The Global Voluntary Carbon Market: Dealing with the Problem of Historic Credits

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Main authors:	Guy Turner	CEO, Trove Research
	Harry Grocott	Associate, Trove Research
Academic contributors:	Mark Maslin	Professor, Geography Dept, UCL
	Simon Lewis	Professor, Geography Dept, UCL

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Executive summary (1 of 3)

The growing number of corporate climate commitments has prompted renewed interest in carbon offsets. Today over 1,000 firms have made either indicative or concrete pledges to align their emissions with the Paris Agreement – which means reducing emissions to zero by 2050. For many firms, achieving this aim will require the use of carbon offsets at some point. Other firms have made pledges to go carbon neutral and offset all their emissions today.

The carbon offsetting concept depends on the environmental rigour of the credits – specifically whether money paid for the offsets is used to reduce emissions (or capture emissions from the atmosphere) beyond levels that would have otherwise occurred. This is a simple distinction but is difficult to implement consistently in practice. Methodologies and standards for defining carbon offsets, and the rigour with which the standards are enforced, have evolved and improved over time.

A challenge of this evolving landscape is that older projects that were registered in previous eras with poorer quality controls have continued to issue credits, and the volume of legacy credits in the system is now very sizable in relation to demand. Although in principle historic credits may have some legitimacy, in practice they risk swamping the market and undermining well-intentioned efforts to invest in genuine emission reductions. Moreover, if the vast quantity of Clean Development Mechanism (CDM) credits created under the Kyoto Protocol remain valid for country-level compliance,* the intentions of governments to genuinely reduce emissions under the Paris Agreement will be greatly threatened.

This study examines in detail the volume of these legacy credits in the system and suggests ways forward for managing this surplus. Specifically, we find:

1. There are some 360 million tonnes of carbon dioxide equivalent (MtCO2e) of surplus credits currently in all the main voluntary carbon offset registries (cumulative issued credits less the volume retired and cancelled for compliance purposes in the California cap and trade scheme). **This represents 2.6 times the current level of combined voluntary and compliance demand for carbon offsetting of 138 MtCO2e in 2020.**
2. **The surplus is still increasing.** In 2020 a little over 200 Mt of credits were issued, compared to 138Mt retired and cancelled, adding more than 60 MtCO2e to the surplus.
3. The potential for projects to back-issue even more credits is even greater. We estimate that the total surplus in the voluntary carbon registries could amount to 700 -1,000 Mt. **This would represent 5 – 7 times the current annual demand.**
4. The potential volume of accumulated carbon credits in the CDM is even greater. Many of these credits have more dubious claims of environmental additionality. If all registered CDM projects elected to have their carbon credits verified for the previous decade they would produce a total additional volume of nearly 7,000 MtCO2e. This would represent 50 – 60 times current annual demand. **If allowed into the voluntary market, these CDM credits would effectively make the voluntary market redundant as a mechanism to reduce global carbon emissions.**

** The CDM was due to close at the end of 2020 but discussions are ongoing between governments on an extension to the scheme after 2020.*

Executive summary (2 of 3)

Carbon credits issued from older projects are, on average, less likely to meet today's tests of environmental integrity.[1] The challenge is how to manage these legacy credits without disincentivising future, well-intentioned private capital.

We suggest three potential routes:

1. Registry-led. Given the important role of registries, it might be possible for these organisations to clean their registries of low-quality legacy projects. An obvious difficulty is that the registries have contractual obligations to the developers who have undergone the process of registering and validating their projects and paying for credits to be issued. Nonetheless, if the consensus is strong enough, it may be possible for the registries to amend their contracts selectively, although this would likely be subject to legal approval.

2. Governance body-led. Discussions are ongoing through the Taskforce on Scaling the Voluntary Carbon Markets about the creation of an independent body that would oversee the integrity of the market. Part of this organization's role could be to decide on how to restrict the use of legacy credits. The body could coordinate opinions from across the industry and reach a consensus that serves the long-term interests of corporate buyers and carbon offsetting industry. Recommendations could be issued to registries and buyers alike.

3. Buyer-led. A consumer-led approach would be based around a drive to only buy high quality credits. Guidance could be issued by independent organisations advising buyers on the authenticity of the bought credits. The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) already restricts the use of credits from projects that commence operation after Jan, 1, 2016. Arguably even this is not stringent enough as it still contains access to a potentially large volume of low-credibility credits in the CDM regime, including energy related projects. Other initiatives are also underway to provide buyers with a rating system on the quality of projects. A drawback of a buyer-led approach is that the door is still open for buyers to use credits from less rigorous sources if they choose to do so.

Our view is that all three approaches are likely to be needed. Registries should take responsibility for cleaning up credits from older, poor-quality projects. This would require working with stakeholders to agree rules for dealing with legacy projects. The new governance body should provide guidelines, or even rules, for registries and buyers of credits a-like and set up the administrative machinery for overseeing compliance. A buy-led initiative could also be very effective in driving standards for both high ambition and the use of high-quality carbon offsets, where appropriate.

1. *Some types of early projects may still be good quality. For example, some early forest protection projects (REDD+) were set up under high standards but have taken many years to progress from idea through to implementation. This is partly due to the complexity of working in rural areas in developing countries with multiple stakeholders.*

Executive summary (3 of 3)

The schematic below shows the quality-risk typically associated with project age and type and provides a potential framework for managing surplus credits by project type and start year. Note, this is a generalized approach and does not take account of project specifics. The categorization is based on third party reports that have assessed the environmental integrity of projects in the CDM, as well as experience of the study team.[1, 2] We note that standards have improved in the voluntary carbon market, and this greater scrutiny and transparency was one reason why the voluntary market became popular for corporate carbon offsetting. We are not aware of any studies that have explicitly looked at the environmental integrity of projects in the voluntary carbon market.

We have used 2016 as an indicative cut off as this is the year chosen by CORSIA before which carbon offsets are not accepted. Other years might also be chosen, or more than one year if a rating system is used. The years refer to project start date rather than vintage of credits.

Potential framework for dealing with legacy credits

Type	Sub-type	Comment	Surplus* (MtCO2e)	Project start date: Pre 2016	2016 - 2020	Post 2020
Projects that remove CO2 from the atmosphere						
CCS	Non-EOR (Enhanced Oil Recovery)	CCS has genuine need for carbon finance. Few non-EOR CCS projects have been developed to date.	small			
Afforestation		Few afforestation projects have been started. Generally regarded as high quality.	214			
CCS	EOR	Except for projects using EOR where there is often a commercial case for the project.	19			
Projects that reduce CO2 emissions						
REDD+	Jurisdictional	No jurisdictional REDD projects have been approved prior to 2020.	-			
REDD+	Project level	Historic project-level REDD subject to leakage risk but highly project specific.	105			(*)
Renewable energy	Least-developed countries (LDCs)	Allowed in order to support expansion of renewables in smallest countries.	112			(*)
Renewable energy	Other than LDCs	Renewable-energy projects excluded on the weak additionality claims on these project types.				
Methane capture[3]		Regarded as medium-risk projects but older projects likely to have been credited under lower standards.	65			(*)
Industrial gas		Industrial-gas projects - problematic additionality claims due to perverse incentives.				
Energy efficiency		Energy-efficiency projects excluded on the weak additionality claims on these project types.	16			

Credits eligible post 2020

(*) Credits eligibility subject to improved standards

Credits ineligible post 2020

Credit eligibility subject to project specific reviews

*Surplus figures exclude 12 MtCO2e of credits categorised as "other"

Source: Trove Research analysis.

1. Eg: https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf
2. Eg: https://newclimate.org/wp-content/uploads/2017/05/summary_vulnerability_of_cdm_projects_internet1.pdf
3. *Many methane capture technologies should be covered by regulations and hence not eligible for offsets. This is particularly the case in countries other than LDCs. A growing number of countries should enhance their regulations under the Paris Agreement. Credits should only be eligible where there is genuine additionality claim.*

Contents

1. Introduction

The growing number of corporate climate commitments has prompted renewed interest in carbon offsets. Today, over 1,000 firms have made either indicative or concrete pledges to align their emissions with the Paris Agreement – which means reducing emissions to zero by 2050. For many firms, achieving this aim will require the use of carbon offsets at some point. Other firms have made pledges to go carbon neutral and offset all their emissions today.

Whilst this market for carbon offsets (known as the voluntary carbon market) has existed for over a decade, the recent surge in interest has prompted collaborative efforts to accelerate wider adoption. The most significant is the Taskforce on Scaling Voluntary Carbon Markets (TSVCM) which was set up in the summer of 2020 under the auspices of the Institute of International Finance. In November 2020, the TSVCM released a consultation document to seek input on how the market can be improved and expanded.[2]

The consultation document addresses a number of areas that will need to be tackled as the market builds confidence and scale. Key areas include principles and processes to help improve and standardize the environmental integrity of carbon offsets, the standardization of contracts and information systems to bring greater transparency.

However, one area less well documented is the accumulation of carbon offsets already in the system. These credits have been issued from projects dating back up to 10 years and are still available to be acquired through the five main registries.[3] Over this time, the rules by which carbon offset projects are defined and measured, and the associated quality assurance processes, have evolved and improved. This process of improvement will continue as methodologies and standards are modified and new ones introduced.

The evolving landscape creates a challenge in how to deal with carbon credits, which are perhaps no longer regarded as high quality (from an environmental integrity point of view) but are still available for purchase as bona fide carbon offsets. Unless dealt with these legacy credits – from both the voluntary market and the Clean Development Mechanism – risk undermining future corporate efforts to achieve ambitious climate targets and deliver emission reductions in the line with the Paris Agreement.

The purpose of this analysis is to shed light on the scale of the issue and propose potential ways forward. In section 3 we also show the significance of the voluntary carbon market as a mechanism to help tackle climate change. These future scenarios are based on initial modelling of the future size of the carbon market. More detailed analysis will be published in forthcoming research notes towards the end of the year.

(1) https://sciencebasedtargets.org/
(2) https://www.iif.com/tsvcm
(3) VERRA, Gold Standard, American Carbon Registry, Climate Action Reserve, Plan VIvo

2. Methodology

Credit supply

The analysis of the supply of carbon credits has been drawn from the five main registries (Verra, GS, CAR, ACR, Plan Vivo) as of October 2020. Across these registries we show the split of projects by *project type, year of issuance* (the year in which the credit was issued and uploaded to the relevant registry) and *year of vintage* (the year in which the credit was actually produced). This approach is different from most other analyses which show data by year of issuance.

This distinction between year of issuance and vintage is important. A registered project can issue carbon offset credits at a given date that includes multiple vintage years. For example, a project can issue credits in 2020 for vintages 2017, 2018 and 2019. Mostly issuances are backdated, but can be forward dated, notably for afforestation projects to account for expected future carbon dioxide removal.

Presenting credits by vintage makes issuances (and retirements) in the most recent years look lower than earlier years. This is because credits issued in 2020 may cover credits produced in previous years, say 2017, 2018 and 2019. Similarly, credits produced in the year 2020 (i.e., vintage 2020) may be not be issued until 2021 or 2022.

The analysis also shows the cumulative surplus of projects (by vintage and type) over time. The surplus is the difference between total issued credits, and the number of credits retired. Retired credits are those that have been offset against emissions from a buyer and can no longer be used to offset any further emissions.

Credit demand

Our forecast of future carbon-offset demand is based on analysis of current growth rates in carbon-offset demand, together with anticipated future demand from the international airline industry and commitments from European oil companies for offsetting the emissions in the oil and gas that they sell (scope 3 emissions).

In our analysis we categorize the projects into eight main project types:

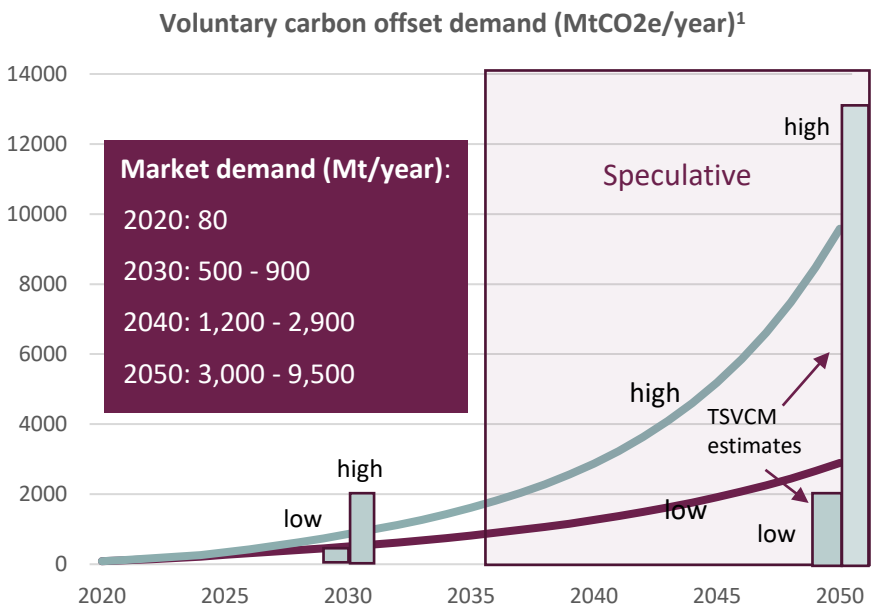
- Reduced Emissions from Deforestation & Degradation (REDD+)
- Fuel switching (e.g., coal to gas, cook stoves)
- Energy efficiency (e.g., efficient lighting)
- Gases (e.g., methane capture/destruction)
- Other nature-based solutions (e.g., afforestation, agriculture)
- Renewable energy (e.g. solar, onshore wind, biofuels, hydro)
- Carbon Capture & Storage (CCS)
- Other (e.g., integrated gas capture & energy utilization)

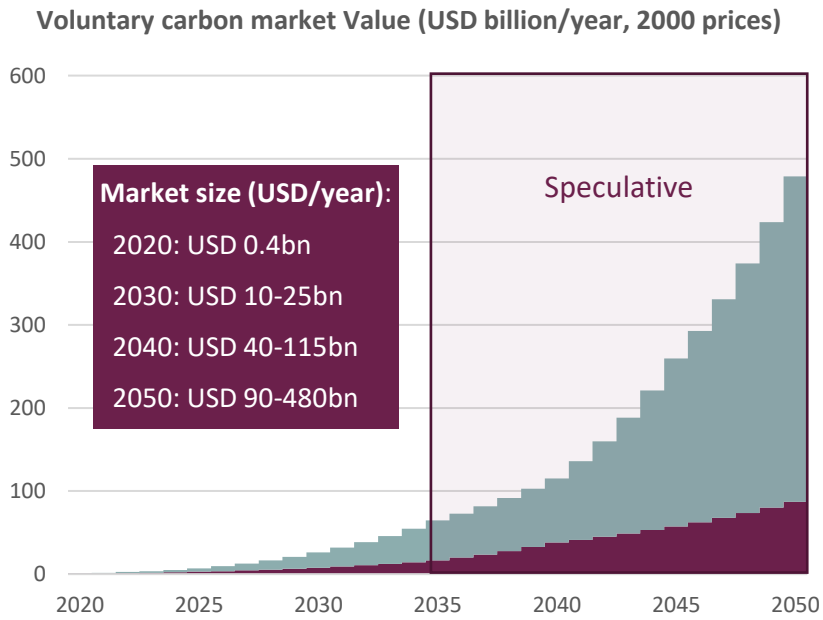
3. The size of the voluntary carbon market (1)

The voluntary carbon market needs to be seen in perspective. We have created scenarios for the potential future demand for voluntary carbon offsets including growth from of companies looking to offset their emissions, international airlines (CORSIA), and long-term commitments for net-zero from European oil companies, as well as future increases in offset prices.

Combining low and high rates of growth and prices to 2050 shows very wide ranges in market value, hence these longer-term scenarios need to be seen as speculative and treated with caution. Projections to 2030 have less uncertainty and are a better basis for thinking about future offset demand.

By 2030 we see the voluntary carbon market potentially increasing from USD 400 million/year in 2020 to USD 10 to 25 billion/year. This would be hugely impressive growth (more than x20 in value terms) but contains some optimistic assumptions.[3] However, even at this rate of growth the voluntary carbon market would still be **less than 10% of current global annual investment in clean energy** and **significantly short of the investment needed to put the world on a trajectory consistent with Paris Agreement**.[4]





Source: Trove Research analysis.

1. *Trove Research calculations. Based on extrapolation of recent trends plus potential new sources of demand for European oil companies and international airlines.*
2. *Future market prices are assumed to increase from an average of USD 5/tCO2e today to USD 15-30/tCO2e in 2030, USD 30-40/tCO2e in 2040 and USD 30-50/tCO2e in 2050.*
3. *In the low scenario we assume that corporate demand for offsets increases at 19% to 2025 (the average rate of growth over the last four years) and then 10% p.a. from 2025 to 2050. In the high scenario we assume 19% growth to 2030 and 15% growth to 2050. These exclude additional demand from CORSIA and EU oil companies.*
4. *USD 282 billion annual investment in clean energy in 2019 – source BNEF, 2020.*

3. The size of the voluntary carbon market (2)

Even under optimistic assumptions the voluntary carbon market will not save the world from climate change. Companies making commitments to reduce their emissions and using carbon offsets to meet a residual shortfall against their targets do so voluntarily. Voluntary action can only ever be a limited contribution to the huge transformation needed to address climate change. It is the role of government to set ambitious climate targets and introduce policies and regulations to achieve them – not to rely on voluntary action.

What is the role of the voluntary carbon market?

In spite of the relatively small size of the voluntary carbon market (compared to the overall level of investment required to meet the Paris goals), voluntary action can provide a useful, complementary source of capital to support government efforts in tackling climate change. (The question of how the voluntary market can work in tandem with government actions will be the subject of a forthcoming research note in this series).[2]

A growing focus of the voluntary market is the support for nature-based solutions – preserving existing forests and growing new forests. Forest-related projects appeal to the voluntary market because they are more than simply stores of carbon. They provide valuable habitats for wildlife and support indigenous communities, attributes which may be overlooked by some government activities purely focussed on emission reductions. The table below shows estimates of the land area required to meet forecast corporate demand for carbon offsets if 100% of this demand is met by new forests. Currently around 25% of corporate offset demand is met by forest-related projects. ***Note, projections beyond 2030 are highly speculative at this stage and should be seen as scenarios rather than forecasts.***

If all the carbon offsets as set out in our demand scenarios are met by storing carbon in new forests…

- An area the size of Scotland would be required to meet current carbon market demand.
- By 2030 this area could rise to the size of Germany (low scenario) or France (high scenario).
- By 2040 the land area required could be equivalent to Nigeria (low scenario) or Algeria (high scenario).
- By 2050 the land area required could be equivalent to Saudi Arabia (low scenario) to Brazil (high scenario).

New forested land area needed to meet future voluntary carbon market demand [(1)]

		2020	2030 forecast	2040 forecast	2050 forecast
Corporate offset demand (MtCO2e/year)		80	500 - 900	1,200 – 2,800	3,000 - 9,600
Land area of forest needed (million km2)		0.08	0.4 – 0.7	1.0 – 2.4	2.0 – 8.0
Equivalent country area if 100% demand met by forests	Low	Scotland	Germany	Nigeria	Saudi Arabia
	High		France	Algeria	Brazil

Source: Trove Research analysis.

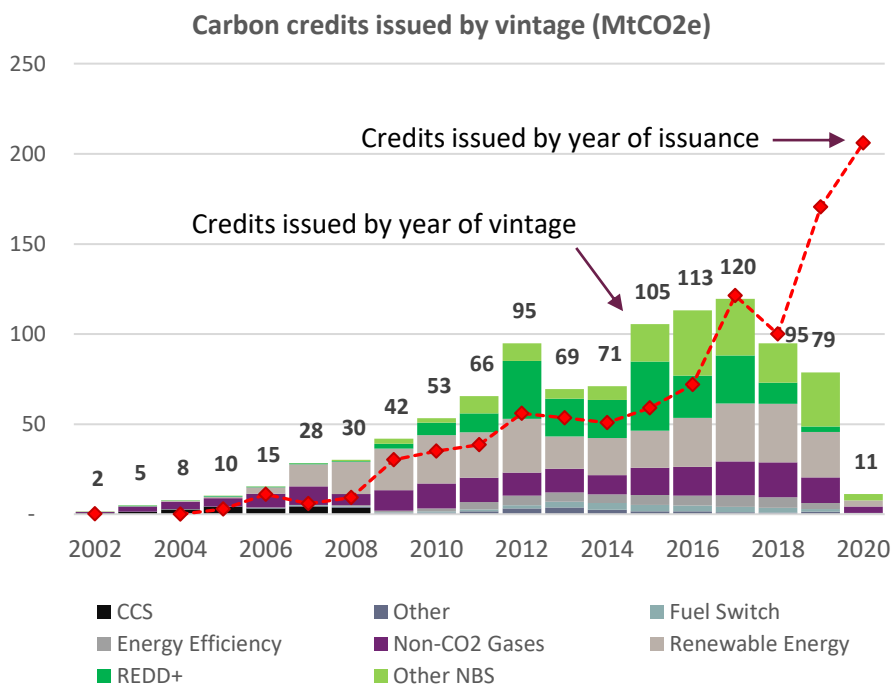
1. *Assumes average carbon absorption rate of 12 tCO2/ha/year.*
2. *The voluntary carbon market represents an additional source of capital that can be used to invest in emission reduction activities. It is important that this investment is additional and does not simply displace intended government-led activity.*

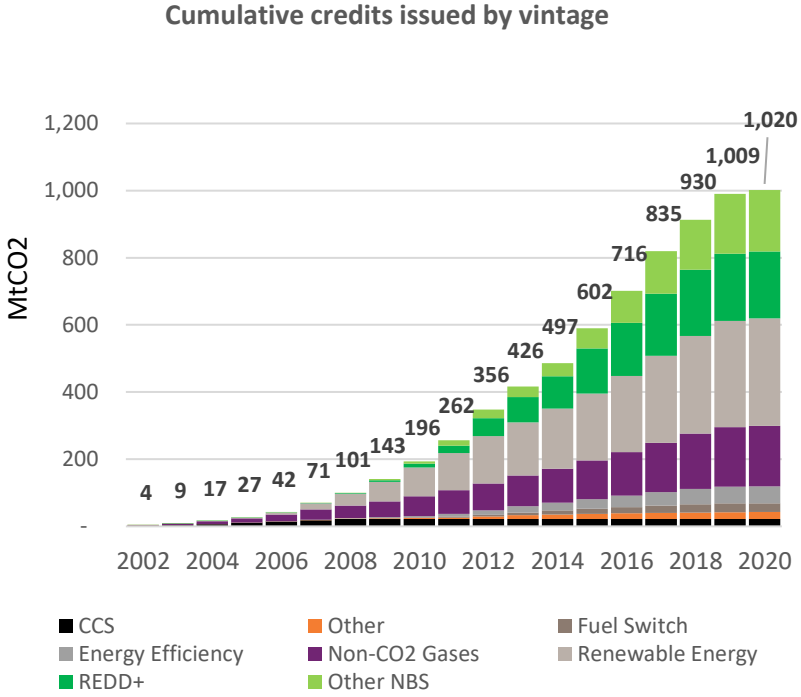
4. Voluntary carbon credits issued by vintage

To date around **1 billion tCO2e** of voluntary carbon credits have issued from the five main registries, averaging around 160-180 MtCO2e/year for the last two years. To put this rate of issuance in perspective, it is equivalent to around 3% of current US greenhouse gas emissions. An issued credit however does not mean it has been retired and used to offset emissions elsewhere – simply that it has been verified. Retired credit volumes are significantly less than the issued volume.

20% of these issued credits are from avoided deforestation (REDD+) projects, and another **18%** from other nature-based solutions (including afforestation and agriculture). Together REDD+ and nature-based solutions account for nearly **40%** of issued credits. Around a third of issued credits are from renewable-energy projects such as onshore wind and solar installations. Historic renewable-energy projects, especially those in more advanced countries such as China, have more questionable claims over additionality.

The left-hand chart shows credit issuances by year (red diamonds) and vintage (bars). Issuances have increased every year, with the exception of 2018. Issuances by vintage appear to decline in 2018, 2019 and 2020, but this is because issuances are often backdated, i.e., credits issued in 2020 are for vintages in earlier years.



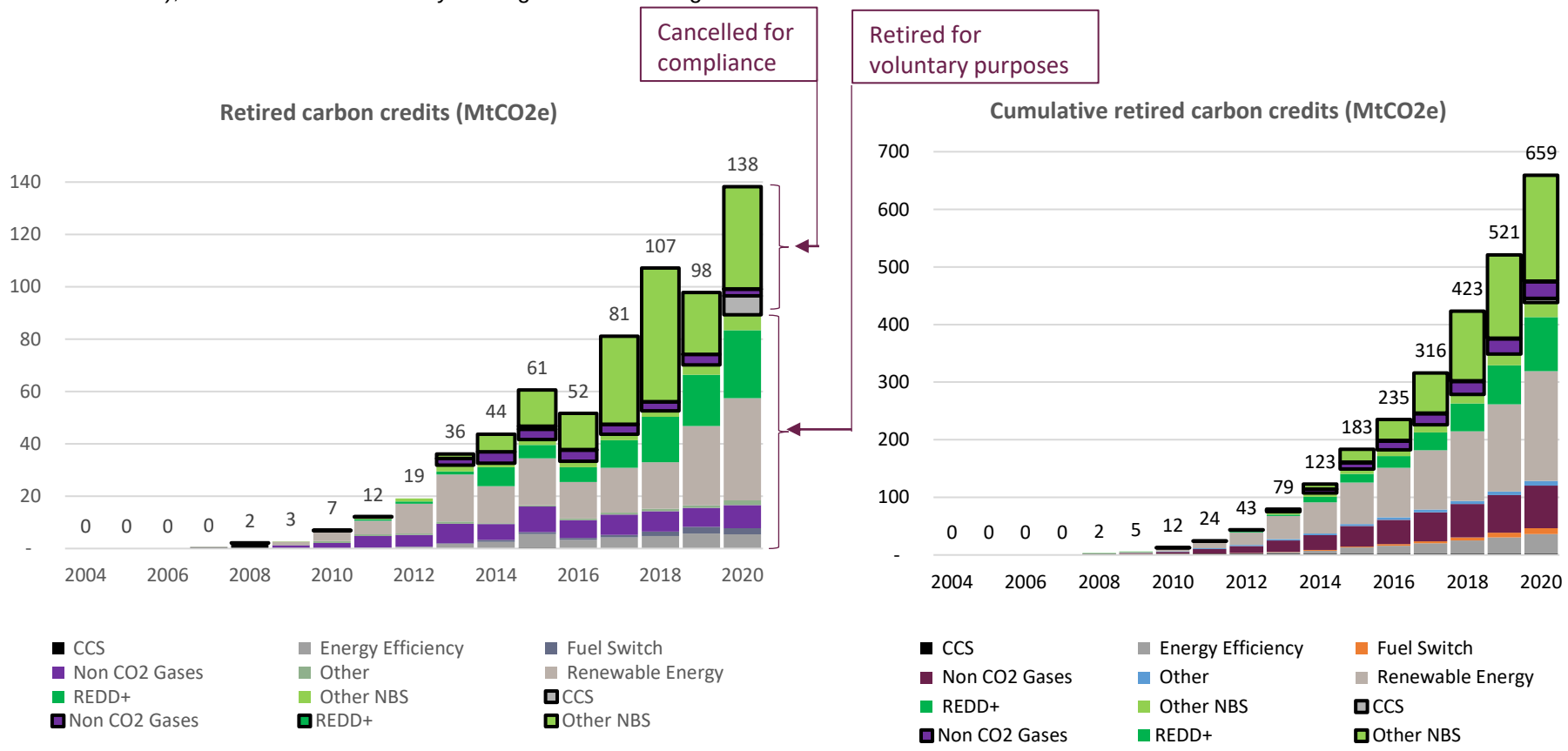


Source: Trove Research analysis.

5. Voluntary carbon credits retired and cancelled by year

By the end of December 2020, **659 MtCO2e** of carbon credits had been either retired for voluntary purposes or cancelled for compliance in the California cap and trade scheme. Around two-thirds of the credits taken out of the global carbon-credit market have been used for voluntary purposes, with a third used for compliance in California.

Just under half of the credits retired for voluntary purposes have been for renewable-energy projects (190 MtCO2e), with REDD+ accounting for 21% and non-CO2 gases 17%. In the California compliance scheme, around 80% of credits cancelled have been forestry or agriculture based (i.e., nature-based solutions), with the remainder mainly coming from non-CO2 gases.



Source: Trove Research analysis of the five main voluntary carbon market registries.

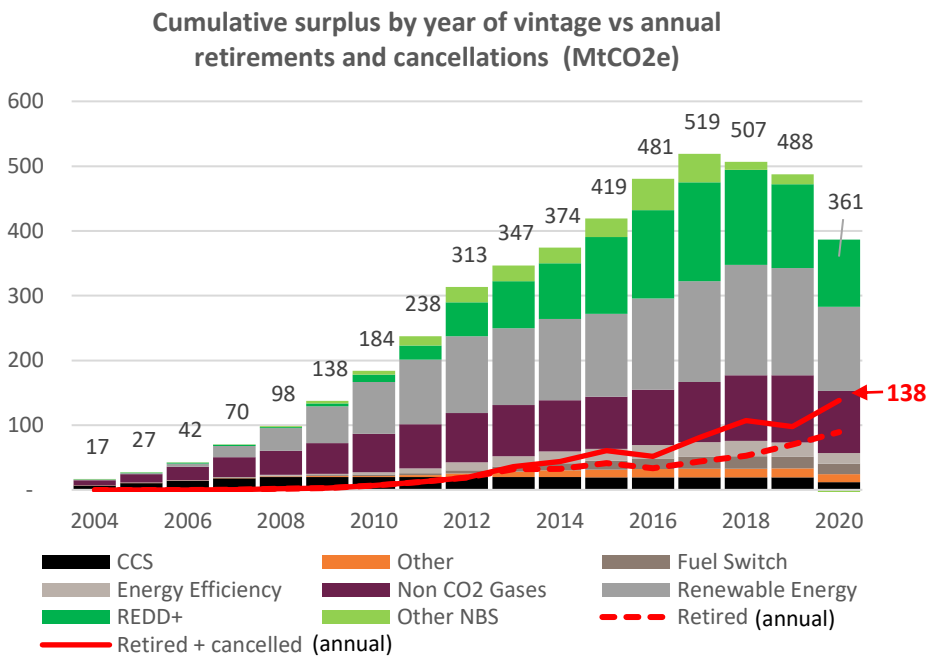
6. Voluntary carbon credits issued and not retired (the surplus)

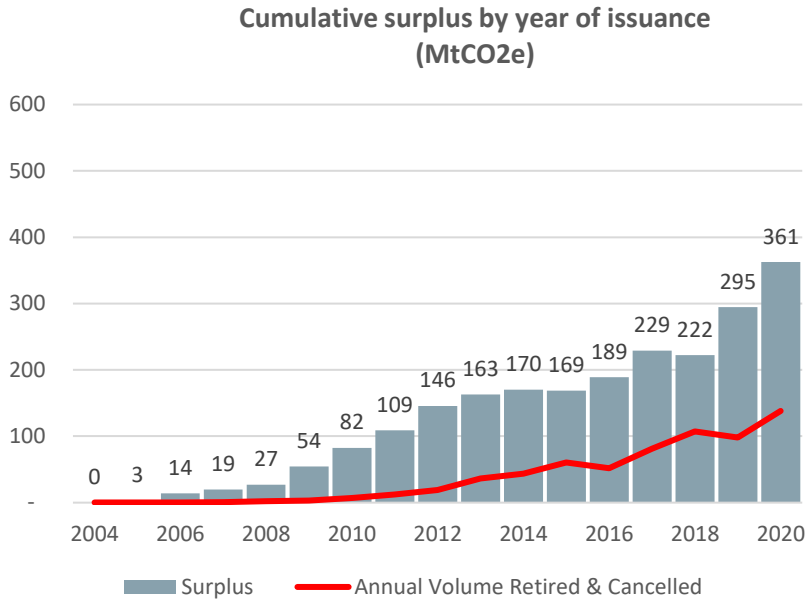
The difference between the volume of credits issued and the volume retired and cancelled represents a surplus in the system that can be used for offsetting emissions elsewhere. By the end of 2020 this surplus stood at around **360 MtCO2e**. Of the total current surplus, 104 MtCO2e (28%) is from REDD+. However, **more than 60% of the surplus is from projects with more questionable additionality claims** (e.g. long-dated renewable energy projects and non-CO2 gases).

This total surplus is **2.6 times the 2020 demand for credits for both retirement in the voluntary market and cancellations in compliance schemes.**

In the left-hand chart, the bars show the cumulative surplus for each vintage year by project type. The red lines show the annual rate of retirements and cancellations. In this chart, the surplus peaks for 2017 vintages because later year vintages are yet to be issued, while retirements are shown in the year in which they occur.

The right-hand chart shows the cumulative surplus by year of issuance, rather than year of vintage. **This shows that the surplus is continuing to increase.** In 2020 around 200 Mt of credits were issued, but only138 Mt were retired or cancelled, increasing the surplus by over 60Mt in the year.





Source: Trove Research analysis of the five main voluntary carbon market registries.

7. Registered projects not issuing credits – the submerged iceberg

The volume of credits that could be issued from current projects is potentially greater than the 360 MtCO2e accumulated surplus we identify, as some registered projects choose not to issue credits until they have found a buyer.

Data from the Verra registry show that currently registered projects have the potential to issue around 280 MtCO2e/year. This compares to an actual issuance from Verra projects in 2020 of 94 MtCO2e, implying that in the Verra registry **projects could issue nearly three times the volume if they choose to do so.** In the table, we show how much greater the surplus could be if this ratio of issuance potential and actual issuance is applied to historical issuances – using a conservative range of x2 to x 3.

There is also an even larger volume of credits in the CDM system that, in theory, could back-issue credits up to 2020. The maximum theoretical volume that could be used from the CDM registries could increase from 100 Mt to a maximum of **6,800 MtCO2e**.[2] If this supply came to market, it would swamp demand by **50 to 60 times.**

These figures are maximums. In practice some projects will not issue credits, even though they might be eligible. Projects may have lapsed, the costs of verification might outweigh the benefits or the project might have reached the end of its crediting period before 2020 and would need to be re-validated. Historic CDM projects also have to be validated against current standards – for example Verra now excludes historic grid-connected renewable-energy CDM projects.

Stocks of carbon credits (MtCO2e)

	Stock of issued credits not retired / cancelled	Maximum volume of credits that could be issued to 2020*
Voluntary carbon market (VCM)	360	700 - 1000
CDM registry (CDM)	100 (2)	6,800 (1)
Total	**460**	**7,000 - 8,000**
Multiple of 2020 voluntary and compliance demand*		
VCM	**x 2.6**	**x 5 - 7**
VCM + CDM	**x 3.3**	**x 50 - 60**

** Voluntary and compliance demand in 2020 = 138 MtCO2e*

However, even with these caveats we reach the conclusion that the issuance potential – both from issued, unretired credits and those that could back-issue if they choose to do so – is worryingly large. If all these credits were issued and retired they could fulfil current levels of credit demand for 50-60 years. The environmental integrity of many these credits (especially from the CDM) is questionable, resulting in a large supply of offsets that have minimal climate benefit.

1. *8,400 currently registered CDM projects have the capacity to issue 8.8 bnt of CERs up to 2020. Of this, 2 bnt has actually been issued, of which 1.6 bnt have been retired. https://unfccc.int/news/the-cdm-executive-board-considers-cdm-beyond-2020*
2. *As of October 2020, there were c. 400 Mt of CERs in the CDM registry that have been issued but not bought or retired. 300 Mt of these are in the Verra registry and available for sale as voluntary carbon units. The residual volume in the CDM registry is 100 Mt.*

8. Why the surplus is a problem

The accumulated volume of surplus credits in the voluntary registries is 2-3 times the current annual demand, but still growing – demand is increasing by around 20% a year (average over the last four years), but supply is increasing more rapidly. Hence, on current trends the surplus does not show signs of diminishing.

In theory the age of a credit should not be a problem. The context for judging a project's additionality may be different today than it was when the project was first registered – but that is not to say that it was not a legitimate project initially. If a solar project built today no longer requires the extra revenue from selling a carbon credit to be viable (e.g. because costs have come down), this does not mean that a project built several years ago should be rendered ineligible if at the time it genuinely needed the extra revenue.

However, in practice older credits present two key problems:

- Methodologies, standards and the rigour with which they are enforced have evolved and improved over time – and they continue to do so. This means that older credits may have been created under less stringent requirements but are still able to be sold in the market today. For example, a study in 2016 for the European Commission found that most energy-related projects (renewables, fuel switch, efficient lighting, waste heat recovery etc.) in the CDM were unlikely to be additional.[1] Renewable-energy credits account for around a third of all credits issued to date. For these reasons, the main registries exclude new renewable-energy projects from being eligible to generate credits unless they are based in LDCs – although legacy projects may still do so.
- Credits that have been issued but not retired raise questions over the necessity of the carbon revenue for project viability.[2] If a project was built and went into operation but revenues from the sale of carbon credits have not materialized, then there is a good argument that the project did not need the carbon revenue and hence was not additional. It is possible that the project could be operational and loss-making because of the lack of carbon revenue, but this is unlikely. Credits could have been sold at any point. It is also possible that the project owner is withholding sales of carbon credits, waiting for prices to increase. It is impossible to know the true reason from the data, but we believe the most likely reason is that the project viability was not dependent on the need for the carbon revenues.

If the accumulated credits from projects that no longer need the carbon revenues remain in the market, then the rationale of the carbon offsetting system is undermined. The market would be flooded with cheap credits of little or no environmental value. At the same time, consumers would be falsely reassured that their activities are not adding to global CO2 emissions and may actually increase their activity (e.g., taking flights). Buyers of offsets need to be confident that their money is being put into projects that clearly lower emissions and provide associated environmental and societal benefits.

1. https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf
2. *Credits are only retired when they are used to offset the buyer's emissions. At this point they will have been sold by the developer. Credits that are issued but not retired are likely to be held by the project developer in the registries, although it is possible that the project developer could have sold the credits to an intermediary who has yet to find a buyer for the credits and retire them. However, we consider this to be less likely due to the risks of holding such a position without a confirmed buyer.*

9. Ways forward (1 of 2)

Carbon credits issued from older projects are, on average, less likely to meet today's tests of environmental integrity.[1] The challenge is how to manage these legacy credits without disincentivizing future investment in carbon reducing activities. Investors shy away from markets where rules change frequently and especially where rule changes are applied to historic activities. However, a balance needs to be struck, and interventions should be made where the case is strong enough. The carbon-offsetting industry should also see the benefit of clearing the backlog of low-quality credits, so that well-intentioned corporate capital is directed to new carbon-reducing projects.

We suggest three potential routes. These are not mutually exclusive.

1. Registry-led. Given the important role of registries, it might be possible for these organisations to clean the market of low-quality legacy projects. An obvious difficulty is that the registries have contractual obligations to the developers who have undergone the process of registering and validating their projects and paying for credits to be issued. Nonetheless, if the consensus is strong enough, it may be possible for the registries to amend their contracts selectively, although this would likely be subject to legal approval.

2. Governance body-led. Discussions are ongoing through the Taskforce on Scaling the Voluntary Carbon Market about the creation of an independent body that would oversee the integrity of the market. Part of this organisation's role could be to decide on how to restrict the use of legacy credits. The body could coordinate opinions from across the industry and reach a consensus that serves the long-term interests of corporate buyers and the carbon-offsetting industry. Recommendations could be issued to registries and buyers alike.

3. Buyer-led. A consumer-led approach would be based around a drive to only buy high-quality credits. Guidance could be issued by independent organizations advising buyers on the authenticity of the bought credits. The airlines group, CORSIA, already restricts the use of credits from projects that commenced operation after Jan,1, 2016. Arguably even this is not stringent enough as it still contains access to a potentially large volume of low-credibility credits in the CDM regime, including energy-related projects. Other initiatives are also underway to provide buyers with a rating system of the quality of projects. A drawback of a buyer-led approach is that the door is still open for buyers to use to credits from less rigorous sources if they choose to do so.

Our view is that all three approaches are likely to be needed. Registries should take responsibility for cleaning up credits from older, poor-quality projects. This would require working with stakeholders to agree rules for dealing with legacy projects. The new governance body should provide guidelines, or even rules, for registries and buyers of credits alike and set up the administrative machinery for overseeing compliance. A buy-led initiative could also be very effective in driving standards for both high ambition and the use of high-quality carbon offsets, where appropriate.

1. *Some types of early projects may still be good quality. For example, some early forest protection projects (REDD+) were set up under high standards but have taken many years to progress from idea through to implementation. This is partly due to the complexity of working in rural areas in developing countries with multiple stakeholders.*

9. Ways forward (2 of 2)

The schematic below shows the quality risk typically associated with project age and type, and provides a potential framework for managing with the surplus credits by project type and start year. Note, this is a generalized approach and does not take account of project specifics. The categorization is based on third-party reports that have assessed the environmental integrity of projects in the CDM, as well as experience of the study team.[1, 2] We note that standards have improved in the voluntary carbon market, and this greater scrutiny and transparency was one reason why the voluntary market became popular for corporate carbon offsetting. We are not aware of any studies that have explicitly looked at the environmental integrity of projects in the voluntary carbon market.

We have used 2016 as an indicative cut off as this is the year chosen by CORSIA before which carbon offsets are not accepted. Other years might also be chosen, or more than one year if a rating system is used. The years refer to project start date rather than vintage of credits.

Potential framework for dealing with legacy credits

Type	Sub type	Comment	Surplus* (MtCO2e)	Project start date: Pre 2016	2016 - 2020	Post 2020
Projects that remove CO2 from the atmosphere						
CCS	Non-EOR (Enhanced Oil Recovery)	CCS has genuine need for carbon finance. Few non-EOR CCS projects have been developed to date.	small			
Afforestation		Few afforestation projects have been started. Generally regarded as high quality.	214			
REDD+	Jurisdictional	No jurisdictional REDD projects have been approved prior to 2020.	-			
REDD+	Project level	Historic project level REDD subject to leakage risk but highly project specific.	105			(*)
CCS	EOR (Enhanced oil recovery)	Except for projects using EOR where there is often a commercial case for the project.	19			
Projects that reduce CO2 emissions						
Renewable energy	LDCs	Allowed in order to support expansion of renewables in smallest countries.	112			(*)
Renewable energy	Other than LDCs	Renewable energy projects excluded on the weak additionality claims on these project types.				
Methane capture [3]		Regarded as medium risk projects but older projects likely to have been credited under lower standards.	65			(*)
Industrial gas		Industrial gas projects problematic additionality claims due to perverse incentives.				
Energy efficiency		Energy efficiency projects excluded on the weak additionality claims on these project types.	16			

Credits eligible post 2020

(*) Credits eligibility subject to improved standards

Credits ineligible post 2020

Credit eligibility subject to project specific reviews

* Surplus figures exclude 12MtCO2e of credits categorised as "other"

Source: Trove Research.

1. Eg: https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf
2. Eg: https://newclimate.org/wp-content/uploads/2017/05/summary_vulnerability_of_cdm_projects_internet1.pdf
3. *Many methane capture technologies should be covered by regulations and hence not eligible for offsets. This is particularly the case in countries other than LDCs. A growing number of countries should enhance their regulations under the Paris Agreement. Credits should only be eligible where there is genuine additionality claim.*

Contact Us

AMERICAS		EUROPE, MIDDLE EAST & AFRICA		ASIA PACIFIC	
United States	+1 888 588 4567 *	South Africa	+ 27 21 673 0103	China	+ 86 21 61326611
Canada	+ 1 416 687 6270	Germany	+ 49 69 133 859 00	Hong Kong	+ 852 2844 9333
Brazil	+ 55 11 4040 7830	Switzerland	+ 41 22 817 9777	India	+ 91 22 6784 9160
Mexico	+ 52 81 1253 4020	United Kingdom	+ 44 20 7618 2222	Malaysia	1800818185 *
		Italy	+ 39 02 5849 0415	South Korea	+82 70 4769 4231
		France	+ 33 17 6769 810	Singapore	+65 67011177
				Australia	+612 9033 9333
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* = toll free
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