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April 2024
Discussion Paper

What Is the Voluntary Carbon Market – and What Contribution Does It Make to Climate Action?

German National Academy of Sciences Leopoldina
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Union of the German Academies of Sciences and Humanities

Discussion Paper

The voluntary carbon market is a mechanism used for the private funding of climate action projects that has become increasingly widespread in recent years. This Discussion Paper explains how the voluntary carbon market works, and discusses the main points of criticism aimed at this mechanism. Most notably, these are:

- **Quality of the climate action projects:** Many climate action projects do not meet the quality criteria needed to result in an effective reduction in greenhouse gas emissions.
- **Corporate climate strategies:** In many instances, corporate climate targets are not transparent and are incompatible with the 1.5 degrees Celsius goal of the Paris Agreement. Notably, excessive use of carbon credits could lead to companies neglecting to implement measures for reducing their own greenhouse gases.
- **Regulation:** The voluntary carbon market is virtually unregulated at present. The lack of binding quality criteria is exacerbating the existing problems.

The future of the voluntary carbon market is uncertain. Structural as well as supply- and demand-side factors will determine how this mechanism and its contribution to climate action evolve in future.

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Fact sheet / April 2024

What is the voluntary carbon market – and can it make an effective contribution to climate action?

What is the voluntary carbon market?

The voluntary carbon market is a mechanism used for the private funding of climate action projects and does not form part of an emissions trading scheme, such as the EU Emissions Trading System. Carbon credits are offered on the market and acquired mainly by private actors. An carbon credit equates to saving one tonne of greenhouse gas emissions, which are supposedly offset in this way. The credits are generated by climate action projects that claim to avoid the release of greenhouse gases or remove carbon dioxide from the atmosphere.

Who uses carbon credits – and what for?

The main buyers of carbon credits are companies who wish to offset their own greenhouse gas emissions. They use the credits to meet self-imposed climate protection targets, such as 'climate neutrality'. Companies follow this and other climate strategies chiefly to satisfy the demand for greater climate action from consumers and investors.

For the first time, the German Energy Efficiency Act passed in 2023 also includes regulatory benefits for companies considered to be 'climate neutral'. The German government is currently drawing up the requirements for being defined as a climate-neutral company.

Opportunities and challenges

In theory, carbon credits allow non-state actors to get involved in efforts to protect the climate beyond their own value chain. Since the market's creation, around EUR 10 billion has been generated in this way for carrying out climate action projects. In practice, however, the voluntary carbon market only has a very limited impact on climate action. The main reasons for this are:

Supply: Many climate action projects make a smaller contribution to climate protection than indicated by the carbon credit as they fail to meet certain quality criteria, such as additionality and permanence.

Demand: Carbon credits offer companies a relatively easy way to meet their self-imposed climate targets. This can lead to companies neglecting to implement measures for lowering their own greenhouse gas emissions.

Structure: There are no public supervisory authorities to lay down the quality criteria for carbon credits and assess the quality of the regulations. To date, this task has only been performed by private initiatives. Such inadequate regulation can aggravate problems.

The future of the voluntary carbon market is uncertain

The future evolution of the voluntary carbon market and its contribution to climate action primarily depend on

- how the market is regulated in future, both nationally and internationally,
- whether climate action projects succeed in demonstrably meeting high standards of quality in future,
- the future role played by carbon credits within the context of corporate climate action strategies and the extent to which alternative climate action strategies are implemented.

Academies' Project "Energy Systems of the Future" (ESYS) | Contact: Claire Stark (energiesysteme@acatech.de)

1 Introduction

The worsening effects of climate change show that the international community's efforts to protect the climate are insufficient at present. So it is all the more important for non-state actors to also get increasingly involved in climate action. This greater involvement has led to a sharp increase in the use of schemes for **offsetting greenhouse gas emissions** (carbon offsetting) in recent years. Carbon credits generated by climate action projects around the world are used for offsetting. These carbon credits are issued and traded on the voluntary carbon market (also known as the voluntary market) by private actors outside of the regulated and mandatory emissions trading systems (compliance markets). In theory, an carbon credit equates to saving one tonne of greenhouse gas emissions.

Since the creation of the voluntary market, around USD 10 billion of carbon credits have been traded. This has provided additional private capital, some of which has gone into **funding climate action projects**. In this way, the market contributes to the **private funding of climate action**, which could play a key role in tackling climate change.[1]

However, the voluntary market is not harnessing its full potential in its current form. The question of whether climate action projects on the voluntary market really help to curb climate change, and to what extent, depends on whether they meet certain **quality requirements**. Investigations have revealed that many of the climate action projects funded by carbon credits do not comply with these criteria adequately, or at all. The demand side – in other words, how the carbon credits are used – also comes in for criticism, with experts claiming that market participants simply use **offsetting** while neglecting to make efforts to **avoid** and **reduce** their own emissions. Consequently, the question of whether the voluntary market will continue to grow in future and will be able to make a meaningful contribution to climate action largely depends on whether these and other issues presented in this paper can be resolved.

This publication begins by categorising the various **carbon markets** and describing how the voluntary market fits into the overall picture. It then explains and analyses the **structure and operation** of the voluntary carbon market, along with its **climate action projects** (supply side) and the **use of carbon credits** (demand side). The statements contained in this paper are based in part on findings from a workshop organised by the joint academies' project "Energy Systems of the Future" (ESYS)[2] and on the analysis of current literature.

1 See Boehm et al. 2022.

2 The workshop took place on 31.01.2023. It was attended by the following participants: Dr. Munib Amin (E.ON), Miriam Borgmann (ESYS Project Office | acatech), Verena Cordes (Siemens Energy), Prof. Dr. Matthias Finkbeiner (Technical University of Berlin), Prof. Dr.-Ing. Manfred Fischedick (ESYS Board of Directors | Wuppertal Institute), Sabine Frank (Carbon Market Watch), Jörn Gierds (ESYS Project Office | acatech), Prof. Dr. Hans-Martin Henning (ESYS Board of Directors | Fraunhofer ISE), Nicolas Kreibich (Wuppertal Institute), Lars Kroeplin (Lufthansa), Prof. Dr. Ellen Matthies (ESYS Board of Directors | Otto-von-Guericke University), Dr. Sebastian Öttl (WWF), Dr. Johannes Pfeiffer (ESYS Project Office | acatech), Prof. Dr. Karen Pittel (ESYS Board of Directors | Ifo Institute), Klaus Schmidt-Dannert (Shell), Gesa Schöneberg (Stiftung Allianz für Entwicklung und Klima), Prof. Dr. Charlotte Streck (Climate Focus), Dr. Cyril Stephanos (ESYS Project Office | acatech), Dr. Tudor Vlah (Wettbewerbszentrale), Carsten Warnecke (New Climate Institute). This paper does not reflect the views of individual workshop participants; rather it was drawn up by the authors nominated for the paper as a follow-up to the workshop and on the basis of its results.

2 Overview of the various carbon markets and how they work

2.1 What types of carbon market are there?

There are basically two different types of carbon market (see Figure 1).

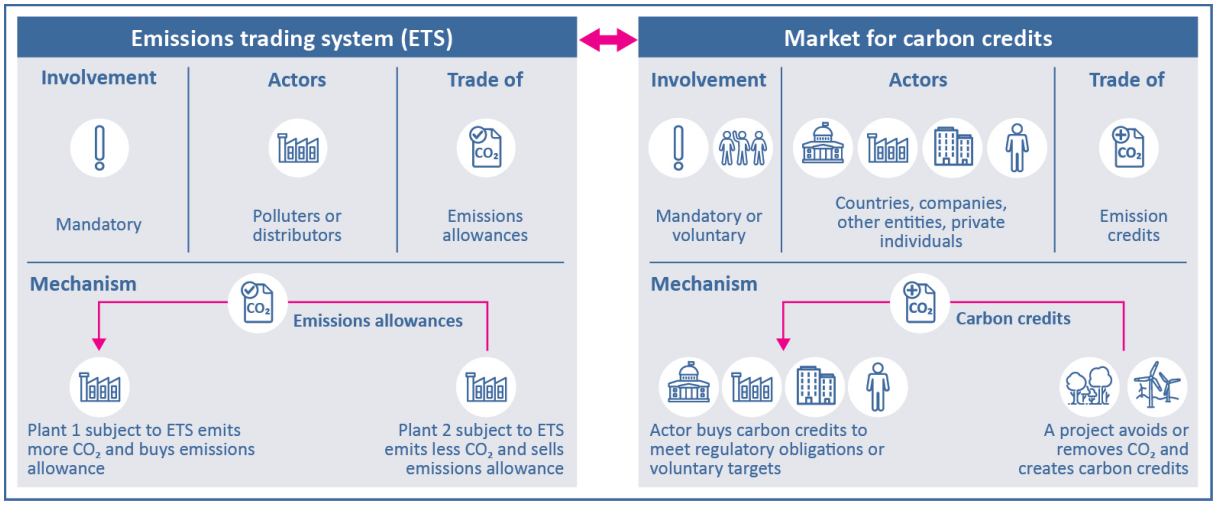

Figure 1: Distinction between emissions trading systems and markets for carbon credits (own diagram)

Emissions trading systems: A number of countries along with the EU operate emissions trading systems. Under such schemes, participants in emissions trading have a **regulatory obligation** to possess emissions allowances for the greenhouse gas (GHG) emissions they cause.[3] Together with carbon taxes, emissions trading systems constitute the main climate action tools in many countries. A total of 34 emissions trading systems were in operation around the world in 2022. In addition to this, carbon taxes had been implemented in a further 37 countries.[4] The two GHG pricing mechanisms together cover around 23 per cent of global GHG emissions. There is considerable variation in pricing, however, and prices are rather low overall: over half of all emissions allowances cost less than USD 10 (approx. EUR 9.30 as at November 2023) per tonne of carbon dioxide equivalent, while prices on the EU ETS, for example, averaged over EUR 70 per tonne of CO_2 equivalent.[5] Although a general increase in prices has been registered over the past few years, prices in the majority of systems are still below the level currently considered necessary to meet the targets set by the Paris Agreement (PA).[6]

Market for carbon credits: Both state and non-state actors can purchase **carbon credits** here and use them for various purposes. The revenue from selling the carbon credits is used by project developers to fund a **climate action project** that is meant to save greenhouse gases equating to the amount of the issued carbon credits. The project does so by either avoiding greenhouse gas emissions or removing greenhouse gases from the atmosphere (see also section 4.1). The voluntary carbon market is a sub-segment of this market (see section 2.2).

3 This applies primarily to emissions of carbon dioxide. Some emissions trading systems take emissions of other greenhouse gases into account too. The EU ETS also sets prices for nitrous oxide and perfluorocarbons (PFCs), for example. And from 2026, the EU ETS will be extended to include methane emissions from shipping. The global warming potential of these greenhouse gases is expressed in terms of the carbon dioxide equivalent. Carbon pricing system is therefore generally used as a simplified term, even if it also refers to other greenhouse gases. This is also true of the voluntary carbon market being considered here, where projects for reducing methane emissions, for instance, are also carried out alongside projects for avoiding and capturing carbon emissions.

4 See World Bank 2022.

5 See International Carbon Action Partnership (ICAP) 2023.

6 See World Bank 2022.

2.2 In what areas is there a demand for carbon credits?

State and non-state actors use carbon credits to achieve **voluntary targets** or to fulfil **regulatory obligations** stipulated by international agreements (Paris Agreement, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)) and national legislation (GHG pricing instruments). There is some overlap between these two demand segments that has an impact on the voluntary carbon market (see also sections 2.3 and 2.4). Figure 2 depicts the resulting demand segments for carbon credits.

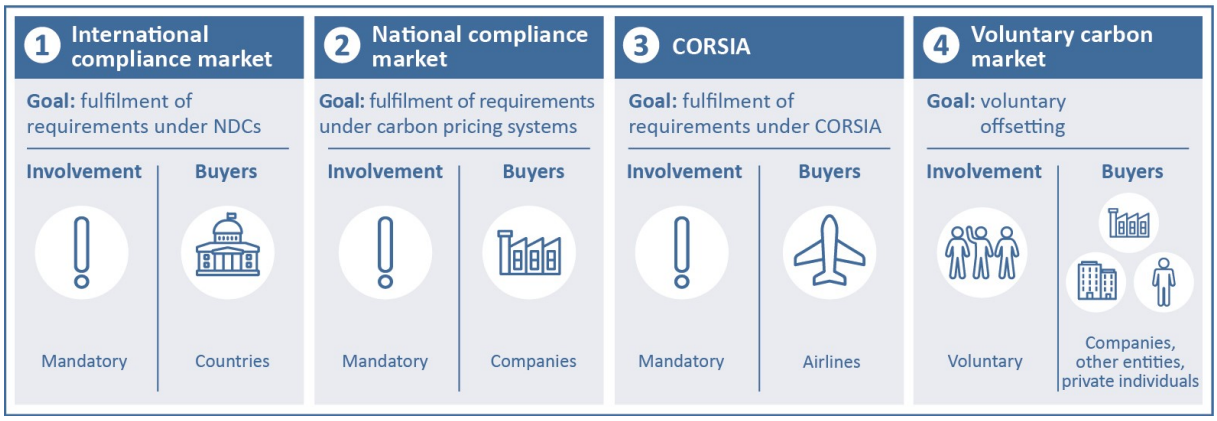

Figure 2: Demand segments for carbon credits (own diagram)

International compliance market (1): Countries can obtain carbon credits under internationally established mechanisms in order to achieve the climate targets set by international agreements (Nationally Determined Contributions or NDCs). 87 per cent of the signatory states to the Paris Agreement have expressed an interest in participating in such an international compliance market and using carbon credits to help meet their climate targets. Some countries have already started to develop corresponding projects. Other actors, on the other hand, such as the EU and USA, have ruled out the possibility of using carbon credits to achieve climate goals.[7]

National compliance market (2): Companies purchase carbon credits to fulfil the requirements imposed by the national GHG pricing mechanism they are governed by. This therefore leads to the two types of carbon market described in section 2.1 intersecting. Carbon credits can currently be used to meet GHG pricing mechanism targets in California, Chile and South Africa, for example.

CORSIA (3): CORSIA is a system for offsetting the carbon emissions from international civil aviation and has been implemented by the International Civil Aviation Organization (ICAO, a sub-agency of the United Nations). Under the CORSIA scheme, aircraft operators purchase carbon credits to offset the proportion of their CO_2 emissions that has resulted from the growth of these operators since 2019 or will result from their future growth. It is planned to implement CORSIA in three separate phases. The voluntary pilot phase that started in 2021 and runs until the end of 2023 requires aircraft operators to offset any emissions exceeding 2019 levels by means of credits for international flights between the participating countries. 119 countries are taking part voluntarily at present. The first official phase commences in 2024 and finishes in 2026, during which time countries will continue to participate voluntarily. In the project's second phase from 2027 to 2035, all member states will be obliged to participate – with a few exceptions (for example, landlocked

7 See ibid.

developing countries).[8] Projections suggest that CORSIA could generate demand for carbon credits totalling 1.6 – 3.7 gigatonnes of CO_2 between 2021 and 2034.[9]

Voluntary carbon market (4): Unlike the international and national compliance markets or the CORSIA scheme, actors on the voluntary carbon market are not obliged to use the carbon credits for fulfilling government requirements (such as reducing greenhouse gas emissions). Participants, such as companies, private individuals or other entities, voluntarily purchase carbon credits to offset their own emissions. This paper examines this particular segment in greater detail from section 3 onwards.

2.3 How are carbon credits created?

A climate action project must be certified in accordance with appropriate standards before it can generate carbon credits. **Three possible mechanisms** are available for doing this (see Figure 3).

Figure 3: Certification standards for carbon credits (own diagram). The stated market shares refer to the percentage of carbon credits issued worldwide.

International certification standards (a): The two most important international certification standards to date, the Clean Development Mechanism (CDM) and Joint Implementation (JI), originated from the Kyoto Protocol. The CDM mechanism certified the trading of carbon credits between industrial and developing countries, while the JI standard applied to trade between industrial countries. Approximately ten per cent of the carbon credits offered in 2022 were still created under the CDM.[10]

The Paris Agreement (PA) redefined the rules for trading and transferring carbon credits. PA Article 6.2 allows accounting units known as Internationally Transferred Mitigation Outcomes (ITMOs) to be traded directly between the signatories. This is of particular importance for the voluntary carbon market, as carbon credits with corresponding adjustments must be traded under the accounting regime set out by Article 6.2 (see section 4.4). The regulations contained in PA Article 6.4 constitute the follow-up mechanism to the CDM. Projects certified by the CDM can, however, be transitioned to the PA Article 6.4 mechanism under certain circumstances. One criticism voiced by experts is that this could lead to a large number of low-quality CDM carbon credits being transitioned to PA Article 6.4.[11]

A Supervisory Body was established in 2022 to monitor the market that is being created under the PA Article 6.4 mechanism. One of the ways PA Article 6.4 is intended to help climate action is for two per cent of the carbon credits certified under this mechanism to be cancelled without being used. It is not clear when it

8 See German Emissions Trading Authority (DEHSt) 2023.
9 See Hood 2019.
10 See World Bank 2022.
11 See Dufrasne 2021.

will be possible to start issuing and trading carbon credits under the PA Article 6.4 mechanism, as this is dependent on the Supervisory Body first establishing rules for implementation.

National, regional and sub-national certification standards (b): There are around 25 national, regional and sub-national certification standards that account for about 15 per cent of the carbon credits offered worldwide.[12] The California Compliance Offset Program and Australia's Emissions Reduction Fund are the largest such schemes.

Private certification standards (c): Private certification standards are together responsible for issuing approximately 75 per cent of carbon credits. There has been a particularly sharp increase in certification using private certification standards since 2018 (see chapter 3.1). The private certification programmes Verified Carbon Standard and Gold Standard register the largest shares here, with 62 per cent and nine per cent of all carbon credits respectively. Unlike the other certification standards available, there is no public supervisory authority for private certification standards (see section 3.3).

2.4 What overlap is there between the segments of the market for carbon credits?

The segments of the carbon credit market described in sections 2.2 and 2.3 **intersect** at various points, and this also has an impact on the **voluntary carbon market**. This applies particularly to any implications arising from international agreements.

Many of the certification standards are authorised for more than one demand segment (see Table 1). The carbon credits issued by these standards can therefore be used across different demand segments. For example, carbon credits that have been issued by a private certification programme (such as Gold Standard) could count towards obligations under CORSIA if necessary. This becomes particularly apparent in the case of the voluntary carbon market, where carbon credits issued by any certification standard can basically be used.

12 See World Bank 2022.

	1 International compliance market	2 National compliance market	3 CORSIA	4 Voluntary carbon market
a International certification standards	✓ Only authorised mechanism Aber: e.g. EU has ruled out use of credits	✓ Only possible in South Korea up to now	✓ Possible with restrictions	✓ Possible
b National, regional, sub-national certification standards	✗	✓ Fundamental mechanism (e.g. in Chile, California)	✗	✓ Possible in principle
c Private certification standards	✗	✓ Possible in some cases if projects carried out locally (e.g. in South Africa)	✓ Possible with restrictions	✓ Fundamental mechanism

✗ Credits cannot be used; ✓ Credits can be used in principle, but with restrictions in some cases

Table 1: Requirements of the different demand segments in terms of certification standards (own diagram)

The way in which the voluntary market is interlinked with national and international compliance markets is constantly evolving. The same is true of the link between the Paris Agreement and the voluntary market: it remains to be seen whether the regulations contained in the Agreement will also come into force on the voluntary market in future and to what extent. This has a particular bearing on whether **corresponding adjustments** are applied (see section 4.4).

The following sections examine the voluntary carbon market and the private certification standards that are of particular interest for this market segment in greater detail.

3 Basis and structure of the voluntary carbon market

3.1 How big is the voluntary carbon market?

Carbon credits have been traded on the voluntary market since the 1990s. During that time, a total of around EUR 10 billion has been generated.[13] In 2021, the annual volume **topped USD 2 billion for the first time**.[14] Market **growth was almost continuous** until 2021 and accelerated notably from 2017. This increase in pace was partly down to the adoption of the Paris Agreement and the heightened level of ambition this brought. It also prompted non-state actors to become more ambitious with regard to climate action. This is reflected by, among other things, the number of businesses adopting climate neutrality targets, which has more than doubled in the past two and a half years among the world's 2,000 largest listed companies.[15] However, 37 per cent of these companies have still not set any targets for reducing their greenhouse gas emissions.[16]

Figure 4 illustrates how the voluntary market has grown based on the number of issued and retired carbon credits contained in the registries of private certification programmes. There is no general public registry for all carbon credits. Carbon credits are recorded in the certification programme's registry as **issued** as soon as the carbon credits for a project have been certified and are offered for sale. These carbon credits can be acquired by either intermediaries or end users (buyers). Carbon credits are not **retired**, however, until the end user has accounted for the purchased credits. Once this has been done, retired carbon credits may not be claimed by any other participants.[17]

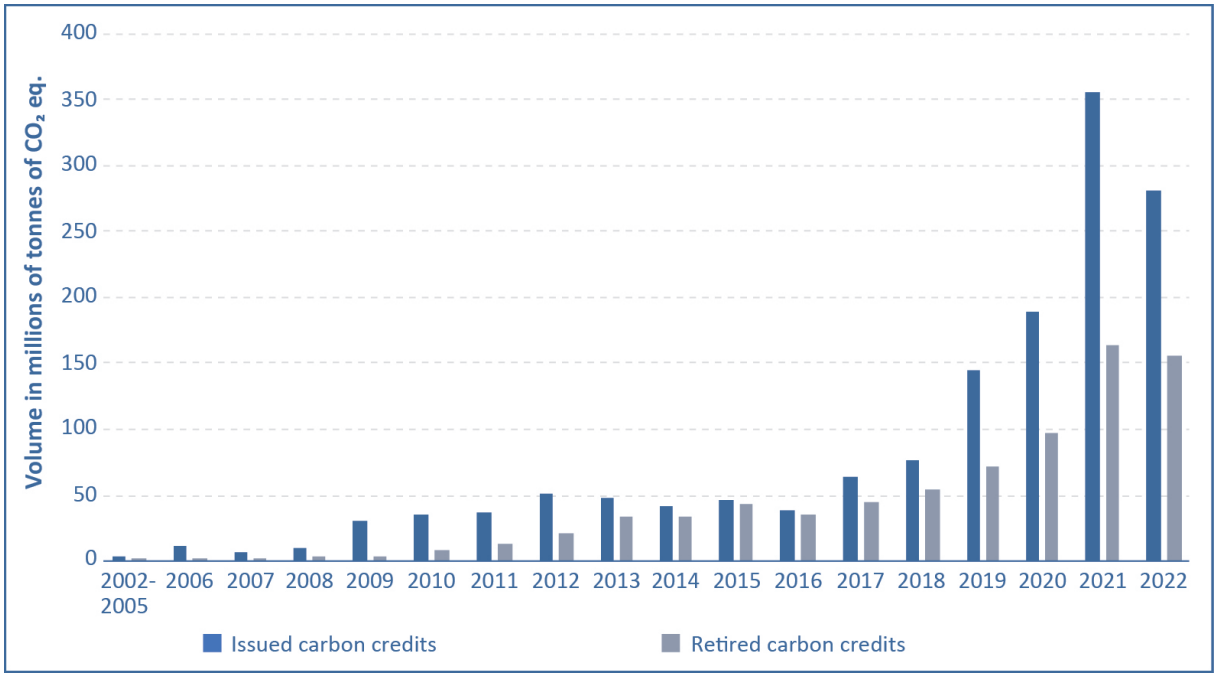

Figure 4: Number of carbon credits on the voluntary carbon market recorded in the registries of private certification programmes and retired[18] (own diagram, data: Climate Focus 2023)

13 See Ecosystem Marketplace 2022.
14 See ibid.
15 See Net Zero Tracker 2023.
16 See ibid.
17 See German Environment Agency (UBA) 2020.
18 Diagram shows carbon credits from the private certification programmes American Carbon Registry, Climate Action Reserve, Climate Forward, Global Carbon Council, Gold Standard, Plan Vivo and Verified Carbon Standard.

Since 2002, private certification programmes have recorded **over 1.6 billion carbon credits** (each for 1 tonne CO_2 eq.) in their registries. This amounts to more than double Germany's total CO_2-equivalent emissions in 2022 (746 million tonnes of CO_2 eq.).[19] Figure 4 also highlights the growing **gap between issued and retired carbon credits**. Only around half of all issued carbon credits (853 million) had been retired by 2023. The high number of non-retired carbon credits still available on the market can put downward pressure on prices on the voluntary market.

The voluntary market's growth stalled in 2022 (see Figure 4). Forecasts nevertheless expect the voluntary market to continue to grow strongly in future,[20] although this is dependent on a large number of factors (see section 6).

Focus on: Prices and pricing on the voluntary carbon market

Prices on the voluntary market are not transparent at present, as there is neither a common mechanism nor standards for setting prices. They are influenced by, among other things, the type of project used (see section 4.1). There are also differences in pricing between the various certification standards. This led to 2021 prices ranging on average from around USD 2 (approx. EUR 1.90 as at November 2023) for Climate Action Reserve to around USD 12 (EUR 11.20 as at November 2023) for Plan Vivo.[21] Prices in 2023 for the two largest private certification providers, Verified Carbon Standard and Gold Standard, were around USD 4 (approx. EUR 3.70 as at November 2023). If international and national/regional/sub-national certification programmes are also taken into consideration, the variation increases, with a spread from USD 1 (approx. EUR 0.90 as at November 2023) in the CDM to USD 128 (approx. EUR 120.00 as at November 2023) in the Switzerland CO_2 Attestations Crediting Mechanism.[22] These prices do not cover the actual cost of CO_2 damage, which the German Environment Agency estimates at EUR 237 per tonne of CO_2 in 2023.[23] Prices for carbon credits are also generally low compared to prices on the EU ETS (about EUR 80 – 90 per tonne of CO_2 equivalent in 2023).

Surveys have shown that the price of carbon credits is a key purchasing criterion for the majority of end users on the voluntary market.[24] This could have an impact on the projects selected and possibly also on the quality of the projects carried out (see section 4.2). To compound the problem, many different participants are often involved in the trading of carbon credits (e.g. project developers, certification providers and intermediaries). As a result of this, only a fraction of the carbon credit price goes into funding the actual projects in many cases. Surveys have revealed that the average commission fee charged by intermediaries on the voluntary market is around 15 per cent.[25] However, as about 90 per cent of the intermediaries surveyed did not indicate how much commission they charge, experts believe that commission fees are higher in reality.[26] Further investigation has shown that carbon credits have sometimes been resold by intermediaries for more than six times the original cost price.[27] Participants at the ESYS workshop criticised this lack of transparency, which, among other things, could also make it more difficult for end users to identify and select high-quality carbon credits in view of the wide range available on the market.

19 See German Environment Agency (UBA) 2023-1.
20 See Taskforce on Scaling Voluntary Carbon Markets (TSVCM) 2021 and Shell/Boston Consulting Group (BCG) 2022.
21 See World Bank 2022.
22 See ibid.
23 See German Environment Agency (UBA) 2023-2.
24 See Shell/Boston Consulting Group (BCG) 2022.
25 See AlliedOffsets 2023.
26 See ibid.
27 See Barratt/Clarke 2022.

3.2 Who participates on the voluntary carbon market?

Figure 5 shows the main participants on the voluntary carbon market. They are almost all private actors who either gain financially by participating in the market or wish to benefit from offsetting their own emissions.

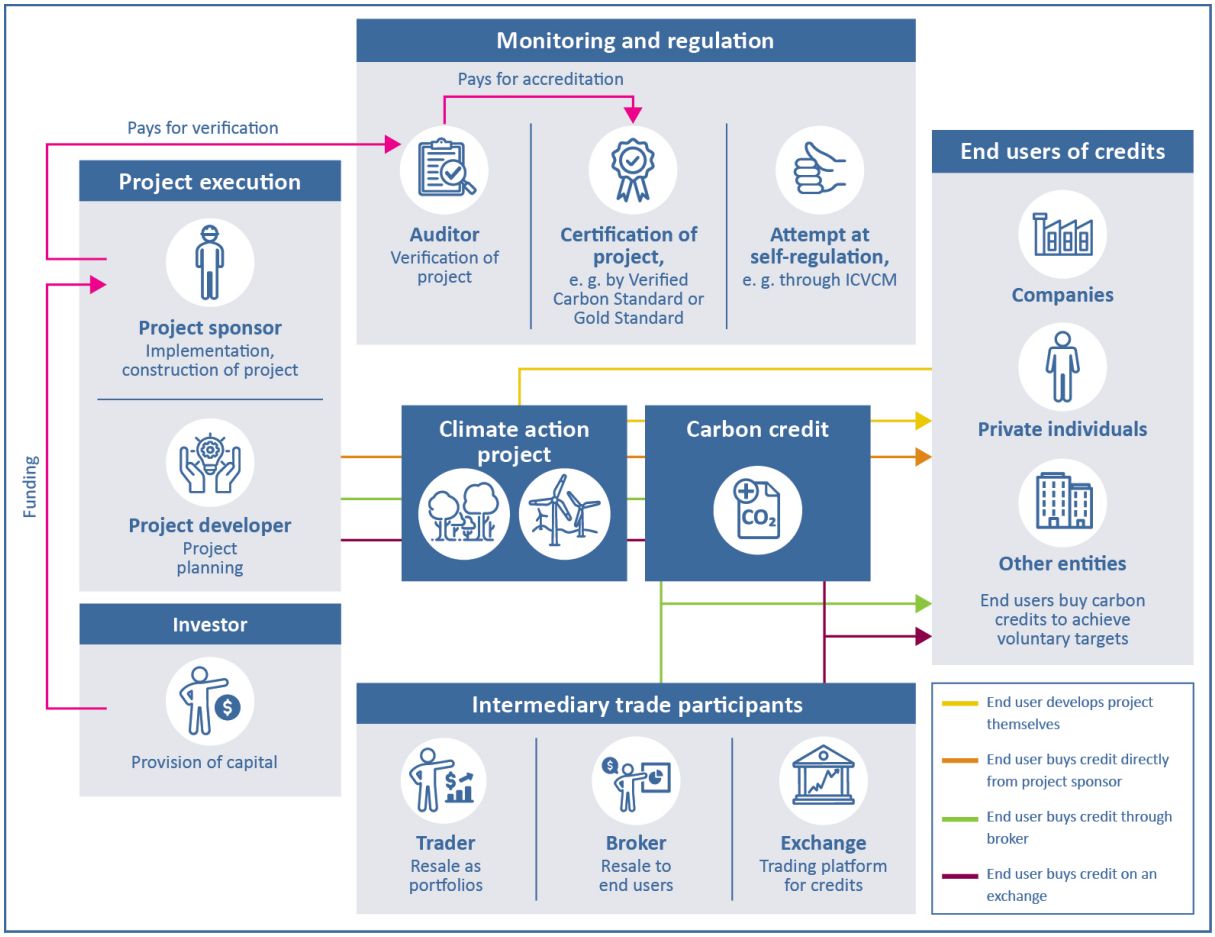

Figure 5: Main participants on the voluntary carbon market and the paths to acquiring carbon credits (own diagram)

Project execution: **Project developers** plan the project, whose aim is to avoid the emission of greenhouse gases or remove them from the atmosphere. **Project sponsors** execute the project (for example, a wind farm or forestry measures). They receive some of the capital required from external **investors**. The carbon credits that are sold are ultimately used for funding climate action projects and paying the parties involved.

Monitoring and regulation: The voluntary market is not subject to state regulation at the current time (for further details, see section 3.3). **Private certification standards** (such as Verified Carbon Standard and Gold Standard) specify criteria for creating, monitoring and certifying climate action projects that generate carbon credits. The carbon credits will only be added to the certification programme's registry once the project has been successfully implemented and its benefit for the climate verified. As explained in section 2.3, carbon credits certified by both private and public (international or national/sub-national/regional) standards can be traded on the voluntary market. **External auditors** are accredited by the certification programme. They validate the climate action project and verify the actual mitigation of emissions achieved. Some certification programmes also stipulate that an independent assessment should take place both at the start of the project and throughout its duration. Besides this, there are also **initiatives** from voluntary market participants that seek to set universal standards for certifying climate action projects (see section 3.3 below).

More recently, there has been a rise in the number of **ratings agencies** that specialise on the voluntary market and evaluate carbon credits.

Carbon credit end users: End users on the voluntary market can be companies, private individuals or other entities. Companies in particular use carbon credits to offset their own greenhouse gas emissions as part of their corporate climate action strategy. Pledges to be "climate neutral" or reach "net zero" play an important role here (see section 5.1). Figure 5 illustrates the different paths for acquiring an carbon credit. End users can develop and execute climate action projects themselves, contact project developers and sponsors directly or purchase the carbon credit via intermediaries (on an exchange or via a broker).

Intermediary trade participants: The majority of the registered carbon credits are traded over-the-counter.[28] **Brokers** play a key role in this. They acquire carbon credits on the behalf of end users then resell the credits to them. There are also professional **traders**, who buy carbon credits and then combine them into portfolios to be resold (e.g. to brokers). In recent times, an increasing number of **exchanges** for trading carbon credits have appeared on the scene. Xpansiv's CBL platform, one of the major exchanges for carbon credits, registered a year-on-year increase in trading volume of nearly 300 per cent in 2021, for example.[29] The introduction of blockchain technologies on the voluntary market in the form of tokenized credits could continue to change the face of trading in future.[30]

3.3 How is the voluntary carbon market regulated?

The voluntary market largely operates **outside of state control**. Neither national regulations nor the Framework Convention on Climate Change (UNFCCC) currently have any significant regulatory impact on the market itself or the actors operating in it. It is true that governments are able to exert some influence over the voluntary market by, for example, issuing guidance on environmental or social standards for the individual climate action projects in their country.[31] In early 2023, for instance, the Finnish government published guidelines that identify best practices for both the development and implementation of climate action projects on the voluntary carbon market and the use of carbon credits.[32]

However, the rules for the voluntary market are defined almost entirely on the basis of **private certification standards**. The voluntary market is therefore largely **unregulated.** Critics point out that this lack of regulation could be partly responsible for the problems on the voluntary market in many cases (see section 4.3).

initiatives have been launched from within the market aimed at setting tougher, more uniform standards for climate action projects and the use of their credits, the most notable of which is the Integrity Council for the Voluntary Carbon Market (ICVCM). This **self-regulation** has so far done little to alleviate the existing problems, though (see section 3.4).

At the start of 2023, the ICVCM developed and published its **Core Carbon Principles**, which are meant to ensure that climate action projects and the associated carbon credits are of a high quality and that the voluntary market upholds high standards of integrity.[33] Four of the principles relate to governance, four to the impact of emissions reduction and two to sustainable development. It is not yet clear how far this new initiative can go towards improving the quality of climate action projects and increasing credibility and

28 See Chen et al. 2021.
29 See World Bank 2022.
30 See ibid.
31 See Greiner et al. 2019.
32 See Laine et al. 2023.
33 See The Integrity Council for the Voluntary Carbon Market (ICVCM) 2023.

transparency on the voluntary carbon market. **Independent initiatives** from actors not involved in the carbon market themselves, such as the Carbon Credit Quality initiative (CCQI) for example, could perhaps offer a more effective way of helping to identify high-quality carbon credits and improving the quality of carbon credits and climate action projects.

3.4 Why is the structure of the voluntary carbon market criticised?

The voluntary carbon market's **lack of regulation** as described in section 3.3 is the opposite of what is needed for climate action in some cases. The **absence of any public supervisory authorities**, for instance, can lead to varying requirements in certification standards. As the aim of project sponsors is to generate as many carbon credits as possible for the project they are carrying out, they could be tempted to select less stringent certification standards. This could also serve as an incentive for project sponsors to exploit loopholes in the regulations, for example by accounting for carbon savings incorrectly (see section 4.4).

The **financial interdependence** between private market participants outlined in section 3.2 could aggravate these problems. For instance, the independence of the auditor could be compromised by the fact that the auditor is financially dependent on the project sponsor.

As described in section 3.2, the large number of participants involved means that projects only receive a **fraction** of the total paid by the end users for the carbon credits in many cases (see "In more detail": "Prices and pricing on the voluntary carbon market"). Intermediaries frequently charge high commission fees. What is more, it is often not clear how much of the funding is actually invested in the project. This inadequate transparency of financial flows together with poor compliance with quality standards (see section 4.3) makes it more difficult for end users to evaluate the climate action projects they are supporting. Critics furthermore claim that participants on the voluntary market are actually aware of the problems in the market, but **do not report on them or do so insufficiently**.[34]

34 See Fischer/Knuth 2023.

4 Supply on the voluntary carbon market: quality criteria and problems of climate action projects

4.1 Which projects generate carbon credits on the voluntary carbon market?

Carbon credits can be generated as part of various kinds of climate action projects. Figure 6 shows the proportion of carbon credits issued on the voluntary market that are accounted for by each project type. A large share of these carbon credits originate from projects for **renewable energies** (36 per cent) and so-called **nature-based solutions** (35 per cent). Other carbon credits are generated through projects with **private households** (e.g. the provision of **sustainable ovens** in developing countries), by **reducing industrial gases** (e.g. eliminating leaks in the gas network) or through waste management (e.g. the capture and utilisation of landfill gas). Among the project types included under "Other" are **CO_2 removal processes** such as Direct Air Carbon Capture and Storage (DACCS).

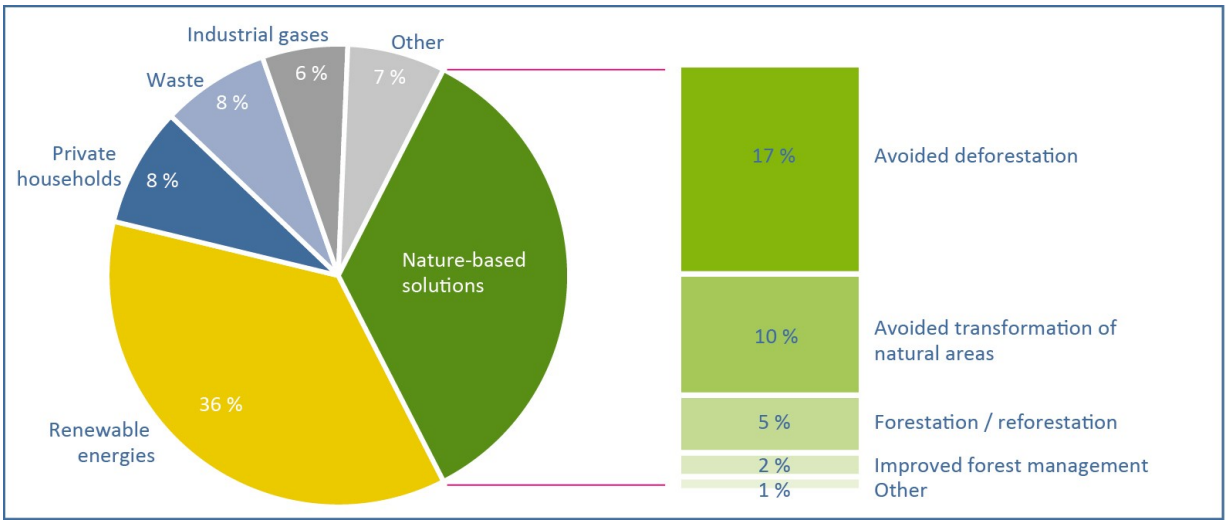

Figure 6: Project categories on the voluntary market[35] (own diagram, data: Climate Focus 2023)

Nature-based solutions refer in particular to projects focusing on sustainable land use that are at the same time intended to contribute to climate protection.[36] Nature-based solutions aimed at protecting forests are additionally included within the REDD+ (Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries) framework. Around **half of carbon credits** linked to nature-based solutions can be traced back to projects aimed at preventing deforestation and a third to projects striving to prevent the transformation of natural areas such as forests, moors and grassland into arable or pasture land.

Projects for the prevention of deforestation or land transformation have attracted particular criticism due to questionable accounting of actual CO_2 emission reductions (see section 4.3). This uncertainty has resulted in **nature-based solutions** being rated and used differently by private certification standard providers. For example, nature-based solutions make up just two per cent of projects at Gold Standard, whereas the figure for Verified Carbon Standard is almost 50 per cent. While carbon credits from climate action

35 All values < 5% were grouped together under "Other". This includes projects with a focus on energy efficiency, fuel switching, CCS, mine gas, and gas processing and utilisation from oil fields. Other activities in the nature-based solutions group ("Other" in Figure 6) with a small share (less than 5%) are projects focusing on carbon storage in agriculture, on reducing emissions in agriculture and on restoration of wetlands.

36 See Stiftung Allianz für Entwicklung und Klima 2021.

projects targeting the prevention of deforestation or transformation of natural areas are generally not certified by Gold Standard, at Verified Carbon Standard they account for approximately 85 per cent of all climate action projects from nature-based solutions.

The majority (over 80 per cent) of carbon credits currently originate from projects aimed at **preventing the generation of greenhouse gases.** In the past, it was only possible to gain carbon credits based on the **removal of CO_2 emissions from the atmosphere** (under 20 per cent) by developing natural sinks – i.e. through forestation or reforestation projects. However, a lack of permanence makes issuing carbon credits via these projects controversial (see section 4.3).

In the recent past, the role of technical CO_2 removal processes has been an increasing topic of discussion in the voluntary market. Companies are hoping this approach will help them gain more effectively measurable and verifiable carbon credits which strengthen the integrity of their climate protection strategy.[37] Companies may therefore also be able to contribute to the research and introduction of technologies which are still in the development phase at present, but which could play an important role in limiting climate change in the future. For example, in May 2023 US bank JPMorgan Chase announced it was acquiring carbon credits from technical CO_2 removal projects to the value of USD 200 million.[38] The companies questioned in a recent survey are expecting that the proportion of carbon credits gained from projects focusing on nature-based or technical removal of CO_2 emissions from the atmosphere will grow from 20 per cent currently to 35 per cent by 2030.[39] Current estimates also suggest that by 2030 some 90 per cent of the demand for permanently captured and stored CO_2 (between 40 and 200 million tonnes of CO_2 in total, according to estimates) will come from the voluntary market.[40]

However, one obstacle is currently the comparatively high costs of technical CO_2 removal processes. As per the start of 2023, these cost on average USD 128 per tonne of CO_2 (or significantly more with certain technologies, such as DACCS) – i.e. several times more than projects prioritising the development of natural sinks and land-based CO_2 removal (on average USD 12 per tonne of CO_2).[41] Should demand among companies for carbon credits from technical CO_2 removal processes rise in the future, this could further reduce costs due to scaling and learning effects.

37 See Shell/Boston Consulting Group (BCG) 2022.
38 See JPMorgan 2023.
39 See Shell/Boston Consulting Group (BCG) 2022.
40 See Mistry et al. 2023.
41 See Hedreen 2023.

4.2 What are the criteria for high-quality carbon credits?

There is no catalogue of mandatory quality criteria for the voluntary market that applies internationally. Table 2 shows the main criteria discussed in publications – sometimes with different emphases. The various certification standards take these quality criteria into account to varying degrees when adding climate action projects to their registries (see section 4.3).

Criterion	Definition
Additionality	A climate action project is additional if it would not have happened without funding using carbon credits.
Permanence	External circumstances such as forest fires may release the greenhouse gases absorbed by a climate action project. Measures should therefore be taken to cover this risk. An important point here is the duration over which the climate action project and potential risks are monitored.
Conservative quantification	Calculation of the emissions saved by a climate action project should use a recognised methodology and be based on conservative estimates.
Transparency and verifiability	The project should be validated by an independent testing centre. The carbon credit should be recorded in a publicly accessible registry. The certification standard should include governance guidelines.
Avoidance of carbon leakage	The implementation of a climate action project should not cause emissions elsewhere.
Compliance with social and environmental standards	Environmental and social standards should be complied with when carrying out a climate action project. Ideally, the project will contribute to as many sustainable development goals as possible.
Transition to net zero emissions	The climate action project should help to achieve global net zero emissions. The technology or processes used should be compatible with a carbon-free/ low-carbon economy, avoid lock-in effects, support innovations and/or lead to transformative change. The country where a climate action project is being carried out should have formulated ambitious goals for achieving net zero emissions.
Avoidance of double counting	Carbon credits should not be double counted. They may therefore only be issued or used once (see section 4.3).

Table 2: Quality criteria for high-quality carbon credits (based on Schneider et al.[42], Shell / Boston Consulting Group (BCG)[43], Blaufelder et al.[44])

42 See Schneider et al. 2020.
43 See Shell/ Boston Consulting Group (BCG) 2022.
44 See Blaufelder et al. 2020.

4.3 Why do climate action projects in the voluntary carbon market attract criticism?

Studies show that, in many cases, carbon credits traded on the voluntary market do not meet the quality criteria set out in section 4.2 – regardless of whether public (e.g. international and national) or private certification standards are involved.[45] Estimates suggest that, with 85 per cent of the carbon credits certified under **CDM**[46] and in 75 per cent of the projects under **JI**, there is a low probability that the additionality criterion has been met.[47] Other studies show that carbon credits certified using **national, sub-national or regional certification standards**, e.g. in California,[48] do not reflect the actual emission reductions achieved. And carbon credits issued according to **private certification standards** have drawn censure too.[49]

REDD+ projects have frequently been the subject of criticism. A recent investigation revealed that just six per cent of the reviewed REDD+ projects that had been certified by the private Verified Carbon Standard led to an additional reduction in CO_2 emissions.[50] This investigation also included carbon credits that had been retired and therefore should have yielded the associated emissions savings by now. These results are supported by other studies of REDD+ projects.[51]

There are various possible causes for the **overvaluation** of REDD+ projects. In many cases, the issue lies in inadequate methodology for **quantifying CO_2 savings**. For example, the deforestation rates assumed by the project sponsors may not reflect the current situation, as they are based on particularly high historical values.[52] The methodology here is also outdated to a degree, as the certification standards stipulate that the reference emissions must be fixed for ten years. This may prevent project sponsors from regularly updating their evaluation criteria. Importantly, there is the incentive for project sponsors to overstate the risk of deforestation or destruction and so generate as many carbon credits as possible. Added to which, certification providers have freedom of choice when it comes to methodology, as there is currently no uniform standard in place. Auditors do examine the issuing of carbon credits, but they only check the correct application of the methodology, not its quality.[53] As well as consistent and high-quality methodology, we are also missing an internationally standardised monitoring system which would allow the actual emissions or emissions savings from climate protection projects to be monitored.[54]

There is also uncertainty – with REDD+ projects in particular – about **the duration** for which climate action projects reduce greenhouse gases. Forestation measures are reversible, i.e. CO_2 storage in this way is subject to direct threats (e.g. deforestation). Other risk factors also come into play – such as fire and pest infestation, which are exacerbated by anthropogenic climate change. For these reasons, there are doubts among experts as to whether nature-based solutions can perform the role of carbon sinks for perpetuity – and even fears that they might become net emitters of CO_2 in the long term.[55] Experts have therefore proposed that, when issuing carbon credits, the timeframe over which the absorption and storage of emissions should be priced in. Additionally, credits could come with a mandatory guarantee that ensures emissions really will be permanently absorbed.[56]

45 See Cames et al. 2016.
46 See ibid.
47 See Kollmuss et al. 2015.
48 See Badgley et al. 2022.
49 See Fischer/Knuth 2023., Greenfield 2023-1 and West et al. 2023.
50 See Greenfield 2023-1.
51 See West et al. 2020, Guizar-Coutiño et al. 2022 and West et al. 2023.
52 See West et al. 2023.
53 See ibid.
54 See Boyd et al. 2023.
55 See Griscom et al. 2017.
56 See Boyd et al. 2023.

REDD+ projects, especially those aimed at preventing deforestation, have also been criticised for not fully accounting for possible **leakage**.[57] After all, protecting a forested area could in turn prompt those responsible to simply move the deforestation to neighbouring areas or, indeed, to other countries with less stringent requirements.[58] However, quantifying leakage in locations relatively close to one another is challenging, as analysis of surrounding areas is often not possible to the degree required.[59]

The majority of carbon credits issued via **Verified Carbon Standard** are based on REDD+ projects (see section 4.1). In view of the problems described, the certification provider has announced that the methodologies employed will be revised.[60] The **Gold Standard** private certification programme excluded the certification of REDD+ projects at an early stage.[61] And the **Federal Ministry for Economic Affairs and Climate Action** has also provided a critical assessment of carbon credits trading based on REDD+ projects.[62]

Beyond those REDD+ projects, a large proportion of carbon credits on the voluntary market are also based on **renewable energy projects**. These attract criticism primarily on account of insufficient **additionality**.[63] As the cost of renewable energies decreased significantly in the past, it is uncertain in many cases whether funding via the voluntary market is necessary to kick-start the development of the relevant projects. Due to the wide-ranging criticism of emissions avoidance projects, some experts favour bringing projects prioritising the removal of CO_2 from the atmosphere (technical or nature-based through e.g. forestation) to the forefront of the voluntary market in future.[64]

Breaches of environmental and/or social standards have also occurred during the implementation of climate action projects in the past.[65] Those projects through which e.g. the local population is displaced sometimes move critics to talk about “climate colonialism”.[66] There are also differences between the certification standards on this point: In an analysis of certified climate action projects which looked into both the reduction of greenhouse gas emissions and other social and environmental criteria, Gold Standard stood out as a positive example.[67] However, carbon credits issued through Verified Carbon Standard or the CDM did not fulfil the criteria adequately.

Regardless of the project type, **double counting** of greenhouse gas emission reductions can occur when issuing carbon credits. This can happen in any of three ways:

- More than one carbon credit can be issued for a single unit of emissions reduction. This is known as “double issuance”.
- One carbon credit can be used twice. This is known as “double use”.
- One carbon credit can be claimed by both the country transferring it and the recipient (a country, company, private individual or other entity). This is known as “double claiming”.

57 See West et al. 2020.
58 See Schneider et al. 2020.
59 See Guizar-Coutino et al. 2022.
60 See Greenfield 2023-2.
61 See Gold Standard 2023.
62 See Wenzel 2023.
63 See Shell/Boston Consulting Group (BCG) 2022.
64 See Boyd et al. 2023.
65 See Greenfield 2023-1.
66 Schlegel/Ziai 2021, p. 28.
67 See Wissner/Schneider 2022.

To avoid **double claiming** of carbon credits, **corresponding adjustments** can be applied (see section 4.4). However, the majority of the carbon credits traded on the voluntary market are offered without corresponding adjustments and therefore counted twice – serving both the emissions reduction goals of the country in which the project is taking place and the climate targets of the end user on the voluntary market.

4.4 What are corresponding adjustments and what role do they play for the voluntary carbon market?

Corresponding adjustments prevent **double claiming** of carbon credits by ensuring the country selling the carbon credit doesn't use the resulting mitigation of emissions for its own emissions accounting (or to count towards their NDC targets). The carbon credit is used solely by the end user (country, company, private individual or other entity) for meeting their climate targets.

The **replacement of the Kyoto Protocol with the Paris Agreement** has far-reaching implications for double counting and the application of corresponding adjustments. This is because, under the Kyoto Protocol, only industrialised nations (Annex B countries) had an obligation to meet emissions reduction targets, and not developing countries. Many of the climate action projects funded using carbon credits took place in developing countries but these countries did not have their own climate targets, which often precluded the possibility of double counting. Under the Paris Agreement, however, all signatories have binding national climate targets (NDCs), increasing the likelihood of double counting.

Corresponding adjustments are used in the international compliance market, where they are applied using accounting units known as Internationally Transferred Mitigation Outcomes, or **ITMOs**, in accordance with Article 6.2 of the Agreement. ITMOs are already being traded. Switzerland, for instance, has signed corresponding agreements with countries including Ghana and Peru.[68] Carbon credits used under CORSIA must also apply corresponding adjustments and may not be counted twice. Article 6.4 of the Paris Agreement, however, states that there will also be carbon credits without any corresponding adjustments (mitigation contribution A6.4ERs).

Figure 7 illustrates how corresponding adjustments work.

68 See Federal Office for the Environment (FOEN) 2023.

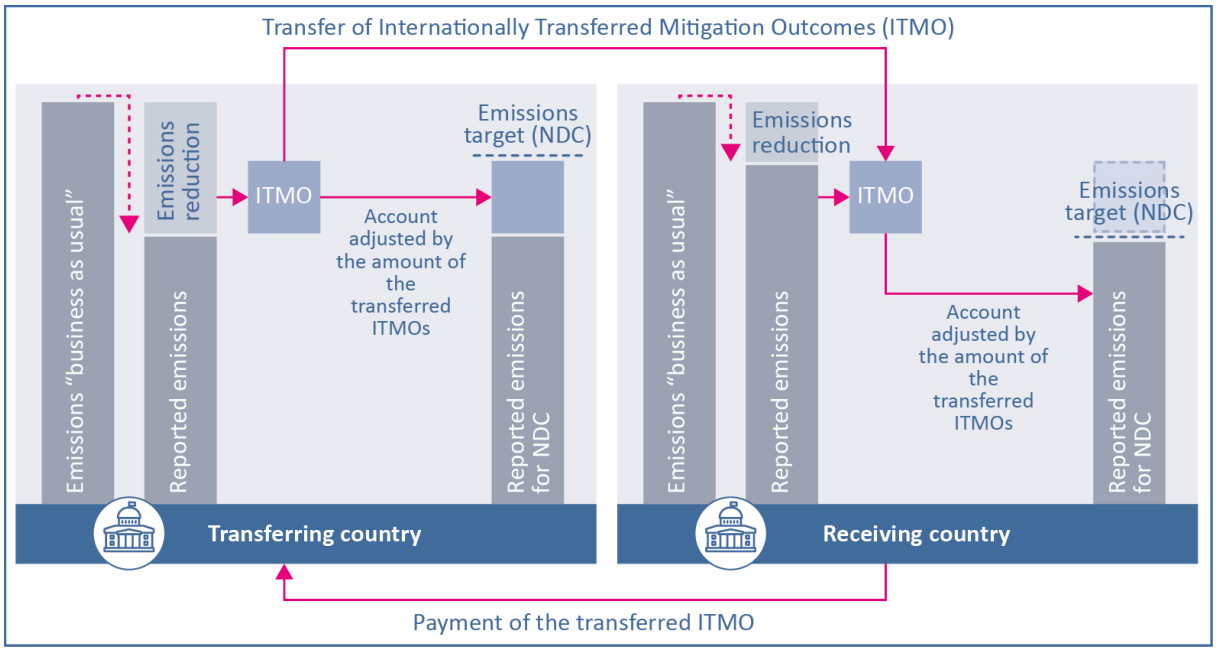

Figure 7: Simplified illustration of corresponding adjustments (own diagram)

It remains to be seen whether **corresponding adjustments** are also set to be used **on the voluntary market** in future and to what extent. Rather than double counting for the international climate protection targets (NDCs) of different countries, the issue here is potential double counting across different "systems". In other words, the emissions mitigation is used to count towards both the emissions reduction targets of the country in which the project is taking place and the private (especially corporate) climate targets of the end user on the voluntary market. This type of double counting could complicate the task of **evaluating the global GHG mitigation effects achieved by the carbon markets**.[69]

Most participants on the voluntary carbon market consider the prevention of double counting to be a key challenge[70], and a number of individual players, such as Gold Standard, have taken a firm stance against potential double counting.[71] The **Core Carbon Principles published by the ICVCM** at the start of 2023, on the other hand, do not make any recommendations either for or against the use of corresponding adjustments for carbon credits. However, another work programme organised together with the Voluntary Carbon Markets Integrity initiative (VCMI) is intended to examine this question.[72] Some countries have already adopted a clear position: in 2021, a group of nations including Switzerland, Colombia, Costa Rica, Finland and Peru signed the San José Principles, which stipulate the use of corresponding adjustments for all carbon credits, including those on the voluntary market.[73]

The question of whether corresponding adjustments are needed depends not least on **what the carbon credit is being used for**. Experts argue that corresponding adjustments are required when carbon credits are being used to help reach climate neutrality targets. If they are being used towards NDCs, on the other hand, there is no need for corresponding adjustments (see section 5.3).

69 See Greiner et al. 2019.
70 See ibid.
71 See Crook 2022.
72 See The Integrity Council for the Voluntary Carbon Market (ICVCM) 2023.
73 See Dirección de Cambio Climático 2023.

5 Demand in the voluntary carbon market: use of carbon credits and corporate climate strategies

5.1 Why do actors in the voluntary carbon market use carbon credits?

End users of carbon credits on the voluntary market are generally looking to **offset** their own emissions. Both private individuals and, in particular, organisations acquire carbon credits for this purpose. The public sector can also be included here.[74] But first and foremost, it is companies who feature as end users on the voluntary market. Some 90 per cent of the demand for carbon credits in Germany in 2019 came from companies, of which a considerable proportion are small and medium-sized companies.[75]

The number of climate targets among the largest 2,000 global companies has more than doubled in the past two and a half years.[76] More than 11,000 non-state actors have now signed up to the UNFCCC's "**Race to Zero Initiative**".[77] Among the conditions for companies seeking to join the initiative is a commitment to achieving net zero greenhouse gas emissions by 2050. Other international initiatives include "**Climate Neutral Now**" launched by the UNFCCC secretariat and "**The Climate Pledge**" initiative founded by Amazon and others. In Germany, there are also private-sector initiatives at federal (e.g. "Wirtschaft pro Klima") and regional level (e.g. "Klimabündnis Baden-Württemberg").[78]

In many cases, the aim of companies here is to meet **the desire of consumers** for greater climate protection. Surveys clearly show that the environmental impact of a product has a major influence on consumers' purchasing decisions.[79] Added to which, sustainable business objectives are increasingly becoming essential in attracting **investment from financial institutions** (e.g. members of the Glasgow Financial Alliance for Net Zero (GFANZ)).[80] There is a firm belief among some players in the financial sector that sustainability-led corporate management strengthens a company's competiveness and therefore lowers the risk of the investment.[81] Given the potential benefits here for investors as well, there is growing demand for investments that take sustainability aspects into account.[82]

The **German Energy Efficiency Act** passed in 2023 stipulates that demonstrably **climate-neutral companies** (see also section 5.2) may be exempt from certain **obligations** when it comes to the introduction of energy and environmental management systems and to the creation of implementation plans for final energy saving measures.[83] For the first time, companies in Germany considered to be "climate neutral" may now therefore also enjoy regulatory benefits. The German government is currently drawing up the requirements companies have to fulfil to be recognised as climate neutral. Details have not yet been announced of the role carbon credits might play here. This could give rise to a **legal definition** that supplements or replaces private labels such as "Carbon Trust", "myclimate – Klimaneutrales Unternehmen" and "South Pole – Climate Neutral Company". These have so far largely been based on the PAS 2060 standard (see section 5.2).

74 See Federal Ministry for Economic Affairs and Climate Action (BMWK) 2023.
75 See German Energy Agency (dena) 2022.
76 See Net Zero Tracker 2023.
77 See United Nations Framework Convention on Climate Change (UNFCCC) 2019.
78 See German Energy Agency (dena) 2022.
79 See European Commission 2023.
80 See Glasgow Financial Alliance for Net Zero (GFANZ) 2023.
81 See BNP Paribas.
82 See Sustainable Finance Advisory Committee of the German Federal government 2021 and Forum Nachhaltige Geldanlagen (FNG) 2020.
83 See Bundestag 2023.

5.2 Why does the use of carbon credits on the voluntary carbon market attract criticism?

The use of carbon credits to offset a company's emissions as part of its climate protection strategies usually attracts criticism. At the heart of such voluntary commitments in most cases is the goal of **climate neutrality**. In many countries, Germany included, climate neutrality has to date existed as **an unregulated, largely open-ended concept**. This means that non-state actors have largely been able to use their own definitions and methodologies to describe climate neutrality (see "Focus on: Climate neutrality vs. greenhouse gas neutrality"). This can make it difficult to compare the targets set by non-state actors.[84] It also leaves the concept of climate neutrality as a whole open to criticism.

Focus on: Climate neutrality vs. greenhouse gas neutrality

The accepted definition of "climate neutrality" is "a state in which human activities result in no net effect on the climate system".[85] Sometimes, other terms are used instead, e.g. "climate positive", "net negative", "greenhouse gas neutral" and "net zero", but the definition of these terms is not always clear. For example, the UN and EU use "**climate neutrality**" and "**greenhouse gas neutrality**" largely synonymously.[86] The **Paris Agreement** explains the target of global greenhouse gas neutrality as follows: In the second half of the 21st century, parties should find a balance globally between greenhouse gas emissions and removal of these emissions by sinks such as forests and moors.[87] In **Germany**, the goal of greenhouse gas neutrality by 2045 as set out by the country's Climate Change Act aligns with the definition in the Paris Agreement.

By contrast, the **Intergovernmental Panel on Climate Change (IPCC)** – a central body in climate research – originally defined climate neutrality in broader terms than greenhouse gas neutrality: As well as finding a balance between the generation of greenhouse gas emissions and their removal by sinks, it also included regional and biogeophysical effects of human activities, like the albedo effect.[88] However, given the absence of a precise scientific definition for "climate neutrality", the IPCC now employs other terms such as "greenhouse gas neutrality" and "net-zero greenhouse gas emissions".[89]

In recent years, this absence of a clear definition for climate neutrality has led to the development of several different **standards** in the market, all designed to set climate neutrality requirements for companies. These include **PAS 2060** from the British Standards Institution (bsi), the **corporate net zero standard** through the Science Based Targets initiative **(SBTi)**, the **Climate Neutral Certification Standard (CNCS)** from Climate Neutral and the **Net Zero Initiative** led by Carbone 4. These standards differ in various ways, including in their objectives, how they account for greenhouse gas emissions and in the guidelines for use of carbon credits. In November 2023 the ISO published the ISO 14068 standard, which stipulates criteria for the use of "climate neutrality" as a term.[90]

Despite the very ambitious nature of some of the standards, **corporate climate neutrality pledges have attracted criticism**. Two points are particularly important here: firstly, when presenting their corporate climate neutrality, companies often only record a proportion of their greenhouse gas emissions (e.g. not all of the three scopes stipulated under the Greenhouse Gas Protocol (GHG Protocol))[91]. In the standards, too, there is also sometimes a lack of commitment to **robust accounting of greenhouse gas emissions**. With PAS 2060 certification, for example, greenhouse gas accounting does not necessarily need to cover all

84 See German Energy Agency (dena) 2022.
85 See Stiftung Allianz für Entwicklung und Klima 2023-1, p. 3.
86 See Luhmann/Obergassel 2020.
87 See ibid.
88 See Intergovernmental Panel on Climate Change (IPCC) 2018.
89 See Stiftung Allianz für Entwicklung und Klima 2023-1.
90 See International Organization for Standardization (ISO) 2023.
91 Scopes 1 – 3 are how the Greenhouse Gas Protocol (GHG Protocol) records the greenhouse gas emissions of companies. Scope 1 are the emissions caused by companies themselves, Scope 2 refers to emissions from purchased energy and Scope 3 covers the upstream and downstream emissions within a company's value chain.

scopes.[92] The analysis conducted by the New Climate Institute showed that eight of the 24 large companies it looked at compiled the data on their emissions with a low level of transparency and integrity.[93] In many cases, the indirect emissions occurring in the company's value chain (Scope 3 emissions) are not adequately mapped. With most companies, Scope 3 emissions make up over 90 per cent of the emissions they produce.

On the other hand, climate strategy measures are not always compatible with the 1.5 degrees Celsius goal of the Paris Agreement. Not all companies follow what is known as the **mitigation hierarchy.** This involves parties first avoiding and/or reducing their own emissions, before unavoidable residual emissions are offset with carbon credits. However, in many cases the companies' climate neutrality strategy involves **any mix** of avoiding and reducing their own emissions, as well as offsetting with carbon credits. This is shown in Figure 8 as an example.

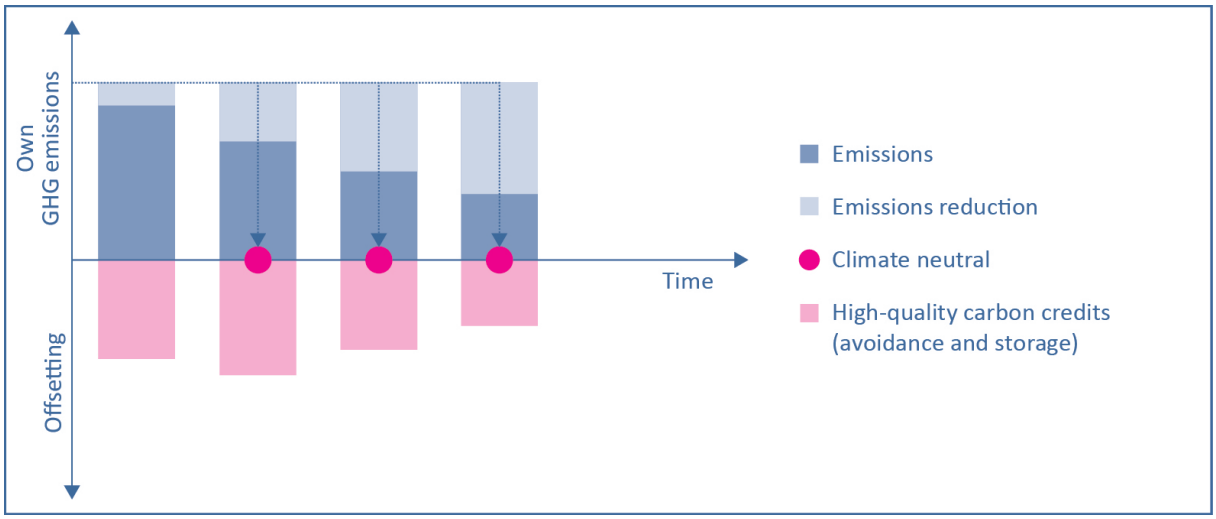

Figure 8: Example climate neutrality strategy (own diagram based on Stiftung Allianz für Entwicklung und Klima[94])

In a study of 24 large companies, the NewClimate Institute concluded that they only committed to a reduction in their emissions of 36 per cent on average in their climate neutrality target year. However, they offset between 23 and 45 per cent of their emissions.[95] This also applies for companies with SBTi certification: the NewClimate Institute has voiced its criticism that, despite SBTi certification, many companies have set goals that would not be compatible with the global 1.5 degrees Celsius goal.[96] As part of PAS 2060 certification, the requirements for achieving climate neutrality would also be met if all the company's own greenhouse gas emissions were offset by carbon credits.[97]

This one-sided focus of climate protection strategies on offsetting by carbon credits can be problematic for various reasons. For a company, offsetting their own emissions could create **false incentives** to neglect measures for reducing and/or avoiding their own emissions.[98] This might delay the implementation of important climate protection measures and the development of the infrastructure required for them (the lock-in effect).[99] This situation could be exacerbated by the fact that companies who are among the largest purchasers of carbon credits worldwide also extract and trade fossil fuels or at least require them for their

92 See German Energy Agency (dena) 2022.
93 See Day et al. 2023.
94 See Stiftung Allianz für Entwicklung und Klima 2023-1.
95 See Fearnehough et al. 2023.
96 See Day et al. 2023.
97 See German Energy Agency (dena) 2022.
98 See Day et al. 2023.
99 See Fearnehough et al. 2023.

business model.[100] By contrast, a study looking at small and medium-sized companies has concluded that offsetting greenhouse gases does not replace or suppress other climate protection activities carried out by these companies, but actually supplements them.[101]

There may also be false incentives for **consumers**, who might limit their consumption of climate-damaging products to a lesser degree if those products are presented as climate neutral.[102]

In view of the **poor quality of carbon credits** (see section 4.2), emissions may not actually be offset at all or not to the extent indicated. A climate neutrality strategy geared towards offsetting would therefore reduce a company's greenhouse gases by less than a strategy based on reducing and/or avoiding their own greenhouse gas emissions.

100 See Chen et al. 2021.
101 See Engler et al. 2023.
102 See Günther et al. 2020.

Focus on: The current legal situation with regard to corporate climate neutrality

Claims of corporate climate neutrality have in some cases become the subject of legal disputes. Indeed, at the beginning of the year, an American airline was charged with making false advertising claims with respect to the use of the term "climate neutral".[103] Since the start of 2023, companies in France have been banned from advertising products as "climate neutral" if they cannot sufficiently substantiate this claim with data across the value chain of the product.[104] In Germany, however, the legal situation is currently unclear, as the courts have appraised the use of the claim "climate neutral" in different ways. While some have described advertising for climate neutrality as misleading for consumers[105], another court decided that advertising using the term "climate neutral" is permissible in principle if the company can back up their promises with transparent and clear statements.[106] A ruling by Germany's Federal Court of Justice remains pending.[107]

The European Commission is contemplating impelling companies – through its current proposal for a "green claims" directive – to substantiate their environmental advertising claims and product statements with reliable information which is based on sound scientific methodology, extends across the whole product lifecycle and is verified by an independent testing centre.[108] The "Directive on empowering consumers for the green transition" adopted by the EU in 2023 also states that, from 2026, all product advertising claims such as "climate neutral", which are essentially based on offsetting greenhouse gas emissions, should be prohibited in principle.[109]

In response to growing criticism, a number of companies – such as easyjet and JetBlue – have said they will not be purchasing any further carbon credits for offsetting purposes.[110] Some German firms, e.g. Rossmann, have also recently announced that they will not be using the description "climate-neutral products" in future.[111] In addition, the public debate around the term "climate neutrality" might prompt companies to keep quiet about their climate protection activities ("green hushing").[112]

5.3 Is there an alternative to the concept of corporate climate neutrality?

In view of the problems associated with the concept of climate neutrality (see section 5.2), some actors in the voluntary market are seeking alternatives. One possibility here is the **climate contributions** approach. Here, in addition to avoiding and reducing their own emissions, actors support projects on a voluntary basis that do not reduce their own climate footprint and are therefore counted as **outside their value chain**. Known as "beyond value chain mitigation", this is a financial commitment that supplements – rather than replaces – the direct reduction of their own emissions.[113] The aim of climate contributions is to help achieve the global objective of greenhouse gas neutrality set out in the Paris Agreement and for actors to take responsibility for their own greenhouse gas emissions. This contribution is therefore referred to as a "**contribution claim**" (also referred to as an "impact claim", "finance claim" or similar).

With the **Blueprint for Corporate Action on Climate and Nature**, the World Wide Fund for Nature (WWF) and Boston Consulting Group (BCG) have developed the climate contribution approach illustrated in Figure 9. Here, companies ascertain their residual, unavoidable emissions and set an **internal price** for them. The funds can be invested in other emissions reduction activities along their value chain, used to acquire

103 See Greenfield 2023-3.
104 See LeGallou/Martellucci 2023.
105 See Frankfurt am Main Higher Regional Court 2022; see Hamm Higher Regional Court 2021.
106 See Düsseldorf Higher Regional Court 2023.
107 See Wettbewerbszentrale 2023.
108 See de Courten 2023.
109 See Diab 2023.
110 See Nguyen 2023.
111 See Rossmann 2023.
112 See Barkey 2023.
113 See Fearnehough et al. 2023.

high-quality carbon credits or channelled into climate protection innovations.[114] The New Climate Institute has developed something similar with the **Climate Responsibility Approach**, where companies set an internal price for residual emissions linked to the cost of damage caused by the release of greenhouse gases. The funds generated in this way are used either to further reduce the company's own emissions, to invest in high-quality carbon credits or for other climate action projects. The internal price for 2023 set by the New Climate Institute is EUR 120 per tonne of CO_2 equivalent.[115] In 2021, 16 per cent of the companies who publish their data in the Carbon Disclosure Project (CDP) used the concept of an internal price for emissions.[116] However, the majority of companies set an internal price of under USD 50 (approx. EUR 46.90, November 2023) per tonne of CO_2 equivalent – i.e. lower than the price quoted by the New Climate Institute and significantly below the cost of CO_2 damage as calculated by the German Environment Agency.

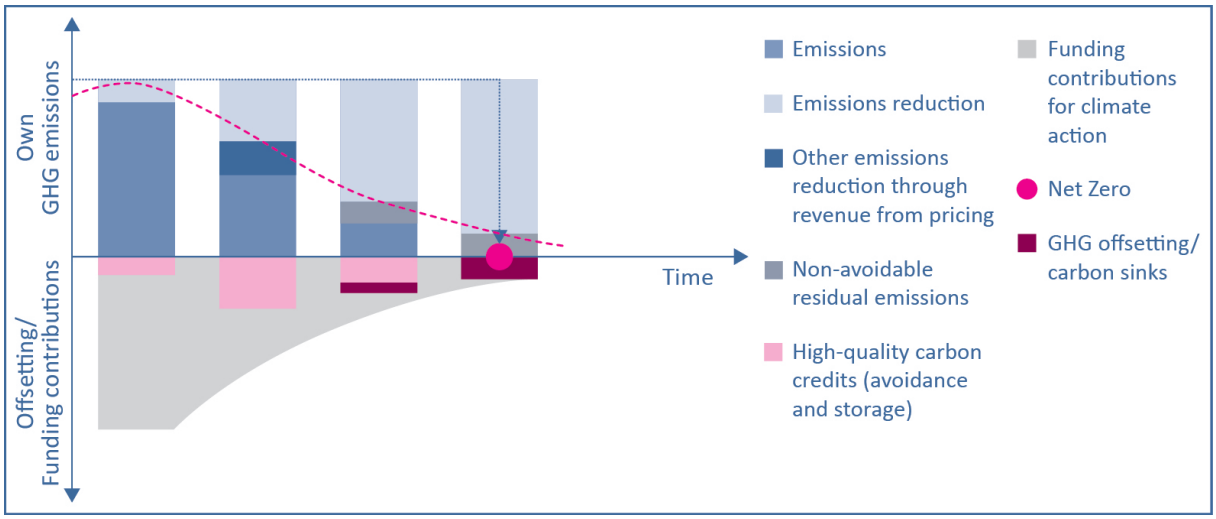

Figure 9: Strategy of the corporate climate mitigation blueprint (own diagram based on Stiftung Allianz für Entwicklung und Klima[117])

Labels within the voluntary carbon market are also aligning with this concept.[118] For example, the "Funding Climate Action Label" from South Pole no longer permits use of carbon credits to help achieve reduction targets. Instead, they are classified as a contribution to the global climate protection goal.[119] With its "Engaged for Impact" label, myclimate focuses on climate action contributions outside an actor's own value chain.[120] At the same time, these new approaches differ only in part from the previous way of doing things. Although the end user of the carbon credits no longer counts them towards their own reduction targets, the number of carbon credits acquired should still be geared to the level of their own emissions (e.g. their unavoidable residual emissions).[121]

114 See Stiftung Allianz für Entwicklung und Klima 2023-1.
115 See ibid.
116 See World Bank 2022.
117 See Stiftung Allianz für Entwicklung und Klima 2023-1.
118 See Kreibich et al. 2023.
119 See South Pole 2023.
120 See myclimate 2022.
121 See Kreibich et al. 2023.

Climate contributions in the form of contribution claims might offer a number of **benefits**:

- Unlike when pursuing corporate climate neutrality goals, with contribution claims it is conceivable that **innovative climate protection solutions** may also be supported whose climate protection impact is not directly quantifiable but which have a significant long-term effect – in terms of climate-positive change and the required transformation to sustainability (e.g. research into the Direct Air Capture process).[122]
- **False incentives** for companies and consumers arising from climate neutrality claims (see section 5.2) could be **avoided**. At the same time, companies may continue to showcase their commitment to climate protection.
- Participants in the ESYS workshop raised the point that **transparency and levels of trust** among consumers in corporate climate protection efforts could be increased.
- Plus, contribution claims require **no corresponding adjustments**, as carbon credits do not count towards a company's climate protection goal, only towards the goal of the country in which the project is taking place. This may be beneficial if the availability of carbon credits with corresponding adjustments for the voluntary market is reduced as part of ambitious government climate targets.

However, when implementing this kind of approach, there are potential **challenges** to consider:

- The **comparability** of the climate protection efforts of individual actors may be hampered by the use of contribution claims. Some participants in the ESYS workshop noted that a common reference point would need to be established to allow comparability between the contribution claims of different companies. Comparability could be achieved e.g. through the internal price used by companies to determine their investments.
- Since the contribution claims concept – unlike carbon credits – is still largely unfamiliar to investors and consumers, contribution claims may have less benefit for companies keen to publicise their climate protection ambitions. Companies might therefore have less incentive to invest in the voluntary market and in climate action projects.
- Added to which, the climate action projects supported as part of the voluntary climate contributions may display similar **quality shortfalls** to current projects (see section 4.3).

122 See Stiftung Allianz für Entwicklung und Klima 2023-2.

6 Conclusions and outlook

Since the voluntary carbon market has been in existence, considerable sums of money have been channelled into the **development of climate action projects**. The voluntary market has experienced **huge growth** in the last five years, and this is based mainly on a voluntary commitment from companies.

However, in the past the voluntary market could only **contribute to actual climate protection to a very limited extent**. Studies show that many of the climate action projects funded ignore **quality criteria** and therefore do not lead to an actual reduction in greenhouse gases. This applies above all for projects involving nature-based solutions. Criticism of the **demand side** concerns the **transparency** of corporate **climate strategies**, but also their **conformity with the 1.5 degrees Celsius goal** of the Paris Agreement.

How the voluntary market will develop in view of the multitude of challenges and what contribution it will make to climate protection in the future is **uncertain**. Estimates here vary widely. The following key **influencing factors** can be identified:

Regulation of the voluntary market: It remains unclear how the voluntary market is to be integrated into international mechanisms (especially PA Article 6). National regulations regarding the use of carbon credits, in particular, are currently being drawn up in a number of countries and will also have implications for the voluntary market.

Quality criteria for climate action projects: In view of the criticism of climate action projects, demand for high-quality carbon credits may rise. National and international regulation may also increase the requirements placed on these climate action projects. The role of carbon credits for the removal of CO_2 from the atmosphere in future will also be a big question going forward. The voluntary market could contribute to making these processes – which are expected to play a significant role in limiting climate change – marketable and more cost-effective.

Use of corresponding adjustments: Given the growing criticism of double counting, demand for carbon credits with corresponding adjustments may rise among end users. However, this would not be in the interest of the countries in which the climate action projects are carried out. They would not then be able to count mitigation of emissions towards their own binding targets (NDCs).

Development of alternative corporate climate protection strategies: In view of the criticism of climate neutrality pledges, companies may focus increasingly on alternative climate protection strategies based on the contribution claim model. Regulatory proposals currently under discussion may also offer incentives here. However, it is uncertain what influence this would have on the voluntary market. If the impact of contribution claims is initially less than that of “climate neutrality” pledges in external communications, this may result in demand for carbon credits shrinking, at least temporarily. At the same time, there may be demand for higher-quality carbon credits following the contribution claim model, as this model evaluates not only the directly quantifiable short-term climate protection effect, but also the transformative impact of certain investments as a contribution to climate action.

Literature

AlliedOffsets 2023

AlliedOffsets: *Analysis of Voluntary Carbon Market Stakeholders and Intermediaries*, 2023. URL: https://carbonmarketwatch.org/wp-content/uploads/2023/02/Stakeholder-Analysis-for-the-Voluntary-Carbon-Market.pdf [Accessed 26.07.2023].

Badgley et al. 2022

Badgley, G./Freeman, J./Hamman, J. J./Haya, B./Trugman, A. T./Anderegg, W. R. L./Cullenward, D.: "Systematic Over-Crediting in California's Forest Carbon Offsets Program". In: *Global change biology*, 28, 4, 2022, p. 1433–1445. DOI: 10.1111/gcb.15943. URL: https://onlinelibrary.wiley.com/doi/10.1111/gcb.15943 [Accessed 21.08.2023].

Barkey 2023

Barkey, S.: "Green Hushing: Darum verstecken immer mehr Unternehmen ihre Klimabemühungen". In: *Berliner Zeitung*, 15.04.2023. URL: https://www.berliner-zeitung.de/news/green-hushing-darum-verstecken-immer-mehr-unternehmen-ihre-klima-bemuehungen-und-erfolge-bei-nachhaltigkeit-li.338342 [Accessed 01.09.2023].

Barratt/Clarke 2022

Barratt, L./Clarke, J. S.: "How Middlemen Carbon Brokers Take a Cut from Money Meant to Help Offset Emissions", 2022. URL: https://unearthed.greenpeace.org/2022/05/02/carbon-offsetting-market-climate/ [Accessed 26.07.2023].

Blaufelder et al. 2020

Blaufelder, C./Katz, J./Levy, C./Pinner, D./Weterings, J.: *How the Voluntary Carbon Market Can Help Address Climate Change*, published by McKinsey & Company, 2020. URL: https://www.mckinsey.com/capabilities/sustainability/our-insights/how-the-voluntary-carbon-market-can-help-address-climate-change#/ [Accessed 23.06.2023].

BNP Paribas 2023

BNP Paribas: "Die Klima-Selbstverpflichtung des deutschen Finanzsektors hat viel in Bewegung gebracht", 2023. URL: https://www.bnpparibas.de/de/die-klima-selbstverpflichtung-des-deutschen-finanzsektors-hat-viel-in-bewegung-gebracht/ [Accessed 31.08.2023].

Boehm et al. 2022

Boehm, S./Jeffery, L./Levin, K./Hecke, J./Schumer, C./Fyson, C./Majid, A./Jaeger, J./Nilsson, A./Naimoli, S./Thwaites, J./Cassidy, E./Waite, R./Wilson, R./Castellanos, S./Singh, N./Lee, A./Geiges, A.: *State of Climate Action 2022*, published by Bezos Earth Fund/Climate Action Tracker/Climate-Analytics/ClimateWorks Foundation/NewClimate Institute/The United Nations Climate Change High-Level Champions/World Resources Institute. Berlin und Köln, Germany, San Francisco, CA, und Washington, DC, 2022. DOI: 10.46830/wrirpt.22.00028. URL: https://www.wri.org/research/state-climate-action-2022 [Accessed 15.08.2023].

Boyd et al. 2023

Boyd, P. W./Bach, L./Holden, R./Turney, C.: "Carbon Offsets Aren't Helping the Planet - Four Ways to Fix Them". In: *Nature*, 620, 7976, 2023, p. 947–949. DOI: 10.1038/d41586-023-02649-8. URL: https://www.nature.com/articles/d41586-023-02649-8 [Accessed 21.09.2023].

German Federal Ministry for Economic Affairs and Climate Action 2023

German Federal Ministry for Economic Affairs and Climate Action: "Koordinierungsstelle Klimaneutrale Bundesverwaltung", 2023. URL: https://www.bmwk.de/Redaktion/DE/Dossier/Koordinierungsstelle-Klimaneutrale-Bundesverwaltung/koordinierungsstelle-klimaneutrale-bundesverwaltung.html [Accessed 22.08.2023].

Bundestag 2023

Bundestag: *Entwurf eines Gesetzes zur Steigerung der Energieeffizienz und zur Änderung des Energiedienstleistungsgesetzes. Gesetzentwurf der Bundesregierung*, 2023. URL: https://dserver.bundestag.de/btd/20/068/2006872.pdf [Accessed 01.09.2023].

Cames et al. 2016

Cames, M./Harthan, R. O./Füssler, J./Lazarus, M./Lee, C. M./Erickson, P./Spalding-Fecher/Randall: *How Additional Is the Clean Development Mechanism? Analysis of the Application of Current Tools and Proposed Alternatives*, published by Öko-Institut e.V. Berlin, 2016. URL: https://www.oeko.de/publikationen/p-details/how-additional-is-the-clean-development-mechanism [Accessed 15.08.2023].

Chen et al. 2021

Chen, S./Marbouh, D./Moore, S./Stern, K.: "Voluntary Carbon Offsets: An Empirical Market Study". In: *SSRN Journal*, 2021. DOI: 10.2139/ssrn.3981914. URL: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3981914 [Accessed 18.07.2023].

Crook 2022

Crook, J.: "Was COP27 the Beginning of the End for Corporate Offsetting?", 2022. URL: https://carbonmarketwatch.org/2022/12/07/was-cop27-the-beginning-of-the-end-for-corporate-offsetting/ [Accessed 14.08.2023].

Day et al. 2023

Day, T./Mooldijk, S./Hans, F./Smit, S./Posada, E./Skribbe, R./Woolands, S./Fearnehough, H./Kuramochi, T./Warnecke, C./Kachi Aki/Höhne, N.: *Corporate Climate Responsibility Monitor 2023. Assessing The Transparency and Integrity Of Companies' Emission Reduction And Net-Zero Targets*, published by NewClimate Institute/Carbon Market Watch, 2023. URL: https://newclimate.org/resources/publications/corporate-climate-responsibility-monitor-2023 [Accessed 15.08.2023].

de Courten 2023

Courten, P. de: "Green Claims Directive: Neue EU-Richtlinie im Kampf gegen Greenwashing". In: *Haufe*, 26.04.2023. URL: https://www.haufe.de/sustainability/strategie/eu-green-claims-directive_575772_593232.html [Accessed 21.07.2023].

Deutsche Emissionshandelsstelle 2023

Deutsche Emissionshandelsstelle: *Klimaschutz im Luftverkehr – CORSIA und der EU-ETS*, 2023. URL: https://www.dehst.de/SharedDocs/downloads/DE/publikationen/factsheets/factsheet_CORSIA-EU-ETS.pdf?__blob=publicationFile&v=7 [Accessed 07.09.2023].

German Energy Agency (dena) 2022

German Energy Agency (dena): *Klimaneutralität von Unternehmen. Bestehende Standards, Initiativen und Label sowie Einordnung der Rolle von Treibhausgas-Kompensation*, 2022. URL: https://www.dena.de/fileadmin/dena/Publikationen/PDFs/2022/ANALYSE_Klimaneutralitaet_von_Unternehmen.pdf [Accessed 21.07.2023].

Diab 2023

Diab, K.: "European Parliament Abandons Neutrality in Anti-greenwashing Drive – Updated", 2023. URL: https://carbonmarketwatch.org/2023/05/11/european-parliament-abandons-neutrality-in-anti-greenwashing-drive/ [Accessed 10.08.2023].

Dirección de Cambio Climático 2023

Dirección de Cambio Climático: "The San José Principles", 2023. URL: https://cambioclimatico.go.cr/sanjoseprinciples/about-the-san-jose-principles/ [Accessed 14.08.2023].

Dufrasne 2021

Dufrasne, G.: "FAQ: Deciphering Article 6 of the Paris Agreement", 2021. URL: https://carbonmarketwatch.org/2021/12/10/faq-deciphering-article-6-of-the-paris-agreement/#kyoto [Accessed 14.08.2023].

Ecosystem Marketplace 2022

Ecosystem Marketplace: *The Art of Integrity. State of the Voluntary Carbon Markets 2022 Q3*. In: Ecosystem Market Place Insight Brief, 2022. URL: https://www.ecosystemmarketplace.com/publications/state-of-the-voluntary-carbon-markets-2022/ [Accessed 31.05.2023].

Engler et al. 2023

Engler, D./Gutsche, G./Simixhiu, A./Ziegler, A.: "On the Relationship between Corporate CO2 Offsetting and Pro-environmental Activities in Small- And Medium-Sized Firms in Germany". In: *Energy Economics*, 118, 2023, p. 106487. DOI: 10.1016/j.eneco.2022.106487. URL: https://www.sciencedirect.com/science/article/abs/pii/S0140988322006168 [Accessed 15.08.2023].

Erlach et al. 2022

Erlach, B./Fuss, S./Geden, O./Glotzbach, U./Henning, H.-M./Renn, J./Rens, S./Sauer, D. U./Christoph M., S./Spiecker genannt Döhmann, I./Stemmler, C./Stephanos, C./Strefler, J./Pittel, K.: *Was sind negative Emissionen, und warum brauchen wir sie?*, 2022. DOI: 10.48669/esys_2022-2.

European Commission 2023

European Commission: Proposal for a Directive of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive), 2023. URL: https://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:52023PC0166&from=EN [Accessed 31.08.2023].

Fearnehough et al. 2023

Fearnehough, H./Skribbe, R./Grandpré, J. de/Day, T./Warnecke, C.: *A Guide to Climate Contributions. Taking Responsibility for Emissions without Offsetting*, published by NewClimate Institute, 2023. URL: https://newclimate.org/sites/default/files/2023-07/NewClimate_GuideClimateContributions_Jul23.pdf [Accessed 18.07.2023].

Federal Office for the Environment (FOEN) 2023

Federal Office for the Environment: "Bilateral Climate Agreements", 2023. URL: https://www.bafu.admin.ch/bafu/en/home/topics/climate/info-specialists/climate--international-affairs/staatsvertraege-umsetzung-klimauebereinkommen-von-paris-artikel6.html [Accessed 14.08.2023].

Fischer/Knuth 2023

Fischer, T./Knuth, H.: "Grün getarnt. Der Klima-Betrug". In: *Die Zeit*, 19.01.2023. URL: https://www.zeit.de/2023/04/co2-zertifikate-betrug-emissionshandel-klimaschutz/komplettansicht [Accessed 14.07.2023].

Forum Nachhaltige Geldanlagen (FNG) 2020

Forum Nachhaltige Geldanlagen: *Marktbericht Nachhaltige Geldanlagen 2020*, 2020. URL: https://www.forum-ng.org/fileadmin/Marktbericht/2020/FNG-Marktbericht-2020.pdf [Accessed 01.09.2023].

Glasgow Financial Alliance for Net Zero (GFANZ) 2023

Glasgow Financial Alliance for Net Zero: "The Alliances and GFANZ", 2023. URL: https://www.gfanzero.com/membership/ [Accessed 31.08.2023].

Gold Standard 2023

Gold Standard: "The Importance of Trust in the Carbon Market", 2023. URL: https://www.goldstandard.org/blog-item/importance-trust-carbon-market [Accessed 15.08.2023].

Greenfield 2023-1

Greenfield, P.: "Revealed: More than 90% Of Rainforest Carbon Offsets by Biggest Provider Are Worthless, Analysis Shows". In: *The Guardian*, 18.01.2023. URL: https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe [Accessed 17.07.2023].

Greenfield 2023-2

Greenfield, P.: "Carbon Credit Speculators Could Lose Billions as Offsets Deemed 'Worthless'". In: *The Guardian*, 24.08.2023. URL: https://www.theguardian.com/environment/2023/aug/24/carbon-credit-speculators-could-lose-billions-as-offsets-deemed-worthless-aoe?CMP=Share_AndroidApp_Other [Accessed 31.08.2023].

Greenfield 2023-3

Greenfield, P.: "Delta Air Lines Faces Lawsuit over $1BN Carbon Neutrality Claim". In: *The Guardian*, 30.05.2023. URL: https://www.theguardian.com/environment/2023/may/30/delta-air-lines-lawsuit-carbon-neutrality-aoe [Accessed 27.06.2023].

Greiner et al. 2019

Greiner, S./Krämer, N./Michaelowa, A./Espelage, A.: *Article 6 Corresponding Adjustments. Key accounting challenges for Article 6 transfers of mitigation outcomes*, published by Climate Focus. Amsterdam, 2019. URL: https://www.carbon-mechanisms.de/fileadmin/media/dokumente/Publikationen/Studie/2019_ClimateFocus_Perspectives_Corresponding_Adjustments_Art6.pdf [Accessed 26.07.2023].

Griscom et al. 2017

Griscom, B. W./Adams, J./Ellis, P. W./Houghton, R. A./Lomax, G./Miteva, D. A./Schlesinger, W. H./Shoch, D./Siikamäki, J. V./Smith, P./Woodbury, P./Zganjar, C./Blackman, A./Campari, J./Conant, R. T./Delgado, C./Elias, P./Gopalakrishna, T./Hamsik, M. R./Herrero, M./Kiesecker, J./Landis, E./Laestadius, L./Leavitt, S. M./Minnemeyer, S./Polasky, S./Potapov, P./Putz, F. E./Sanderman, J./Silvius, M./Wollenberg, E./Fargione, J.: "Natural Climate Solutions". In: *Proceedings of the National Academy of Sciences of the United States of America*, 114, 44, 2017, p. 11645–11650. DOI: 10.1073/pnas.1710465114. URL: https://pubmed.ncbi.nlm.nih.gov/29078344/ [Accessed 10.08.2023].

Guizar-Coutiño et al. 2022

Guizar-Coutiño, A./Jones, J. P. G./Balmford, A./Carmenta, R./Coomes, D. A.: "A Global Evaluation of the Effectiveness of Voluntary Redd+ Projects at Reducing Deforestation and Degradation in the Moist Tropics". In: *Conservation biology: the journal of the Society for Conservation Biology*, 36, 6, 2022, e13970. DOI: 10.1111/cobi.13970.

Günther et al. 2020

Günther, S. A./Staake, T./Schöb, S./Tiefenbeck, V.: "The Behavioral Response to a Corporate Carbon Offset Program: A Field Experiment on Adverse Effects and Mitigation Strategies". In: *Global Environmental Change*, 64, 2020, p. 102123. DOI: 10.1016/j.gloenvcha.2020.102123.

Hedreen 2023

Hedreen, S.: "Direct Air Capture 'Breakthrough' Traps CO2 Emissions in Concrete", 2023. URL: https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/direct-air-capture-breakthrough-traps-co2-emissions-in-concrete-74149252 [Accessed 26.07.2023].

Hood 2019

Hood, C.: *Completing the Paris 'Rulebook': Key Article 6 Issues*, published by Center for Climate and Energy Solutions. Arlington, VA, 2019. URL: https://www.c2es.org/wp-content/uploads/2019/04/completing-the-paris-rulebook.pdf [Accessed 26.07.2023].

Intergovernmental Panel on Climate Change (IPCC) 2018

Intergovernmental Panel on Climate Change: *Global Warming of 1.5°C. An Ipcc Special Report on the Impacts of Global Warming of 1.5°C above Pre-industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*. Cambridge, UK and New York, NY, US: Cambridge University Press, 2018. DOI: 10.1017/9781009157940. URL: https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SR15_Full_Report_LR.pdf [Accessed 28.07.2023].

International Carbon Action Partnership (ICAP) 2023

International Carbon Action Partnership: *Emissions Trading Worldwide. Status Report 2023*. Berlin, 2023. URL: https://icapcarbonaction.com/system/files/document/ICAP%20Emissions%20Trading%20Worldwide%202023%20Status%20Report_0.pdf [Accessed 28.07.2023].

International Organization for Standardization (ISO) 2023

International Organization for Standardization: "ISO/FDIS 14068. Greenhouse Gas Management and Climate Change Management and Related Activities - Carbon Neutrality", 2023. URL: https://www.iso.org/standard/43279.html [Accessed 04.08.2023].

JPMorgan 2023

JPMorgan Chase & Co: "JPMorgan Chase Seeks to Scale Investment in Emerging Carbon Removal Technologies, Announces Agreements Intended to Durably Remove and Store 800,000 Tons of Carbon", 2023. URL: https://www.jpmorganchase.com/news-stories/jpmorgan-chase-seeks-to-scale-investment-in-emerging-carbon-removal-technologies [Accessed 15.08.2023].

Kollmuss et al. 2015

Kollmuss, A./Schneider, L./Zhezherin, V.: *Has Joint Implementation reduced GHG emissions? Lessons Learned for the Design of Carbon Market Mechanisms*. In: SEI Working Papers: 2015-07, published by Stockholm Environment Institute, 2015. URL: https://www.sei.org/publications/has-joint-implementation-reduced-ghg-emissions-lessons-learned-for-the-design-of-carbon-market-mechanisms/ [Accessed 21.08.2023].

Kreibich et al. 2023

Kreibich, N./Kühlert, M./Schulze-Steinen, M./Brandt, J./Präger, A./Schöneberg, G./Karatassios, D.: *Grundprinzipien eines Contribution Claim-Ansatzes. Konzeptpapier*, published by Wuppertal Institut/Stiftung Allianz für Entwicklung und Klima. Wuppertal, 2023. URL: https://allianz-entwicklung-klima.de/wp-content/uploads/2023/05/2305_Konzeptpapier_CC-1.pdf [Accessed 28.06.2023].

Laine et al. 2023

Laine, A./Ahonen, H.-M./Pakkala, A./Laininen, J./Kulovesi, K./Mäntylä, I.: *Guide to Good Practices For Voluntary Carbon Markets. Supporting Voluntary Mitigation Action with Carbon Credits*. Helsinki: Finnish Government, 2023. ISBN: 978-952-383-511-5. URL: https://julkaisut.valtioneuvosto.fi/handle/10024/164732 [Accessed 11.10.2023].

Le Gallou/Martellucci 2023

Le Gallou, M./Martellucci, E.: *Greenwashing, Certified? How to Ensure New Laws and Standards Do Not Rubberstamp Dubious Climate Neutrality Claims*, published by Environmental Coalition on Standards, 2023. URL: https://ecostandard.org/wp-content/uploads/2023/03/ECOS-Report-Carbon-neutrality-claims-March-2023.pdf [Accessed 27.06.2023].

Luhmann/Obergassel 2020

Luhmann, H.-J./Obergassel, W.: "Klimaneutralität versus Treibhausgasneutralität: Anforderungen an die Kooperation im Mehrebenensystem in Deutschland". In: *GAIA - Ecological Perspectives for Science and Society*, 29, 1, 2020, p. 27–33. DOI: 10.14512/gaia.29.1.7. URL: https://epub.wupperinst.org/frontdoor/deliver/index/docId/7492/file/7492_Luhmann.pdf [Accessed 28.07.2023].

Mistry et al. 2023

Mistry, K./Carroll, B./Baker, T./Ponce de Leon, P./Dewar, A./Sims, A.: *The Time for Carbon Removal Has Come*, published by Boston Consulting Group, 2023. URL: https://www.bcg.com/publications/2023/the-need-and-market-demand-for-carbon-dioxide-removal [Accessed 11.10.2023].

myclimate 2022

myclimate: *We create Impact. Jahresbericht 2022*, 2022. URL: https://www.myclimate.org/fileadmin/user_upload/myclimate_-_home/01_Information/01_About_myclimate/02_Annual_reports/Documents/JB22-A5-final-DE-web.pdf [Accessed 31.07.2023].

Net Zero Tracker 2023

Net Zero Tracker: "Data Explorer", 2023. URL: https://zerotracker.net/ [Accessed 15.08.2023].

Nguyen 2023

Nguyen, A.: "Carbon Neutral Claims Under Investigation In Greenwashing Probe". In: *Forbes*, 16.06.2023. URL: https://www.forbes.com/sites/amynguyen/2023/06/16/carbon-neutral-claims-under-investigation-in-greenwashing-probe/ [Accessed 27.06.2023].

Düsseldorf Higher Regional Court 2023

Düsseldorf Higher Regional Court - Ref. I-20 U 72/22 and Ref. I-20 U 152/22 06.07.2023, in each case not legally binding [Accessed 18.07.2023].

Frankfurt am Main Higher Regional Court 2022

Frankfurt am Main Higher Regional Court - Ref. 6 U 104/22 10.11.2022.

Hamm Higher Regional Court 2021

Hamm Higher Regional Court - Ref. 4 U 57/21 19.08.2021.

Rossmann 2023

Rossmann: „Klimaneutralität bei Rossmann. Einstellung der Werbung mit dem Begriff „Klimaneutralität", 2023. URL: https://www.rossmann.de/de/neu/nachhaltigkeit/klimaneutral [Accessed 22.08.2023].

Schlegel/Ziai 2021

Schlegel, A./Ziai, A.: *Die deutsche Afrikapolitik. Erneuerung einer ungleichen Zusammenarbeit?* Paris: Ifri, 2021. ISBN: 979-10-373-0406-3. URL: https://www.ifri.org/sites/default/files/atoms/files/schlegel_ziai_deutsche_afrikapolitik_2021_002.pdf [Accessed 21.08.2023].

Schneider et al. 2020

Schneider, L./Healy, S./Fallasch, F./León, F. de/Rambharos, M./Schallert, B./Holler, J./Kizzier, K./Petsonk, A./Hanafi, A.: *What Makes a High-Quality Carbon Credit? Phase 1 of the "Carbon Credit Guidance for Buyers" Project: Definition of Criteria for Assessing The Quality of Carbon Credits*, published by World Wildlife Fund/Environmental Defense Fund/Oeko-Institut, 2020. URL: https://www.worldwildlife.org/publications/what-makes-a-high-quality-carbon-credit [Accessed 21.08.2023].

Shell/Boston Consulting Group (BCG) 2022

Shell/Boston Consulting Group: *The Voluntary Carbon Market. 2022 Insights And Trends*, 2022. URL: https://www.shell.com/shellenergy/othersolutions/carbonmarketreports.html [Accessed 15.08.2023].

South Pole 2023

South Pole: *The Voluntary Carbon Market 2022-2023*, 2023. URL: https://www.southpole.com/publications/the-voluntary-carbon-market-report-2022-2023 [Accessed 31.07.2023].

Stiftung Allianz für Entwicklung und Klima 2021

Stiftung Allianz für Entwicklung und Klima: *Nature-based Solutions im freiwilligen Kohlenstoffmarkt – aktuelle Bedeutung und Potenziale*, 2021. URL: https://allianz-entwicklung-klima.de/wp-content/uploads/2021/02/studie2021-nature-based-solutions-kohlenstoffmarkt.pdf [Accessed 13.09.2023].

Stiftung Allianz für Entwicklung und Klima 2023-1

Stiftung Allianz für Entwicklung und Klima: *Unternehmerische Klimaschutzstrategien. Info sheet*, published by Stiftung Allianz für Entwicklung und Klima, 2023. URL: https://allianz-entwicklung-klima.de/wp-content/uploads/2022/05/2302_Info-sheet_Klimaschutzstrategien.pdf [Accessed 26.06.2023].

Stiftung Allianz für Entwicklung und Klima 2023-2

Stiftung Allianz für Entwicklung und Klima: *Corresponding Adjustment und Contribution Claim. Info sheet*, published by Stiftung Allianz für Entwicklung und Klima, 2023. URL: https://allianz-entwicklung-klima.de/wp-content/uploads/2023/02/2302_Corresponding-Adjustment-und-Contribution-Claim.pdf [Accessed 28.06.2023].

Sustainable-Finance-Beirat der Bundesregierung 2021

Sustainable-Finance-Beirat der Bundesregierung: *Shifting the Trillions. Ein nachhaltiges Finanzsystem für die Große Transformation*, 2021. URL: https://sustainable-finance-beirat.de/wp-content/uploads/2021/02/210224_SFB_-Abschlussbericht_Kernbotschaften.pdf [Accessed 01.09.2023].

Taskforce on Scaling Voluntary Carbon Markets 2021

Taskforce on Scaling Voluntary Carbon Markets: *Final Report*, 2021. URL: https://www.iif.com/Portals/1/Files/TSVCM_Report.pdf [Accessed 31.08.2023].

The Integrity Council for the Voluntary Carbon Market (ICVCM) 2023

The Integrity Council for the Voluntary Carbon Market: *Core Carbon Principles, Assessment Framework and Assessment Procedure*, 2023. URL: https://icvcm.org/wp-content/uploads/2023/03/CCP-Book-FINAL-27Mar23.pdf [Accessed 20.07.2023].

German Environment Agency (UBA) 2020

German Environment Agency: "Future role for voluntary carbon markets in the Paris era", 2020. URL: https://www.umweltbundesamt.de/sites/default/files/medien/5750/publikationen/2020_11_19_cc_44_2020_carbon_markets_paris_era_0.pdf [Accessed 26.04.2023].

German Environment Agency (UBA) 2023-1

German Environment Agency: "Kohlendioxid-Emissionen", 2023. URL: https://www.umweltbundesamt.de/daten/klima/treibhausgas-emissionen-in-deutschland/kohlendioxid-emissionen#kohlendioxid-emissionen-im-vergleich-zu-anderen-treibhausgasen [Accessed 14.08.2023].

German Environment Agency (UBA) 2023-2

German Environment Agency: "Gesellschaftliche Kosten von Umweltbelastungen", 2023. URL: https://www.umweltbundesamt.de/daten/umwelt-wirtschaft/gesellschaftliche-kosten-von-umweltbelastungen#methodenkonvention-zur-ermittlung-von-umweltkosten-des-umweltbundesamtes [Accessed 31.08.2023].

United Nations Framework Convention on Climate Change (UNFCCC) 2019

United Nations Framework Convention on Climate Change: "Race to Zero. Halving Emissions by 2030", 2019. URL: https://racetozero.unfccc.int/system/race-to-zero/ [Accessed 04.08.2023].

World Bank 2022

World Bank: *State and Trends of Carbon Pricing 2022*. Washington, DC: World Bank, 2022. ISBN: 978-1-4648-1895-0. URL: http://hdl.handle.net/10986/37455 [Accessed 15.08.2023].

Wenzel 2023

Wenzel, S.: "High-Integrity Carbon Markets, No Environmental Risks!". In: *Carbon Mechanisms Review*, 1, 11, 2023, p. 4–11. URL: https://www.carbon-mechanisms.de/fileadmin/media/dokumente/Publikationen/CMR/CMR_01_2023_bf.pdf [Accessed 27.07.2023].

West et al. 2020

West, T. A. P./Börner, J./Sills, E. O./Kontoleon, A.: "Overstated Carbon Emission Reductions from Voluntary Redd+ Projects in the Brazilian Amazon". In: *Proceedings of the National Academy of Sciences of the United States of America*, 117, 39, 2020, p. 24188–24194. DOI: 10.1073/pnas.2004334117. URL: https://www.pnas.org/doi/full/10.1073/pnas.2004334117 [Accessed 31.08.2023].

West et al. 2023

West, T. A. P./Wunder, S./Sills, E. O./Börner, J./Rifai, S. W./Neidermeier, A. N./Kontoleon, A.: *Action Needed to Make Carbon Offsets from Tropical Forest Conservation Work for Climate Change Mitigation*, 2023. DOI: 10.48550/arXiv.2301.03354. URL: https://www.researchgate.net/publication/366983760_Action_needed_to_make_carbon_offsets_from_tropical_forest_conservation_work_for_climate_change_mitigation [Accessed 21.08.2023].

Wettbewerbszentrale 2023

Wettbewerbszentrale: "Aktuelles. 17.07.2023 // Update: Werbung mit „klimaneutral" – Wettbewerbszentrale legt Revision zum Bundesgerichtshof ein", 2023. URL: https://www.wettbewerbszentrale.de/de/home/_news/?id=3683 [Accessed 21.08.2023].

Wissner/Schneider 2022

Wissner, N./Schneider, L.: *Ensuring Safeguards And Assessing Sustainable Development Impacts In The Voluntary Carbon Market. An Overview of Approaches*, published by Öko-Institut e.V., 2022. URL: https://www.oeko.de/en/publications/p-details/ensuring-safeguards-and-assessing-sustainable-development-impacts-in-the-voluntary-carbon-market [Accessed 15.08.2023].

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