

WORKING PAPER

Net Zero Greenhouse Gas Emissions and the Role of Voluntary Carbon Markets

ABOUT VCMI

VCMI has been led by Meridian Institute, a US-based ot-for-profit organization, and supported by consultants



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ABOUT THIS PAPER

This VCMI Working Paper is a product of the VCMI Consortium working in collaboration with staff from the VCMI funders. This paper has not been reviewed nor approved by the VCMI Steering Committee, which was being formed as the paper was being developed. The intent of the paper is to spur dialogue and an exchange of ideas to inform the development of VCMI guidance during the next phase of the VCMI process, which will be governed by the VCMI Steering Committee (which you can learn more about here).

If you would like to give feedback, please contact vcmi@merid.org



I. Introduction

Introduction

Under the landmark 2015 Paris Agreement, 196 countries committed to avoiding the catastrophic impacts of climate change by limiting global warming to well below 2°C, preferably to 1.5°C, compared to pre-industrial levels.¹ However, we are currently on track for more than 2.5°C of warming above preindustrial levels this century – far above the "safe upper limit" of 1.5°C warming defined by the United Nations Intergovernmental Panel on Climate Change (IPCC).^{2,3}

While action to mitigate climate change and halt nature loss is essential, global finance flows are further entrenching unsustainable economic pathways.^{4,5} The IPCC reports that an additional investment of \$2.4 trillion is needed each year in the energy system alone until 2035 to limit warming to 1.5°C.6

This short working paper sets out the science behind the Paris Agreement targets and considers what this means for business and for the future of voluntary carbon markets.

In 2020 alone, 12 million hectares of tree cover was lost in the carbon-rich tropical belt, including 4.2 million hectares of previously undisturbed primary rainforest, resulting in 2.64 GtCO₂ emissions – equivalent to the annual emissions of 570 million cars.⁷



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II. Science as the Foundation

Science as the Foundation

1.5°C-consistent emissions pathways are characterized by a rapid phase out of CO₂ emissions and deep emissions reductions in other greenhouse gases (GHGs) and climate forcers. In pathways with no or limited overshoot of 1.5°C, global net anthropogenic CO₂ emissions decline by about 45% from 2010 levels by 2030, reaching "net zero" around 2050. Net zero emissions are reached when anthropogenic emissions of GHGs to the atmosphere are balanced by anthropogenic removals over a specified period. All 1.5°C pathways (with no or limited overshoot) developed by the IPCC use GHG or carbon dioxide removals – such as afforestation/reforestation or direct air capture and storage - to help neutralize emissions from sources that are difficult, impossible or take more time to eliminate.8

Not all 1.5°C net zero pathways are equal when it comes to the broader sustainable development agenda. Global climate models are based on five Shared Socioeconomic Pathways (SSPs), which project socioeconomic global changes up to 2100 and are used to derive GHG emission scenarios dependent on different climate policies. SSPs 1-5 are depicted in Figure 1. SSP1 is aligned with the SDGs, assumes deforestation is stopped by 2030 and has garnered significant international governmental support. In contrast, SSP5 scenarios are high risk and rely heavily on GHG removals (i.e. negative emissions), which will partially depend on technologies which do not exist at scale today.9

Figure 1. Intergovernmental Panel on Climate Change (IPCC) Shared Socioeconomic Pathways (SSPs)¹⁰



Note: The IPCC Shared Socio-economic Pathways (SSPs) were developed to complement the IPCC's Representative Concentration Pathways (RCPs), which include time series of emissions and concentrations of the full suite of greenhouse gases, aerosols, and chemically active gases, as well as land use/land cover. Based on five narratives, the SSPs describe alternative socio-economic futures in the absence of climate policy intervention, comprising sustainable development (SSP1), regional rivalry (SSP3), inequality (SSP4), fossil–fuelled development (SSP5), and middle-of-the-road development (SSP2). The combination of SSP-based socio-economic scenarios and RCP-based climate projections provides an integrative frame for climate impact and policy analysis.

It is therefore critical to aim for a pathway which relies as little as possible on GHG removals. This means accelerating the decarbonization of economies and ending deforestation in the coming years, in addition to drastically reducing emissions of non-CO₂ gases. Such action will be challenging but is by no means out of reach. The International Energy Agency's latest report, "Net Zero by 2050", shows that it is both technologically feasible and cost effective to transition to a net zero energy system by 2050 while ensuring stable and affordable energy supplies, providing universal energy access, and enabling robust economic growth.¹¹ Similarly, the Food and Land Use Coalition shows that it is possible – and necessary - to halt tropical deforestation and protect other natural ecosystems while setting aside



hundreds of millions of hectares of land for forest and ecosystem restoration, and to produce affordable, nutritious food for the global population.¹²

But there are going to be some emissions which simply cannot be eliminated entirely by mid-century (including certain industrial and agricultural emissions). These leftover emissions are known as "residual emissions" – i.e. those that remain unabated at the time net zero is reached in 1.5°C-aligned scenarios. These residual emissions will need to be neutralized by an equivalent quantity of removals. There is significant work ongoing across the scientific community to define which emissions are likely to be infeasible to abate by mid-century – because they are expected to be either economically or technologically unviable.¹³

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III. Net Zero in a Business Context

Net Zero in a Business Context

The "net zero" terminology has acted as a magnet for corporate climate commitments, with companies, cities, investors, and countries rushing to make high ambition GHG commitments ahead of COP26 in Glasgow in November 2021. At the time of writing, more than 3,000 companies have signed up to the United Nation's Race to Zero campaign.¹⁴ However, these commitments have also acted as a lightning rod for other stakeholders to express their concerns about the lack of clarity and integrity of those commitments, with widespread confusion linked to the discrepancy in terms of scope and ambition. For example, commitments include different emission sources and gases in target boundaries, different timelines, different emission reduction trajectories, and different approaches to the use of carbon credits.¹⁵ This is because there is not yet a widely agreed upon definition of net zero at the corporate entity level, leading to confusion and inconsistent claims.

An analysis of corporate climate commitments shows the use of nearly 30 different terms to communicate a company's intentions. These range from expressions around the concept of "carbon neutrality", using terms such as "climate neutral", "zero CO₂", "zero GHG", "fossil-free", "emissions-free", and "zero environmental footprint", and those that take on the "net zero" concept implying longer term abatement commitments and "offsetting" or "neutralizing" residual emissions. Companies referring to the latter may claim to be "net zero GHG", "net zero carbon", or "net zero CO2". Understandably, this has created confusion among consumers and stakeholders.

There are ongoing efforts to define science-based and SDG-consistent net zero pathways for the private sector. For example, the Science Based Targets initiative (SBTi) – with broad support from investors, businesses, and civil society - is developing criteria for companies wanting to set net zero targets which (based on their public

consultation documents) are expected to require them to:

- Abate (i.e. eliminate or reduce) emissions within their own value chains (i.e. for Scopes 1, 2, and 3).¹⁶ While there may be different requirements for Scope 3 emissions in terms of ambition and coverage - and there will be different pathways for different sectors - in aggregate, this approximates to a halving of emissions each decade. It is expected that SBTi will require companies to include all relevant sources of emissions within their target boundaries, including emissions from land use and land-use change.ⁱ
- Remove or neutralize any residual emissions ahead of 2050 to reach a state of net zero CO₂ emissions by this date. The SBTi and the broader scientific community are working to define the acceptable level of residual emissions globally, by sector and by activity.17



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- The SBTi will likely recommend that companies go beyond these minimum standards and take responsibility for their remaining and/or historic emissions in the near term as they transition. SBTi will likely recommend companies achieve this by either purchasing carbon credits to compensate for or net out remaining and/or historic emissions, or by multiplying remaining and/or historic emissions by a carbon price which raises revenue that can then be spent on carbon credits or other climate mitigation investments. This refers to a company's actions or investments that mitigate GHG emissions beyond those covered by their near-term science-based emission reduction targets or their longer-term net zero targets. SBTi recommends that action beyond value chain emission reduction targets prioritize interventions with strong co-benefits that contribute to achieving other social and environmental goals.¹⁸



IV. Implications of Net Zero for the Demand-Side of VCMs

Implications of Net Zero for the Demand-Side of VCMs

Voluntary carbon markets allow the trading of verified emissions reductions and carbon removals in the form of carbon credits. Between 2016 and 2020, the market grew by 280%, with nearly 95 million carbon credits retired in 2020 at a value of around \$430 million.¹⁹ Credit purchases have increased in a variety of sectors including finance, insurance, energy, consumer goods, and airlines, while purchases by the chemical/petrochemicals/oil and gas sector have remained stable. Figure 2 shows the increase in voluntary carbon credit purchases on a global scale from 2010-2020. The volume of retired credits sourced from REDD+, afforestation and renewable energy has increased, while demand for energy efficiency and non-CO₂ gas (e.g. methane reduction) projects have remained relatively constant over the last five years.²⁰

Historically, many firms bought carbon credits because doing so was a seen as an inexpensive way of making their business or products more attractive by claiming a positive impact on the environment, without having to make material changes in the underlying business or incur significant expenditure. This scenario is typically referred to as "offsetting", where "one does something that results in extra good that is equivalent – in magnitude, approximate timing, and recipient population – to the original harm done".²¹

The validity of the offsetting approach - where credits are purchased as a substitute for climate action within the value chain of a company - is increasingly being questioned. Scientists, civil society, and corporate guidance initiatives are converging on a position that states that companies and organizations should not purchase carbon credits as a replacement for climate mitigation within their own value chains. Proponents of this view argue for moving away from the offsetting model and moving toward a model where carbon credit purchases are supplementary to sciencebased abatement of companies' own value chain emissions, rather than a replacement.

Figure 2: Voluntary Carbon Credit Purchases (million tCO_e)22



The SBTi has proposed terminology – which is referenced above – that describes the use of carbon credits in this way:

- The term "compensation" refers to: (i) a company's efforts to prevent, reduce or eliminate emissions outside of its value chain; (ii) companies in all sectors can catalyse action in the voluntary carbon market as part of an effort to compensate emissions as they transition toward a state of net zero emissions; and (iii) these efforts should not be counted as part of a company's net zero efforts.
- The term "neutralization" refers to: (i) a company's efforts (which can either take place within or outside of its value chain) to remove carbon from the atmosphere to counteract any residual emissions that are not feasible to abate; and (ii) such neutralization efforts could be used by companies when approaching their net zero dateⁱⁱ.

The SBTi is gaining significant momentum, with more than 1,500 companies from 60 countries and 50 sectors committed to setting science-based GHG emission reduction targets. However, there are companies which have yet to align their business activities with the Paris Agreement temperature goals in this way. Some of those companies may wish to purchase credits to offset their emissions as a substitute for science-based action within their own value chains. Company purchase of high quality credits can deliver critical finance for climate mitigation and promote international and cross-sector partnerships. But it is essential that these companies are not using these credits to make claims that would mislead their stakeholders - including investors and customers - into thinking that they are on an SDG-consistent net zero pathway. See Working Paper: Claims Framework.



It is worth noting that neutralization does not necessarily require purchasing of carbon credits as emissions can be directly neutralized by a company and accounted for as Scope 1 removals.



V. Annex A: Glossary of Key Terms

Annex A: Glossary of Key Terms

TERM	DEFINITION
Abatement	Measures that companies take to prevent, reduce, or eliminate sources of GHG emis- sions within their value chains. ¹
Additionality	A key characteristic of carbon credits, ensuring that carbon emissions are lower than if the project had not been implemented. ²
Article 6	The voluntary cooperation mechanisms that will assist governments in implementing their NDCs as part of the Paris Agreement. They include Internationally Transferred Mitigation Outcomes (ITMOs) between governments, an international carbon market, and the use of development aid. ³ The rulebook for Article 6 is the only part of the Agreement that is yet to be finalized; eligibility of forest units is an open question.
Avoided emissions	Emission reductions that occur outside of a product's life-cycle or value chain, but as a result of the use of that product. Avoided emissions is a relative metric estimated by comparing the climate impacts of a given product, activity, or service against the climate impacts of a reference product, activity, or service. ⁴
Baseline	The business-as-usual scenario the mitigation activity is compared against. The base- line must be robust and realistic. It runs the risk of being inflated to generate more credits. ⁵
Cancellation of a carbon credit	The definitions of cancellation and retirement vary between carbon standards and programs. For the purposes of this work, cancellation refers to a situation in which the carbon credit is put out of circulation without being used towards any particular carbon neutrality or GHG reduction goal. On the other hand, retirement refers to a situation in which the carbon credit is directly used towards a carbon neutrality or GHG reduction of retirement of a carbon neutrality or GHG
Carbon credit	An emissions unit that is issued by a carbon crediting program and represents an emission reduction or removal of greenhouse gases. Carbon credits are uniquely seri- alized, issued, tracked, and cancelled by means of an electronic registry. ⁶

TERM DEFINITION Carbon dioxide removal / greenhouse gas removal gases other than CO₂. have not been tested at scale.7 Carbon neutrality volume of all CO₂ emissions.⁹ Carbon offset nisms than purchasing carbon credits. Carbon Standard / Carbon Standard Setting

Carbon dioxide removal (CDR) refers to the process of removing CO_2 from the atmosphere. Since this is the opposite of emissions, practices or technologies that remove CO_2 are often described as achieving "negative emissions". The process is sometimes referred to more broadly as greenhouse gas removal (GHGR) if it involves removing

There are two main types of CDR: either enhancing existing natural processes that remove carbon from the atmosphere (e.g. by increasing its uptake by trees, soil, or other "carbon sinks") or using chemical processes to, for example, capture CO_2 directly from the ambient air and store it elsewhere (e.g. underground). All CDR methods are at different stages of development and some are more conceptual than others, as they have not been tested at scale.⁷

In the global context, carbon neutrality is the same as net zero carbon dioxide (CO_2) emissions which are achieved when anthropogenic CO_2 emissions are balanced globally by anthropogenic CO_2 removals over a specified period.⁸ But in the sub-global context, companies can achieve carbon neutrality through purchase of carbon credits from activities that reduce, avoid or temporarily capture GHGs equivalent to the volume of all CO_2 emissions.⁹

A carbon offset broadly refers to a reduction in GHG emissions – or an increase in carbon storage (e.g., through land restoration or the planting of trees) – that is used to compensate for emissions that occur elsewhere. A carbon credit that is being used for the purpose of offsetting is a transferrable instrument certified by governments or independent certification bodies to represent an emission reduction of one metric tonne of CO_2 , or an equivalent amount of other GHGs.¹⁰ VCMI recommends avoiding the conflation of offsets and carbon credits as carbon credits can be used for purposes other than offsetting, and offsetting can be accomplished through other mechanisms than purchasing carbon credits.

The term carbon standard is often used to refer to an entity that develops and promulgates standards (i.e. methodologies, protocols, and requirements) that must be adhered to by project developers and applied third-party validators in order for a project to be issued a carbon credit. In this report, we have tried to distinguish between the entity – which we refer to as a carbon standard setting body or entity – and the standards that are promulgated by those entities. Carbon standard setting bodies are also often referred to as "carbon crediting entities" due to the fact they issue and maintain a registry of the carbon credits that they issue.

TERM	DEFINITION	TERM	DEFINITION
Compensation	Measurable climate mitigation outcomes, resulting from actions outside of the value chain of a company that compensate for emissions that remain unabated within the value chain of a company.	Double use	A situation in which the wards achieving climate would use a single emis
Compliance market	A market for carbon offsets created by the need to comply with a regulatory act. Compliance markets include cap-and-trade domestic schemes ¹¹ (e.g. European Union Emissions Trading Scheme, California cap-and-trade, Colombia's carbon tax) and sectoral schemes (e.g. Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).	Double claiming	A situation in which the ferent entities towards in which the emission r emissions unit or credit
Corresponding adjustment	Accounting rule to ensure that when countries trade carbon credits, the credit is counted towards the buyer's Nationally Determined Contribution under the Paris Agreement and detracted from the seller's Nationally Determined Contribution. ¹²	Hard to Abate Sectors	Economic sectors with my. These include heav transport (heavy-duty r
Counterbalance	This is a term used by the World Resources Institute and the Science Based Target initiative in various materials. ^{13,14} In a WRI blog by Andrew Steer and Craig Hanson posted in April 2021 they state: <i>"We tentatively propose 'counterbalance' as a replace-ment for the word 'offset.' The latter implies a least-cost choice or equivalent reduction on the part of the emitter, while the former is intended to capture the notion of voluntary support to decarbonization outside an emitter's value chain, to complement aggressive reduction within the emitter's own Scope 1, 2 and 3 emissions. We are not insisting on this specific term: the terminology is less important than the substance." ¹⁵</i>	Insetting	The term "insetting" ha or remove emissions wi aries. ¹⁶ The Science Ba distinct from efforts to measures are directly a chain emissions as it pi In 2015, the Internation insetting as "a carbon r within a company's sup
Decarbonization	Measures that prevent the release of CO ₂ emissions associated with electricity, industry, and transport.		lated three best practic to claim to be insetting company must invest f project. This project ca
Double counting	A situation in which a single greenhouse gas emission reduction or removal is counted more than once towards achieving climate change mitigation. Double counting can occur through double issuance, double use, and/or double claiming.		ganizations. Secondly, involving the productio uct transportation) and with the supply chain). measurable, and verifia
Double issuance	A situation in which more than one emissions unit or credit is issued for the same emissions or emission reductions. This leads to double counting if more than one of these emissions units or credits is counted towards achieving climate change miti- gation. This can occur, for instance, when the same project is registered under two different carbon programs or twice under the same carbon program. This situation can lead to double issuance if carbon programs do not implement proper controls to	Internationally Transferable Mitigation Outcomes (ITMO)	Carbon credits provide transferred between co Commitments (NDCs).
	ensure that, if a project is registered with more than one program, offset credits are cancelled by one program before offset credits are issued by another program for the same emission reductions or removals.	Jurisdictional approach	A sub-national or natio This includes a baseline

same emissions unit or carbon credit is counted twice toe change mitigation. This could, for example, occur if an entity ssions unit or carbon credit to fulfil two different purposes.

same emission reduction or removal is claimed by two difachieving climate change mitigation, e.g. once by the country eduction or removal occurs, and once by the entity using an , such as an airline operator under CORSIA.

relatively higher abatement costs than the rest of the econoy industry sectors (cement, steel, chemicals) and heavy-duty oad transport, shipping, aviation).

s been used to refer to a company's efforts to prevent, reduce, ithin its own supply chain, but outside of its operational boundsed Target initiative considers such insetting measures to be "neutralize" or "compensate", instead proposing that insetting ccounted for in a company's efforts to abate all of its supply ursues its net zero target.¹⁷

al Carbon Reduction and Offset Alliance (ICROA) defined eduction project, verified by an offset standard, which occurs pply chain or supply chain communities". ICROA also formuces in the use of insetting as a management strategy. Firstly, and account for reduced or removed emissions accordingly, a inancially in the development and maintenance of the insetting n be developed by the company, its suppliers, or third-party orthe investment project must involve a supply-chain activity (i.e. n or sourcing of raw materials, product transformation, or prodthe supply chain community (all stakeholders with a direct link Lastly, the activities covered must generate additional, unique, ole emissions reductions.¹⁹

d under Article 6 of the Paris Agreement that can be ountries as a means to meeting Nationally Determined

nal set of rules to create carbon assets from REDD+ activities. e, a national or subnational registry and potential rules for

TERM	DEFINITION	TERM	DEFINITION
Jurisdictional approach continued	trading or seeking payments for results. Traditionally, results-based finance for REDD+ has been dependent on jurisdictional setups. ²¹ These minimize the risk of leakage, inflated baselines and double counting.	Nesting	The integration of forest carl allowing them to continue ge Peru's market is an example
Leakage	Leakage occurs when a carbon offset project displaces emission-creating activities to outside the project boundary, rather than halting them in actual terms. ²²	Net zero CO ₂ emissions	Net zero carbon dioxide (CO emissions are balanced glob period. Net zero CO ₂ emissic
Mitigation contribution	Refers to an approach in which companies either make a financial contribution to an emissions reduction or removal activity or they purchase carbon credits with the ob- jective of contributing to climate change mitigation outside of their value chain. Such contributions or purchases currently may or may not be used for offsetting purposes. If they are used for offsetting purposes, there is substantial debate about whether they can simultaneously be used by host country to achieve its NDC (see double counting and double claiming above).	Net zero emissior	Net zero emissions are achie to the atmosphere are balan Where multiple greenhouse sions depends on the climat (such as global warming pote as well as the chosen time h
Nationally Determined Contributions (NDCs)	Climate mitigation and adaptation targets set by countries as part of the Paris Agree- ment developed at COP21 in 2015. NDCs constitute a commitment by each country to outline their climate plan post-2020. ²³	Neutralization	Measures that companies ta counterbalance the impact o company, that remains unab Or neutralize:
Natural climate solutions	Natural climate solutions (NCS) can be considered as a subset of nature based solu- tions with a specific focus on addressing climate change. NCS has been defined as "conservation, restoration, and/or improved land management actions to increase car- bon storage and/or avoid greenhouse gas emissions across global forests, wetlands, grasslands, and agricultural lands." ^{24,25}		Defined by the Oxford Englis ing an opposite force or effe in the atmosphere, neutraliza tive emissions. ³²
Nature-based solutions	Nature based solutions (NBS) are actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. ²⁶	No or limited overshoot of 1.5°	Non-overshoot pathways de C Change (IPCC) 1.5°C special level (concentration, forcing, until 2100)." ³³
Nature positive	Nature-positive means halting and reversing nature loss by 2030, measured from a baseline of 2020. ²⁷	Offset / Offsettin	g The act of compensating or leased to the atmosphere th equivalent amount of GHG e of the organization or a parti
Negative emissions	Removal of greenhouse gases (GHGs) from the atmosphere by deliberate human activities, i.e. in addition to the removal that would occur via natural carbon cycle processes.		form of purchasing a carbon an amount of carbon credits compensated. ^{34,35}

bon projects into jurisdictional REDD+ programs, while enerating and trading carbon units outside the jurisdiction. of this approach.²⁸

 p_2) emissions are achieved when anthropogenic CO₂ ally by anthropogenic CO₂ removals over a specified ons are also referred to as carbon neutrality.²⁹

eved when anthropogenic emissions of greenhouse gases need by anthropogenic removals over a specified period. gases are involved, the quantification of net zero emiste metric chosen to compare emissions of different gases ential, global temperature change potential, and others, norizon).³⁰

ake to remove carbon from the atmosphere in order to of a source of emissions, within the value chain of the nated.³¹

sh Dictionary as "making (something) ineffective by applyct." With respect to halting the accumulation of emissions ation of unabated emissions can only occur through nega-

scribed in the Intergovernmental Panel on Climate report are: "Pathways that stay below the stabilization or temperature) during the time horizon of interest (e.g.

cancelling out all, or a portion of, the GHG emissions rerough investments in activities that reduce or remove an emissions and which are located outside the boundaries cular product system. Such investments are often in the credit. Offsetting is effected by purchasing and retiring equivalent to the volume of GHG emissions that is being

TERM	DEFINITION	TERM	DEFINITION
Offsetting as substitution	The act of purchasing carbon credits to be used as a substitute for within value chain emissions abatement without having a net zero abatement pathway in place.	Retirement of carbon credits	"Retiring" a carbon credit des count. The owner of the carb those emissions to meet its c
Permanence	The capacity of reduced emissions not to re-enter the atmosphere. In practical terms, this means giving the buyer the confidence that declared emissions reductions will not be reversed by a future event (e.g. that the forest will be cut down). ³⁶	Science-based targets	Targets that are in line with v the goals of the Paris Agreer pre-industrial levels and purs
Project-based approach to REDD and REDD+	Carbon assets are generated based on an independently established baseline. Project-based approaches are seen to carry a higher risk of leakage, permanence, and inflated baselines. Independent standards, such as those developed by the Verra, Gold Standard or Planet Vivo, have developed leakage and permanence methodologies and continuously improve them.	Shared socio- economic pathways (SSPs)	Shared socioeconomic pathy with varying socioeconomic of narratives, the SSPs describe mate policy intervention, con (SSP3), inequality (SSP4), fo
REDD and REDD+	REDD refers to reducing emissions from deforestation and forest degradation; ³⁷ REDD+ refers to reducing emissions from deforestation and forest degradation, and conservation of forest carbon stocks, sustainable management of forests, and en-		development (SSP2). ^{47,48,49} Th and representative concentra an integrative frame for clima
	hancement of forest carbon stocks. ³⁸ In 2013 the Warsaw Framework was formalized providing guidance to countries developing REDD+ plans, monitoring systems, base- lines and safeguards. These guidelines are not intended to guide transactions.	Validation and Verification Bodies (VVBs)	Independent organizations d of mitigation activities and ve fication of other social and e
Removals (or anthropogenic removals)	Anthropogenic removals refer to the withdrawal of GHGs from the atmosphere as a result of deliberate human activities. These include enhancing biological sinks of CO ₂ and using chemical engineering to achieve long-term removal and storage. ³⁹	Value chain emissions	A company's Scope 1, 2, and standard. ⁵¹
Representative concentration pathways (RCPs)	Scenarios that include time series of emissions and concentrations of the full suite of greenhouse gases (GHGs) and aerosols and chemically active gases, as well as land use/land cover. ⁴⁰ The word representative signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing character-istics. The term pathway emphasizes the fact that not only the long-term concentra-	Verified emissions reductions (VER)	Carbon offsets exchanged in tary certification process usin cation standards include VC major firms.
	tion levels but also the trajectory taken over time to reach that outcome are of interest. ⁴¹	Vintage	The year in which the carbor process can take 2—3 years for already-reduced emissior
Residual emissions	Residual emissions are emissions sources that remain unabated by the time net zero is reached in 1.5°C mitigation pathways with low or no overshoot ⁴² The SBTi is explor- ing a range of approaches for determining residual emissions globally, by sector, and by activity, which will be included in the public consultation of Net Zero Guidance. ⁴³	Voluntary Carbon Market	The voluntary carbon market that are not purchased with market. It does include offset meet carbon neutra <u>l or other</u>

scribes the internal transfer of a unit to a retirement acoon credit can claim to have reduced emissions and use climate commitments.⁴⁴

vhat the latest climate science says is necessary to meet nent – to limit global warming to well below 2°C above sue efforts to limit warming to 1.5°C.⁴⁵

ways (SSPs) were developed to complement the RCPs challenges to adaptation and mitigation.⁴⁶ Based on five e alternative socioeconomic futures in the absence of clinprising sustainable development (SSP1), regional rivalry ssil–fuelled development (SSP5) and middle-of-the-road he combination of SSP-based socioeconomic scenarios ation pathway (RCP)-based climate projections provides ate impact and policy analysis.⁵⁰

uly approved under a carbon standard provide validation erification of emission reductions. It may also include verinvironmental co-benefits.

3 emissions as defined by the GHG Protocol accounting

n the voluntary market usually certified through a volunng a third-party independent standard.⁵² The main certifi-S, CCB, Gold Standard, Planet Vivo, and auditors include

n emission reduction took place. Given the verification from the project inception, projects may generate credits ns. Older vintage generally sells at a lower price.⁵³

place encompasses all transactions of carbon offsets the intention to surrender into an active regulated carbon ts that are purchased with the intent to re-sell or retire to environmental claims.⁵⁴

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The Voluntary Carbon Markets Integrity Initiative (VCMI) is a multistakeholder platform to drive credible net zero aligned participation in voluntary carbon markets (VCMs).

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