reduce these barriers are beginning to emerge and be implemented (see Insights 8 and 9).

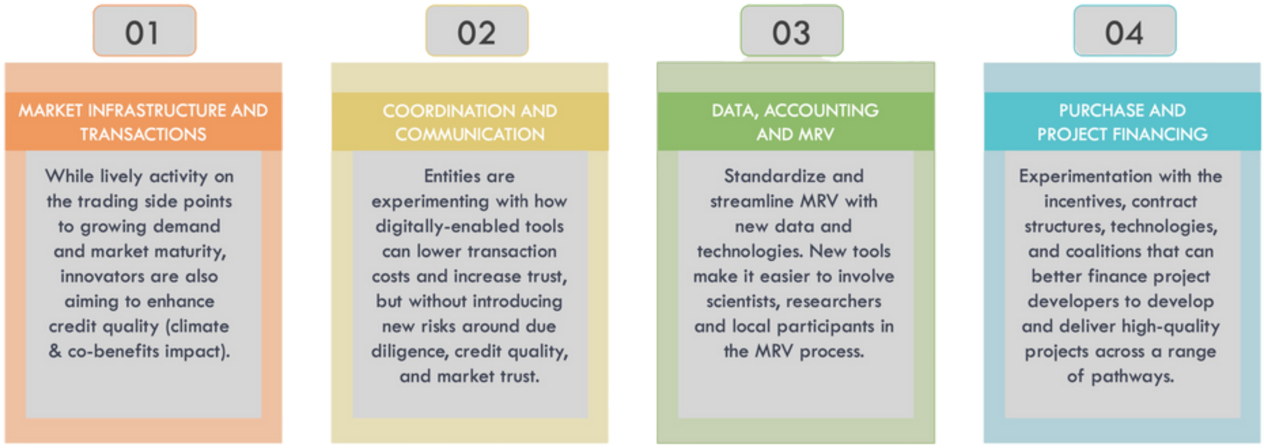
Figure 7: Three Market-wide Structural Barriers Undermining Process & Data Integrity



8. Trends are showing a balance of risk mitigation and creative problem solving to move the VCM forward.

A recent influx of new entrants, technologies, and finance has propelled four core VCM functions into new phases of dynamic iteration, innovation, and growth (see Figure 8). Digital and Web3 technologies are enabling many of these innovations (see the previous insights and slides 118-127 in the Landscape Guide).

Figure 8: Balancing Risk Mitigation and Creative Problem Solving Across Four Market Functions



For example, numerous start-ups are leveraging Web3 technologies to integrate smart contracts, transparent and interconnected registries, and decentralized data collection and storage tools into multiple stages of the credit journey. These technologies are helping to streamline market transactions, enhance market coordination and communication, augment available MRV processes, and encourage experimentation with more appropriate financing mechanisms.

9. A transformative VCM requires building and activating levers that will inform the creation of robust pillars for data integrity and process integrity.

The Landscape Guide delineates how the VCM's current structural barriers can be overcome and builds the case for four levers that, once built, integrated, and scaled, will simultaneously strengthen and merge data and process integrity to build a more accurate and dynamic VCM centered on carbon credit quality (see slides 118-127).

These four levers cover both the supply and demand sides of the market:

1. **The supply and demand sides need to reach consensus on credit quality.** The supply side needs to focus on defining thresholds for data quality that are based on available technological capabilities and measurement limitations. On the demand side, corporate guidance will play a critical role in more consistently pointing buyers to high-quality credits.

2. **Certification bodies need to promptly integrate technological advancements, especially remote sensing and Web3 technologies, into their data value chains** (i.e., how data is collected, stored, produced, processed, and contextualized). Remote sensing, Web3 technologies, machine learning, and artificial intelligence are driving key innovations and showing the most promise to add value at various stages of the data value chain.

3. **Certifiers need to** ensure that methodology creation, verification, and validation processes **adhere to best practices for expert review and independence.**

4. **The VCM** – with these first three levers – **needs to converge around, and build up, a governance model that can transparently surface the market's inherent** limitations and complexities. This requires a market- and climate-aligned resolution, and a commitment to continually iterate on, and integrate improvements in, data collection, management, and verification technologies and processes.

Conclusion

The VCM is in a critical stage of evolution and must resolve structural process and data integrity issues before it can fulfill its potential as a critical financing mechanism for stabilizing the global climate before 2050. These structural issues around data and process integrity are hindering the VCM's ability to align on a definition of credit quality and subsequently send appropriate price signals based on a credit's climate and co-benefit performance. Fortunately, a growing volume of digital MRV and Web3-based technologies that can resolve some of the critical issues on data and process integrity are being developed, integrated, and deployed throughout the VCM. The continued integration of digital tools with complementary market levers will strengthen data and process integrity, thus driving consensus on credit quality and acceptable use. Once constructed, these building blocks can catapult the VCM to its full potential to deliver climate solutions at scale.

About the Authors

RMI is an independent nonprofit that transforms global energy systems through market-driven solutions to align with a 1.5°C future.

Climate Collective is a leading coalition of stakeholders leveraging digital infrastructure to unlock verifiable climate action at scale.

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