

Carbon markets 101

THE ULTIMATE GUIDE TO GLOBAL OFFSETTING MECHANISMS

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Contents

Introduction	3
Trading greenhouse gas emissions	3
Distinguishing between two forms of carbon markets	3
UN carbon markets	4
Lessons from the Kyoto Protocol for the Article 6 markets	4
The Clean Development Mechanism	4
International Emissions Trading and Joint Implementation	5
Carbon markets under the Paris Agreement	5
Article 6.2	5
Article 6.4	6
Main challenges	6
Too many credits available	6
The risk of double counting	8
Protecting local stakeholders and the environment, and delivering on the sustainable development goals	8
Delivering an overall mitigation in global emissions (OMGE)	8
Avoiding perverse incentives that hamper ambition	8
The Carbon Offsetting and Reduction Scheme for International Aviation	9
Other international carbon markets	10
REDD+	10
The voluntary carbon market	10
Looking ahead: going beyond offsetting	11

Introduction

This briefing gives an overview of the current discussions under Article 6 of the Paris Agreement which establishes the foundation for market-based climate measures after 2020. It lays out key lessons from the Kyoto Protocol markets, highlights essential issues within the Article 6 negotiations, and provides recommendations on how to solve them. It concludes with an overview of non-Article 6 carbon markets, which have ties to the Article 6 discussions, such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), a carbon market specifically designed for airlines.

Trading greenhouse gas emissions

Carbon markets are one of the tools to tackle the climate change problem, i.e. the *accumulation* of greenhouse gases in the atmosphere. Since we only have one atmosphere, it does not matter where the emissions are released, because they will soon spread around the earth, creating a greenhouse effect. Following this logic, if a group of people, countries or companies agrees to limit their emissions to a certain amount (aka adopt a “carbon budget”), it does not matter how much each person emits, or where they do so, as long as the whole group does not emit more than what they committed to. Since it doesn’t matter where we reduce emissions, the argument behind carbon trading is that the best way to take climate action is to reduce emissions where it is easiest (i.e. least costly) to do so.

To this end, governments around the world have established carbon markets, where emissions (or emissions reductions) can be exchanged from one entity to another. In theory, as long as we control the total amount of emissions traded in the market, it does not matter for the climate who buys or sells. Of course, in practice, establishing a global, or even national, carbon market is a challenging task. There are significant risks that the systems contain loopholes which can result in this policy having little to no impact on reducing emissions.

Distinguishing between two forms of carbon markets

In order to understand how different carbon markets function, one needs to ask the following question: *how are emission reductions exchanged from one person/country/company to another?*

There are two different types of carbon markets: cap and trade schemes (or *emissions trading systems, ETS*) and baseline-and-credit mechanisms, which we will call offsetting mechanisms (although this is a simplifying characterisation¹).

These two forms of markets do not work in the same way, and do not have the same objective. The fundamental distinction between the two is in what is being bought and sold on the market. In both cases, it’s a tonne of CO₂e. However, in an ETS, companies trade pollution permits (often called “allowances”), which allow them to emit one tonne of CO₂e. When a company releases 1tCO₂e, it must give one permit back to the government (“surrender an allowance to the regulator”). In an offsetting mechanism, on the other hand, countries/companies trade offsets, i.e. emission reduction units, which must represent a tonne of CO₂e which has been reduced already².

The timing is therefore crucial to distinguish between ETSs and offset mechanisms: in an ETS, companies trade permits to pollute in the future, while in an offsetting mechanism, the traded emission reductions have already happened (hence are from the past). From this follows a host of other differences.

Offsets can only lead to a zero-sum game, because one tonne of CO₂e is emitted somewhere, and one tonne is reduced somewhere else. Hence, they cannot be used to reduce emissions in the long term and are incompatible with the idea of going towards net-zero emissions at a global level.

The choice of one system over the other leads to significantly different targets when it comes to climate ambition. Under an ETS, the

1 Throughout this guide, we make simplifying assumptions, characterizations, and statements. These simplifications help focus on what matters and should not be controversial in any way. For example, we will assume throughout the briefing that the unit of measure traded in carbon markets is always 1tCO₂e. This is not a fixed international rule, but it is the unit used in an overwhelming majority of the systems.

2 Sometimes, offsets can be used in emissions trading systems, which has important repercussions on the effectiveness of the ETS, but we will not focus on this issue here.

government has full control over the amount of CO₂e which can be emitted, because companies taken together cannot emit more than the total number of allowances distributed. Under an offsetting mechanism, the government might set a theoretical emission limit, but companies will be free to emit as much as they want, as long as they buy offsets. This means that companies are paying others to reduce emissions instead of doing the job themselves.

Global carbon markets to date have been nearly exclusively offsetting mechanisms, rather than emissions trading systems. This is why, in this guide, we will focus largely on offsetting mechanisms which are implemented at the UN level. Below, we describe some of the main offsetting mechanisms in the world, explaining what they are and how they work (or don't work!).

UN carbon markets

Under the United Nations' climate body (the United Nations Framework Convention on Climate Change, UNFCCC), countries have set up different offsetting mechanisms. Theoretically, this allows countries to set more ambitious climate targets, since climate action is cheaper. However, in practice it is very difficult to establish a clear relationship between the ability to buy cheap carbon credits and a country's willingness to commit to more climate action. In certain cases, the opposite can happen, as countries prefer to sell their emission reductions instead of using them to meet their own targets (more details about this further down).

Lessons from the Kyoto Protocol for the Article 6 markets

Under the Kyoto Protocol, three carbon markets were established. The main commonly understood objective was to make it as cheap as possible for rich countries to meet their emission reduction objectives (developing countries did not have reduction targets under the Kyoto Protocol).

The Clean Development Mechanism

The main market is called the Clean Development Mechanism³ (CDM), which allowed rich countries to buy emission reductions from developing ones through carbon credits, called Certified Emission Reductions (CERs). In theory, this should have allowed countries to adopt more ambitious climate targets. In practice, it even failed at the task of compensating existing emissions. This is because a large majority of the emission reductions under the CDM would have happened anyway. For example, some projects which sold emission reductions were mandated by law, and some were profitable even without selling credits. Countries relied on these credits to *replace* other emission reduction efforts which meant that the CDM led to an *increase* in emissions, compared to a situation where countries would have met their targets without relying on the CDM. It is estimated that 85% of CDM projects would have operated even without the CDM revenues⁴.

In addition, some projects registered under the CDM have had significant negative impacts at local level, because the system lacks essential safeguards⁵. For example, its rules on local stakeholder consultations are insufficient and it has no mechanism in place to address grievances raised by local communities.

These elements demonstrate why the CDM has failed at its task of contributing to the global effort to reduce greenhouse gas emissions and delivering sustainable development benefits. It provides valuable lessons for the Article 6 mechanisms, but countries should not be allowed to use the credits it generated towards their Nationally Determined Contributions (NDCs) under the Paris Agreement (see below).

3 Carbon Market Watch has extensively worked on the CDM. After being revised several times, it has become clear that the CDM has major shortcomings, and must end. You can read more about this in our publication "[CDM: Local Impacts of a Global System](#)". As of 2019, the survival of the CDM is subject to tense negotiations between countries, see the "Paris Agreement" - Article 6.4 section below.

4 Öko-Institut (2016), "[How additional is the Clean Development Mechanism?](#)", 2016

5 You can find concrete case studies of projects which had harmful local impacts [here](#) and [here](#). You can also find our guide on how to conduct effective local stakeholder consultations [here](#).

International Emissions Trading and Joint Implementation

The other two carbon markets established under the Kyoto Protocol are slightly different, and interact with one another.

International Emissions Trading (IET) is like an emissions trading system for rich countries, which received units (AAUs - for *Assigned Amount Units*) that could be sold to other rich countries. However, IET was not effective because too many units were distributed under it, i.e. national targets under the Kyoto Protocol were very weak.

Joint Implementation is similar to the CDM, but the trade of emission reductions happened between rich countries, rather than from developing to developed countries. The units were called Emission Reduction Units (ERUs).

IET and JI - a poisonous mix for the climate

Since Kyoto targets were very weak, they were over-achieved by several countries, without significant climate action being undertaken. This was the case for example when the Soviet Union collapsed, leading to a significant economic downturn. As a result, emissions in the countries of the bloc plummeted. This meant that, compared to the baseline that was fixed at 1990 levels, it appeared as if the ex-Soviet countries had carried out significant climate action. Some countries ended up with a lot of unused⁶ credits from IET (AAUs) which they were able to sell to others.

Many countries sold this extra abatement to private companies which were allowed to use that instead of complying with more ambitious regulations⁷. Technically, companies could not use these credits, because they were meant *for countries*. So countries sold credits from the JI to companies, and cancelled their AAUs to account for this sale. In theory, this ensured that for every tonne emitted by a company, a country had to reduce one more tonne, because it had one less “pollution permit” (AAU). But in practice, since countries had too many AAUs in the first place, having to cancel such units did not make any difference for them, and ended up allowing companies to pollute more without forcing countries to do any extra effort. This issue is often referred to as the “hot air problem” under the Kyoto markets, and it is a major lesson to be learned when designing the Paris Agreement markets.

Carbon markets under the Paris Agreement

Under the Paris Agreement, (nearly) all countries around the world have adopted climate targets, not just rich countries, and two new carbon markets have been established to replace the three Kyoto markets. These markets are covered in large part by Article 6 of the agreement, and negotiators have been discussing the detailed rules of these mechanisms since 2016. As of 2019, no agreement has been found⁸.

The Article 6 is split into two different market mechanisms: Article 6.2 and Article 6.4 (the latter is sometimes called the Sustainable Development Mechanism, or SDM).

Article 6.2

Article 6.2 sets up a carbon market which allows countries to sell any extra emission reductions they have achieved compared to their target⁹. For example, if a country has committed to reducing its emissions by 100 tCO₂e, but actually reduces 110tCO₂e, it would be able

6 See for example this report “[carry over of AAUs from CP1 to CP2](#)”

7 Many companies relied on CDM and JI credits to meet their obligations under the EU Emissions Trading System, which played a major role in crashing the system for a decade.

8 Because of this, the section below should be taken with a grain of salt. The description made of the two Paris markets is what CMW perceives as being a possible outcome for these markets (which is not the same as the best outcome!). When, if at all, an agreement is found, we will update this guide to reflect it.

9 Targets are self-defined, and called Nationally Determined Contributions. Taken collectively, the NDCs of all countries do not set the world on track to meet the temperature target of the Paris Agreement.

to sell the extra 10tCO₂e reduced to another country, which has not managed to meet its own target. These credits would be called Internationally Transferred Mitigation Outcomes (ITMOs).

Under this system, countries could be allowed to enter into bilateral agreements and self-define how “environmental integrity” is ensured. This means that there would not be any specific body to control the market, and the quality of the emission reductions transferred would not necessarily be measurable. Of course, other scenarios are possible, where countries are bound by strict rules which regulate the quality of the transferred credits. This would logically be beneficial for the climate, and would be a preferable outcome to a do-what-you-like system¹⁰.

One major risk in this market is that it could repeat the failures of the JI and IET systems, by trading “hot air”. If national emission reduction targets are too weak, which is the case for several countries which adopted emission reduction objectives that do not require them to take any climate action, then the transferred credits will have no value for the climate. Relying on such credits instead of reducing emissions domestically would be equal to reducing emissions on paper but not doing anything in practice. The solution is for buyer countries to only buy credits from countries which have ambitious climate targets, in line with a 1.5°C compatible trajectory, recognising the principle of common but differentiated responsibilities.

Article 6.4

A different system, Article 6.4 resembles much more the Clean Development Mechanism, except that it will not be restricted to projects implemented in developing countries. Under this market, it is expected that project developers will reduce emissions through specific actions in a country, and sell these emission reductions to another country/company/person. This process requires more “governance”, i.e. more control from a body tasked with establishing detailed rules and verifying that projects and credits comply with certain criteria.

Main challenges

While many of the shortcomings of the Kyoto Protocol’s markets are clearly identified, the solutions, and the political willingness to implement them, are not as straightforward. Below we cover five main challenges in the Article 6 negotiations at the UNFCCC.

Too many credits available

Since projects started reducing emissions under the Kyoto Protocol’s market, demand has been much lower than supply. As a result, many projects which have been registered under the CDM, and have reduced emissions, are not producing credits. Producing (called “issuing”) credits costs money, because the project developers must pay an external auditor to verify the quality of their project. If nobody is interested in buying the credits, and prices are hence very low, it does not make sense for the project developer to pay the cost of producing a credit.

This means that, in many cases, projects have reduced emissions but have not yet issued credits. However, the credits could still be released in the future, if the project developers decided to pay the external verifier. This means that the number of credits available today is much lower than the number of credits which *could be available if credit prices increased*. The key point here is that many credits could be issued for emission reductions which have already taken place, which raises questions about the true climate benefit of relying on these credits to “compensate” present or future emissions.

By 2020, the number of credits which the CDM will potentially have made available is 4.6 billion. Of this, it is expected that around 600 million credits will be used towards existing targets and commitments, or have already been used in the past. This means that around four billion credits could be available for use after 2020, without actually leading to direct reduction of one single tonne of CO₂e after 2020. This number of credits is much bigger than the expected demand at least until 2035.

¹⁰ The ongoing negotiations around Article 6.2 are highly technical, and the system is of course much more complex than what is described here.

GLOBAL CARBON MARKETS: 5 MAIN CHALLENGES AND 5 WAYS TO ADDRESS THEM

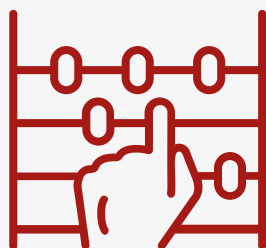
TOO MANY CREDITS AVAILABLE



THE USE OF OLD CDM CREDITS SHOULD NOT BE ALLOWED AFTER 2020



THE RISK OF DOUBLE COUNTING



ROBUST ACCOUNTING RULES ARE NEEDED, INCLUDING THE APPLICATION OF CORRESPONDING ADJUSTMENTS FOR EVERY CREDIT



PROTECTING LOCAL STAKEHOLDERS AND THE ENVIRONMENT AND DELIVERING ON THE SUSTAINABLE DEVELOPMENT GOALS



MARKETS MUST INVOLVE LOCAL COMMUNITIES IN PROJECTS, AND HAVE SAFEGUARDS IN PLACE, SUCH AS A GRIEVANCE MECHANISM



DELIVERING OVERALL MITIGATION IN GLOBAL EMISSIONS



ALL CREDITS SHOULD BE PARTIALLY CANCELLED TO GO BEYOND ZERO-SUM OFFSETTING



AVOIDING PERVERSE INCENTIVES THAT HAMPER AMBITION



COUNTRIES SHOULD ADOPT AMBITIOUS CLIMATE TARGETS INSTEAD OF SELLING EMISSION REDUCTIONS



In addition, a large majority of the projects which would generate these credits would continue to reduce emissions regardless of whether they can sell emission reductions or not¹¹.

This is why it is crucial that units issued under the Kyoto Protocol are not used after 2020, and in particular are not accepted towards the achievement of mandatory emission reduction objectives such as the nationally determined contributions under the Paris Agreement, or the airlines' obligations under the future aviation offsetting scheme (see section below).

The risk of double counting

Another major threat for carbon markets after 2020 is the fact that emission reductions could be counted multiple times.

All countries under the Paris Agreement have adopted an emissions reduction target. When one country sells a reduction to another country, it is important to ensure that this reduction is not counted by both countries. Tracking countries' progress towards their national objectives (i.e. checking whether they are reducing their emissions by as much as they said they would), is often done based on countries' *emission inventories*. These inventories are essentially a physical measure of the amount of CO₂e which is released into the atmosphere. If emissions are reduced, this will be seen in the country's inventory. If this emission reduction is sold to another country, it will also be used by this other country towards meeting its objective. This is double counting.

In order to avoid this, it is of paramount importance that countries make corrections to their reported emissions¹², to show that some of their achieved emission reductions have been used by another entity. This is called a "*corresponding adjustment*". If a country reduced its emissions by 100tCO₂e, but sells 10 credits to another entity, then it should report a reduction of 90tCO₂e. In this case, the corresponding adjustment applied is 10tCO₂e.

Protecting local stakeholders and the environment, and delivering on the sustainable development goals

In addition to questions related to the true impacts of carbon markets on the climate, concerns have been raised regarding the local impacts of such markets. By recognising specific projects as eligible, programmes such as the CDM provide certain legitimacy to the projects. A "UN certification" is for most observers a guarantee of quality.

Yet, in reality, mechanisms such as the CDM have lacked the most essential safeguards to avoid harmful local impacts (see previous section on the CDM). This must be corrected in the new set of markets under the Paris Agreement. Specifically, this means adopting detailed rules for consulting local stakeholders before emission reduction projects are implemented - and making such consultations mandatory -, establishing a grievance mechanism, governed by an independent body, and specifying criteria which could be used to measure a project's contribution to sustainable development.

Delivering an overall mitigation in global emissions (OMGE)

Unlike the Kyoto markets, Article 6 sets an objective to go beyond "zero-sum" compensation, and use carbon credits to *reduce* emissions. This means that more emissions must be reduced than what is being emitted as a result of using a carbon credit. In order to deliver on this objective, a partial cancellation rate should be adopted, i.e. every time a credit is transferred, a portion of it is cancelled. In this way, a country which purchases ten credits might only be able to use five, and hence a reduction of 5tCO₂e will not be counted by anyone.

While the Paris Agreement only mentions this objective in the context of Article 6.4, it should be implemented as broadly as possible, including within Article 6.2.

Avoiding perverse incentives that hamper ambition

Finally, without proper safeguards, there is a risk that using the Article 6 mechanisms leads to the adoption of *lower* emission reduction

11 Warnecke et al. (2019): "Robust eligibility criteria essential for new global scheme to offset aviation emissions", Nature Climate Change, 9, 218-221

12 Technically, inventories cannot be changed. The corrections must be applied to an account based on the country's inventory, i.e. you take the final number of a country's inventory, you copy paste it to another table which you call "account" and you make corrections to that. The inventory is always the physical measure of emissions in a country, it cannot be changed with accounting procedures.

targets. This is because the ability to sell credits will push seller countries to adopt lower domestic targets and sell the emission reductions instead of using them towards their own objectives.

This is particularly true if countries are allowed to sell emission reductions from sectors (or gases) which are not covered by their nationally determined contributions. For example, a country might have excluded its waste sector from its NDC target. If it is allowed to sell emission reductions from this sector, it would have an incentive not to set an emission reduction target for it, because doing so would force it to use the emission reductions towards its own target, or to make corresponding adjustments to avoid double counting.

Another solution could be to require corresponding adjustments to be applied *inside* an NDC, even if credits are issued *outside* of it.

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

In parallel to the UNFCCC's carbon markets, another UN agency is in the process of developing its own mechanism: in 2016, member countries of the International Civil Aviation Organisation (ICAO), the UN body responsible for civil aviation, agreed to establish the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), a carbon market specifically designed for airlines.

The objective of this market is to compensate the growth in emissions from international flights above 2020 levels. Emission levels will be measured in 2020¹³, and anything emitted above this threshold will have to be compensated by airlines through the purchase of carbon offsets.

The shortcomings of CORSIA

It is important to keep in mind two things when discussing the future aviation offsetting scheme and its effectiveness. First of all, this scheme covers only *international* flights, not domestic, which represents a significant share of global aviation emissions. From the flights that it does cover, only the growth in emissions will be compensated. In total, CORSIA will therefore only cover about 10% of global aviation CO₂ emissions.

Second, we are no longer referring to CO₂e, but only to CO₂. This is because CORSIA only covers CO₂ emissions, without taking into account other impacts which air travel has on climate. These so-called “non-CO₂ impacts” can be massive, and act as a multiplier to the impact from CO₂ emissions. It is very hard to calculate the exact value of this multiplier, but it is sometimes estimated between two and four times the impact of CO₂-only.

In order to compensate for their emissions, airlines will therefore have to buy carbon credits, and the big question is: where will these credits come from? With an estimated demand of around two billion credits, airlines will probably be the largest source of demand for carbon credits after 2020, which means that what they can or cannot buy will have a major impact on the future carbon markets.

In the near future, countries meeting through ICAO will decide which offset credits are eligible for CORSIA, based on recommendations from an expert group. Recognising credits issued under the Kyoto Protocol would render CORSIA meaningless. This is because, as explained above, there are about four billion credits potentially available already, while airlines will only need two billion. Hence, they could meet their obligations under CORSIA simply through the purchase of very cheap old credits, without achieving any actual reduction of emissions after 2020.

In addition to this, the double counting rules to be adopted under the Article 6 of the Paris Agreement will have to also cover carbon credits used by airlines, in order to avoid both a country and an airline claiming the same emission reduction towards their respective targets.

13 It is actually the average between 2019 and 2020 emissions

Other international carbon markets

REDD+

There is another offset scheme established under the UN, but which has not been recognised for the use of its units towards meeting country targets: REDD+ (which stands for reduced emissions from deforestation and land degradation, conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks). Through this market, project developers create carbon credits based on the avoidance of deforestation, which would have led to emissions being released when trees are felled and/or burned.

However, this market has been strongly criticised for its lack of environmental integrity. Issuing credits for avoided deforestation raises three major problems.

First, it is extremely difficult to accurately establish what would have happened in the absence of the project. Perhaps the trees would not have been cut down anyway? Establishing a scenario to which one can compare the observed reality requires making major assumptions, which are sometimes unrealistic.

Second, it is also very difficult to ensure that by reducing deforestation somewhere, the project is not increasing deforestation somewhere else. This indirect impact of a conservation project is hard to estimate and to prevent, and can substantially reduce the benefits of a forest protection measure.

Finally, issuing credits for avoided deforestation requires that the deforestation is avoided over a long period of time. If the credits are used to justify emissions in another part of the world, then the avoided emissions should be avoided for at least the lifetime of the emissions it is justifying¹⁴. An often-used reference is a 100-year time horizon. Yet, thinking that it is possible for a project developer or an offset provider to protect trees for an entire century is a very strong assumption to make.

The voluntary carbon market

The UN's carbon markets are the main "compliance" markets, meaning that they are established in order for their participants to meet binding targets set by governments. In addition, some private companies also choose to buy carbon credits on a voluntary basis, most often as a tool for corporate social responsibility and to improve their public image.

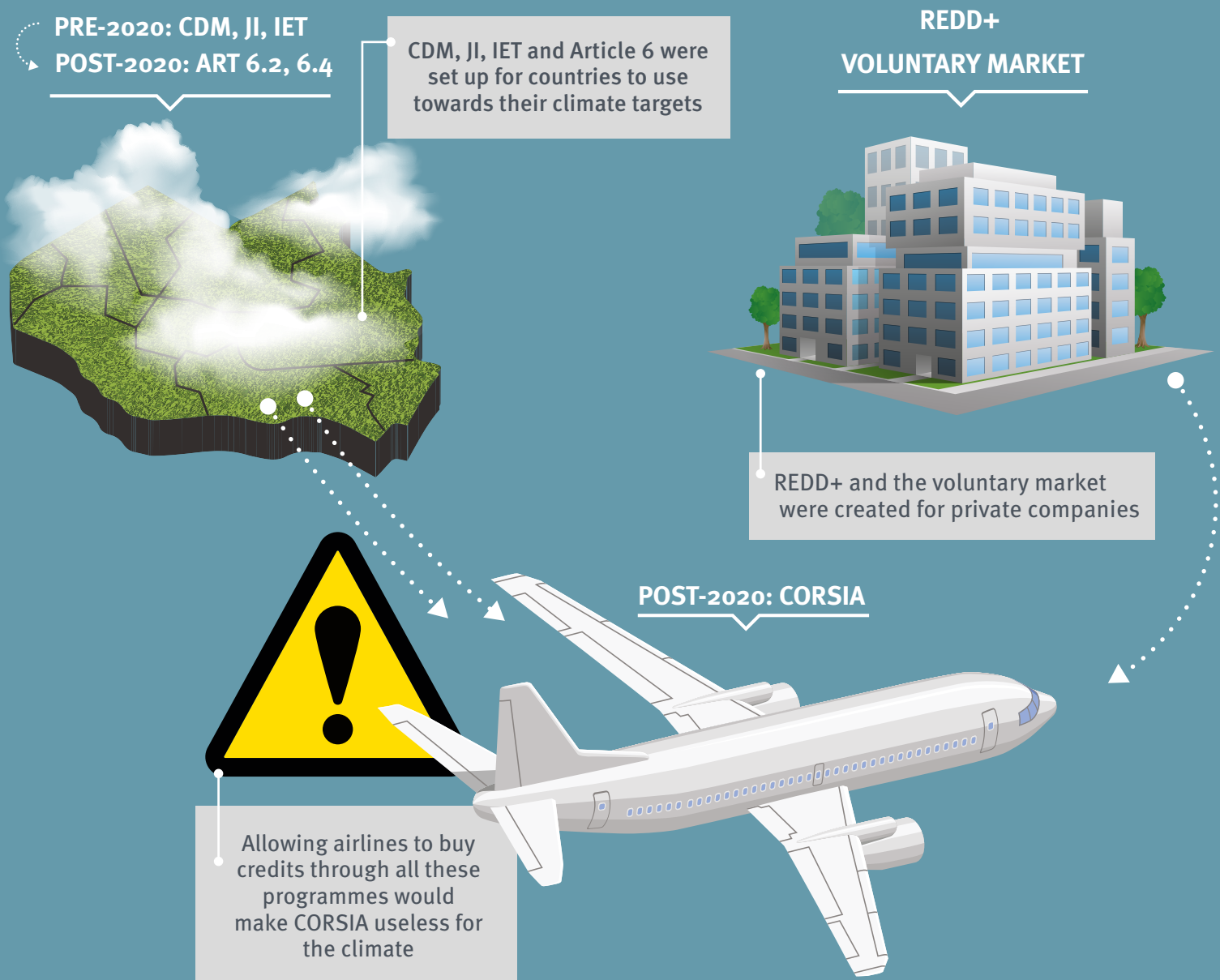
These credits are bought and sold in the so-called "voluntary" market¹⁵, which is not backed by any government standard or mandatory goals, but rather based on specific organisations certifying that emission reductions have environmental integrity (called "greenhouse gas (GHG) programmes"). The entire market, therefore, rests on the relationship of trust between buyers and the GHG programmes, and the claim that the credits sold on the market truly contribute to reducing emissions.

Similar to the compliance market, this market has shortcomings, including in relation to the environmental integrity of the credits transacted. While fewer studies have been conducted on the quality of the voluntary market, in part because it is much smaller than the main UN markets, some of the criticisms of compliance markets are valid also here. For example, several types of projects which have been found to be non-additional, such as large renewable energy projects, have been used in the voluntary market to issue credits.

14 CO₂ emitted into the atmosphere progressively disappears over time. It takes about 100 years for it to fully disappear. If you justify the emission of 1tCO₂ by avoiding equivalent emissions somewhere else, then as a minimum you need to ensure that the avoided emission will stay avoided until the CO₂ which you emitted has fully disappeared. This has to be true in order for your project to have environmental integrity, but it is not enough on its own (i.e. it is a necessary but insufficient condition to ensure environmental integrity).

15 Some companies also purchase credits from the CDM on a voluntary basis. But while companies can purchase credits from compliance markets, it is not possible for countries to buy credits from the voluntary market and claim the emission reductions towards official targets.

GLOBAL CARBON MARKETS AND THEIR POTENTIAL USE IN THE AVIATION OFFSETTING SCHEME



Looking ahead: going beyond offsetting

As described in the introduction to this briefing, we have focused on offsetting mechanisms. Yet these mechanisms are based on a logic which does not hold in the long term. In order to be able to offset one's emissions, someone else needs to have "extra" emission reductions available to sell.

Yet, the Paris Agreement requires all countries to reduce emissions as much as they can. This means that there is no room to offset, because there are no "extra emission reductions" available when countries are already doing their maximum.

This means that the carbon market system must evolve towards something better than offsetting. It should aim to *accelerate* the transition, rather than offering a cheap way out and replacing somebody's efforts with those of someone else.

The world should move away from offsetting mechanisms and towards financing climate projects that truly drive the zero-carbon transition. One way of achieving this is to use existing carbon markets to disburse climate finance by buying carbon credits and cancelling them, without claiming the actual emission reductions. But this will be a subject for another guide.



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