



The Good Is Never Perfect: Why the Current Flaws of Voluntary Carbon Markets Are Services, Not Barriers to Successful Climate Change Action

Oliver Miltenberger^{1,2,3*}, Christophe Jospe² and James Pittman⁴

¹ Climate and Energy College, The University of Melbourne, Melbourne, VIC, Australia, ² Carbon A List, Research Division, Hotchkiss, CO, United States, ³ Department of Environmental Science, Policy, and Management, University of California, Berkeley, Berkeley, CA, United States, ⁴ Regen Network, San Francisco, CA, United States

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*Correspondence:

Oliver Miltenberger
omiltenberge@student.unimelb.edu.au;
ormiltenberger@berkeley.edu

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The world's current level of climate change action does not match its ambitions to tackle the issue, and its ambitions do not currently meet the levels of action science recommends. Voluntary carbon markets (VCMs) are one option proposed to lessen those disparities, and have been both criticized and championed by various groups. Critiques note them as being opaque, flawed, and ineffective. Yet they demonstrate tremendous potential for impact and unprecedented levels of finance. We contend that the critiques of these markets are not only resolvable, but are unavoidable challenges that must be addressed on the path to mobilizing climate change ambition and achieving targets. Furthermore, we believe that by 2050, the current discrete market-based solutions in climate action will become internalized aspects of our economies rather than separate remediations. This goal of internalizing the externalities that cause climate change will result in massive, sustained decarbonization, rapid reorganization of global economies, and an extraordinary push to invent, solve, and scale strategies that facilitate the transition. Pricing carbon is a key contemporary step for transitioning to that future. Voluntary carbon markets are one means to catalyze this action and while needing improvements, should be given appropriate leeway to improve and fulfill that role.

Keywords: emissions trading, carbon offsets, climate change, voluntary carbon markets, climate ambition, emissions reductions, market-based instruments

INTRODUCTION

Currently, countries and non-state actors are far from achieving the climate change ambitions set by the Paris Agreement (United Nations General Assembly, 2021). To meet these goals, the International Panel on Climate Change (IPCC) recommends a dramatic scale-up of greenhouse gas (GHG) reductions and increase global GHG sinks by 2050 (IPCC, 2018). Compliance carbon markets and carbon taxes, while increasingly common, are not scaling up fast enough to match this imperative (United Nations Framework Convention on Climate Change, 2017; United Nations Environment Programme and Green Financing Facility, 2021). Voluntary carbon markets (VCMs) are an alternative market-based instrument that reward GHG offsets. Voluntary carbon markets are projected to grow 15-fold by 2030 to accommodate increased demand for climate

solutions in the private sector (Taskforce for Scaling the Voluntary Carbon Market and Final Report, 2021). Voluntary carbon markets provide financial incentives for increased climate action ambitions, developing mitigation projects, and if scaled, can facilitate significant climate action (Streck, 2021).

Voluntary carbon markets exist because there is an imperfect suite of carbon incentives to fully address GHG reductions. Due to lagging regulatory actions, and an interest to remain unregulated, corporate players are increasingly leading in climate action through pledges in VCMs that meet or exceed the analogous mandates of compliance markets. However, there are a number of issues and critiques concerning the design, function, and scale-up of VCMs (Blum, 2020). Critiques span from popular misunderstanding of carbon market economics, to fundamental flaws in their arrangements and implementation. We will discuss several of the most common critiques, clarify the issues of most concern, and offer insight around their solutions.

Beyond these insights, we posit two key perspectives in response to all such critiques. First, the urgency for large-scale climate action outweighs the risk of VCM flaws which can be corrected on an *ad hoc* basis. Secondly, we contend that, if global responses to climate change are effective, by 2050 these critiques will no longer be a concern—carbon markets will largely no longer exist. Instead, incentives related to GHG emissions reductions and removals will be fully internalized by economic activities with GHG accounting and integrated in all aspects of production and service, making carbon prices fully incorporated into all market prices.

Acknowledging obvious shortcomings, we contend that VCMs are a necessary sandbox for innovation as well as a mechanism to bridge the divide between current challenges and a GHG conscious economy of the future. We assert that current marketplaces should be reimagined as wellsprings of problem-solving and catalytic capital rather than instruments to be overly-disparaged, or abandoned. In this paper, we find the common problems of VCMs to be integral as problems of climate change action generally, and as such, represent the opportunity to solve those needs. Beyond addressing past and present issues, we call for governance frameworks that support integrated, interoperable, and inclusive economies and offer a clear understanding for what is mute, needs immediate attention, and what requires room to grow. Ultimately, we believe efforts in the VCM space will lead to economies free of external mechanisms that address climate-change and facilitate regenerative environments.

VOLUNTARY CARBON MARKET CRITIQUES

The following sections identify, clarify, and offer critical perspectives for several of the most relevant VCM critiques. We broadly group them into VCM issues of: *use, economics, implementation, and social impacts*.

Issues of Use Greenwashing

Greenwashing happens when companies seek to appear as if they are making a greater contribution to environmentalism than the true impact of their actions (Laufer, 2003). To outsiders and some within the space, VCMs are critiqued as enabling this in climate action, resulting in actions indiscernible from business-as-usual or are simply a way of paying for a right-to-pollute (Monbiot, 2006). For instance, groups such as CDM-Watch, a UN watchdog group for the use of carbon credits and SEI, a climate policy think-tank, cite examples of false energy-efficiencies being claimed by coal-plants and alarming rates of ineffective credits being used to offset corporate emissions (Lazarus, 2016).

However, greenwashing can be mitigated through greater transparency from both VCM operators and credit purchasers. Public reporting of GHG accounting and receipts that link origin of the credit to the emissions being mitigated will uncut greenwashing significantly (Yang et al., 2020). Oversight bodies are beginning to address these issues (Taskforce for Scaling the Voluntary Carbon Market and Final Report, 2021) and the increasing demand for a social license to operate points toward progress. These concerns can be further assuaged through public pressure, shareholder initiatives, divestment, investment mandates, fines, and watchdog organizations.

Carbon Accounting

Net-zero claims are often accomplished through use of VCM offsets to balance unavoidable emissions. Recently publicized net-zero ambitions have created unmet and sometimes unrealistic demand for offsets, exposing them to misuse (Rogelj et al., 2021). For instance, the number of claims for offsetting emissions is simply unrealistic given ecosystem constraints—not every major emitter can plant a trillion trees (Kalesnik et al., 2020). Net-zero ambitions should therefore have disclosure requirements and be audited to legitimize or rate likelihood of their success.

Double counting is another example of misuse that occurs when two or more entities claim the same offset. This can happen intentionally, but is also emergent from the absence of consistent or complete accounting protocols and a lack of alignment between market jurisdictions or operators. This lack of coordinated standardization allows for claims to be made without clear means to judge their feasibility or quality (Schneider et al., 2019).

Further progress to resolve these concerns will require adoption of standardized nested accounting, and protocols for interoperability across accounting scales and systems such as between corporate net-zero accounting and reporting Nationally Determined Contributions under the Paris Agreement. This is an active area of innovation in policy and technology with momentum to establish a global framework accommodating diverse market arrangements (Wainstein, 2020).

Issues of Economics Market Failures and Inefficiencies

Climate change impacts represent a market failure that yet lacks a financial incentive for change. A common industry

critique of legislated carbon markets is the risk of excessively or unfairly burdening product and service markets with compliance costs. Historically, evidence is unresponsive for industries and businesses that voluntarily take action to mitigate an environmental impact without an incentive mechanism (Jaffe et al., 2005). Voluntary carbon markets may be one of the first clear examples, and resultantly instigate a quicker, wider participation in fixing the underlying market failure. However, given their voluntary nature it is unlikely VCMs would exist without the prior establishment of compliance markets initiating action to mitigate GHG emissions.

Another market economics critique is that all markets, no matter how well-designed, will always contain intrinsic flaws and externalities. It is true that real-world markets, regulated or voluntary, tend not to function in accordance with the theoretical conditions of economic science (Cullenward and Victor, 2020). Regardless, given the political palatability of carbon markets over taxes and sheer difficulty of negotiating alternative solutions at a moment requiring urgent and expedient action, we contend it is best to proceed with carbon markets despite inefficiencies, and refine over time to correct for key issues of concern.

Within market operations, critics note that voluntary offset markets in particular create excess supply and distorted prices that interfere with the effectiveness of compliance markets (World Bank Group, 2019). There is some potential validity to this concern in initial carbon market creation. However, as mentioned above, addressing interoperability will eventually placate this issue. More concerning is the significant risks of initial emissions baseline misreporting, as a means to create artificial emissions reductions and increase appearance of performance impact. Many of the dynamics giving rise to this concern are likely to be less significant over time as carbon markets mature and reporting normalizes over time.

Clearly due to the inherent limitations of human nature and economics carbon markets will fail to resolve all, or may even create new, patterns of market failure. However, with these significant areas of risk, the negative impacts of all the economic cases above are not likely to exceed the potential of net-benefit when comparing further delayed climate change intervention. Simply put, the existence of carbon markets is better from an environmental, social, and economic standpoint than the absence of any emissions reduction incentive mechanism.

Issues of Implementation

Monitoring, Reporting, and Verifying

Most VCM projects must evaluate, register, validate, monitor, report, and verify their outcomes in often dynamic and differing contexts (United Nation Framework Convention on Climate Change, 2021). It is a time and resource intensive process that represents a significant capacity and cost burden to project development. In some cases, the costs of these activities can constitute a majority of the market value of a carbon credit, reducing the incentive for implementation.

Requirements for monitoring and reporting are also complex and inconsistent across markets and project types. Data collection is tedious and idiomatic for verifying VCM project impacts. Managing these requirements, especially in regards to

interoperability of markets, presents a high hurdle for validation, and verification of reporting (Knox-Hayes et al., 2020).

Technological breakthroughs in the availability and quality of remotely sensed data via satellite imagery, drones, laser-detecting devices (LiDAR) and proliferation of *in-situ* devices utilizing the internet of things (IoT) as well as machine learning and artificial intelligence analytics offer innovations that will decrease development costs while increasing the rigor and reach of verifiable impacts (Xiao et al., 2019). Over time, these advancements will enable smaller and more diverse projects to participate in market benefits and steer toward best practices. This will not only result in more trustworthy markets, but enable the scale-up climate mitigation activities. Infrastructure for high-resolution, temporal monitoring of the environment will also provide metrics that can serve decision-making in investment and finance, ecosystem management, and policy and regulation.

Additionality and Baselines

An outcome is *additional* if it would not have occurred without intervention. Activity-based additionality is the benchmark that desired changes in GHG stocks would not have occurred without purposeful intervention. This type of additionality is often the first test of eligibility for a VCM project. Financial-based additionality is slightly different. It presents further complexity and controversy by requiring that the emissions outcome would not have occurred without access to the financial return from the VCM project. The Paris Agreement and wider VCM stakeholders acknowledges these VCM criticisms are exemplified and needing redress (Michaelowa et al., 2019).

While there is a clear need for technical assessment of practice-based additionality relative to baselines, financial additionality is difficult to prove and does not have clear consensus for project implications (Michaelowa et al., 2019). Practice based additionality is the norm in VCMs, however, there should be added focus on funding projects through multiple streams as to avoid the confounding potential of financial additionality.

A baseline is the estimation of pre-intervention system measurements and business-as-usual projections. Baselines that estimate discrete GHG stocks for a project are known as static. Dynamic baselines alternatively account for natural environmental fluctuations and risks due to extreme weather or drought events (Greenhouse Gas Protocol, 2003). Assessment of baselines and additionality must also distinguish between projects that remove carbon from the atmosphere from those that avoid the release of carbon to the atmosphere. Carbon removal projects, such as natural climate solutions through expansion of biotic sinks, are broadly considered less contentious than avoidance markets (Gillenwater, 2012). Carbon removal projects utilize inherently subjective baselines and more assumptive estimations to determine impact.

This also calls to question risk of reversal such as through disturbance events, change of ownership or policy, or altered market dynamics. Buffer pools and thorough due diligence throughout project duration as well as establishment of organizing bodies and technological advances will help to mitigate these risks.

Permanence

Permanence in carbon markets refers to the assurance that carbon will remain in a stock for a long period of time, usually 30–100 years. Different VCM protocol and methodology administrators have built systems to balance technical requirements with the practical constraints of insuring against reversals (Offset Guide, 2021). Scientifically, anything short of guaranteed long-term immobilization of carbon is not possible without burdensome and complex legal and administrative maneuvers by market administrators and government agencies.

Since VCMs are a bridge incentive mechanism to internalizing an externality, the concept of permanence should be revisited. Voluntary carbon markets present an opportunity to protect and expand carbon sinks, incentivize low or negative carbon production, and increase the flow of carbon from the atmosphere to short term and durable stocks—even in cases with shorter term permanence.

A land-based system that transitions to a new management regime that is reasonable to continue for even as little as 10–15 years that results in retaining and removing carbon can provide significant value to the atmosphere and to a buyer in a VCM. It should not be required that VCM project developers seek administrative maneuverings or questionable or eccentric science to prove 100 years of permanence (Ruseva et al., 2020).

Issues of Social Impact

Stakeholder Inclusion and Inequity

Voluntary carbon markets, especially in nature-based projects, affect socio-economic, and environmental systems beyond the activities that directly produce carbon credits. If not stakeholders are not appropriately included in the design process, these projects can be at risk of disenfranchising local livelihoods and creating perverse economic incentives (McDermott et al., 2013). This stakeholder neglect is documented through diverse unintended consequences and lasting distrust for VCM projects (Morrow et al., 2020). For example, in some early project-based REDD+ projects, the financialized carbon benefits resulted in local communities restricted from access to their traditional land and livelihoods, echoing a neo-colonial model of land use that benefits developed nations' interests to the detriment of disadvantaged local communities (Beymer-Farris and Bassett, 2012).

In response, many standards now offer standalone certifications or additional eligibility requirements for stakeholder inclusions, such as Verra's Climate, Community, and Biodiversity program or in PlanVivo or GoldStandards' validation criteria. These added guardrails have shown higher willingness to pay indicating both VCMs are capable of self-correction and these inclusions are desirable to the marketplace (Forest Trends' Ecosystem Marketplace, 2021). Moreover, clear regulation on rights and ownership of credits needs to be developed at national and sub-national levels. This is a process currently taking place, but in need of further support (Streck, 2020). Continued adaptation of VCM standards and mechanisms to correct inequities is essential to durable VCM outcomes and requires wide community engagement in the design and management of a projects.

DISCUSSION

The issue VCMs attempt to solve is quintessentially a tragedy of the commons dilemma wherein atmospheric space for GHGs has been overexploited. To address the critiques of VCMs, we should look to governance frameworks for management of common pool resources (CPRs) (Ostrom, 1997). Community managed CPRs given enough buy-in will actually avoid over-exploitation and calibrate to desirable as well as sustainable management outcomes (Ostrom, 2003, 2014). The structure and operation of VCMs should reflect this framework to identify best practices based on local VCM circumstances and enforce restrictions based on large-scale CPR needs such as through capping emissions. Wider inclusion of stakeholders, adaptive management, and fairly allocating cost-benefits will ultimately serve both global economic outcomes and transform VCMs from market arrangements that abstracts GHG values to resource management that integrates their value.

Technological developments will play a crucial role. Though some technologies are deployed in advanced stages in service to VCMs, further innovation and integration is necessary to scale impacts and improve trust. Given their explosive interest as tool for climate action and diverse arrangements, VCMs provide a unique sandbox for innovating and refining technological products that serve climate action. Continued development will widen bottlenecks and mediate criticisms in VCMs and improve the science of earth system management.

Rather than impairing or foregoing use of VCMs, we envision these critiques as pointed opportunities to reimagine and invigorate the way we steward our CPRs, and offer not a final solution, but a necessary stepping stone to the goals of climate action. While acknowledging them as only one tool in this endeavor as well as their shortcomings, VCMs nevertheless represent a pathway that encourages better characterization, standardization, and decision support for all climate actions, ultimately strengthening social systems that function alongside climate interventions.

The Future

We view the problems presented to be solutions in wait. The precision, thoughtfulness, and widespread understanding of VCM critiques is indicative of the need for these market-based solutions to climate change to be successful. The role of VCMs and the transition away from them we describe is back-casting perspective and posits that VCMs are not the right nor only tool, but a tool needed today for climate action success 30 years from now.

In that future, there will be little to no need for carbon markets, voluntary or regulated, and taxes and policy, as disincentive mechanisms, will have mostly corrected externalities of GHG emissions. Avoidance of GHG emissions and incentive to maintain GHG sinks will be integrated into the global exchange of goods and services at all scales and in all domains. No part of the economy will go unchanged, and no product or service prices will exclude the cost of that abatement. Voluntary carbon markets are a foray into the infrastructure and R&D of this transition that provides a platform to scope, prime, and initialize solutions

to the issues of climate change with increased participation and investability in those actions.

As interests and investments continue to scale, many current VCM issues concerning transparency, manipulation, additionality, permanence, monitoring and reporting bottlenecks, friction, and transaction costs, will be made insignificant if not irrelevant due to the deluge of innovation and market participation we see in the space today. From this optimistic and back-casted perspective, the flaws of VCMs today are simply the growing pains of a maturing set of means to address the climate crisis. What seems unsolvable and unacceptable now will undoubtedly and, indeed, imperatively produce a net benefit for our climate, environment, and society. However, we simultaneously highlight the absolute need to approach VCM development with unshakably high-standards, a directive to adapt and improve wide stakeholder participation, and a clear-eyed vision permissive of current worries.

With this in mind, it is important to resolve key flaws in siloed VCM operations, avoid the creation of additional market failures, and mandate progress in social justice, equity, and the preservation of robust ecosystem services across all climate action developments. Opportunities to realize and empower these successes lay in the fertile space of VCMs.

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DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

OM developed the organizational structure, led proofing, and prepared the manuscript for submission. CJ served as architect for subject matter inclusion and convened the group, including those mentioned in acknowledgments. JP led task management and provided technical and economic fact-checking. All authors shared responsibilities in idea origination, refinement, writing, editing, and narrative development.

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