FOE/DB/3

Town and Country Planning Act 1990 (as amended)

Application by West Cumbria Mining Limited

Proposal: Development of a new underground metallurgical coal mine and associated development

Site: Former Marchon Site, Pow Beck Valley and area from Marchon Site to St Bees Coast, Whitehaven, Cumbria

Planning Inspectorate reference: APP/H0900/V/21/3271069

Cumbria County Council reference: 4/17/9007

SUPPLEMENTARY/REBUTTAL PROOF OF EVIDENCE

OF

DERIK BROEKHOFF

Date: 7 September 2021

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1. Qualifications and experience

1.1. My name is Derik Broekhoff. I am a Senior Scientist at the Stockholm Environment Institute ('**SEI**'). I am based in SEI's office in Seattle, United States. I joined in 2015 to work on climate change mitigation research. My areas of expertise include carbon markets and carbon offsets.

1.2. I have worked on energy and climate policy for more than 20 years, with an emphasis on greenhouse gas accounting, emissions trading, and carbon offsets. My research interests include the effective design and implementation of environmental market mechanisms, along with assessing and enabling climate mitigation policies that go beyond "carbon pricing". I have advised numerous state, national, and multi-national policy initiatives on carbon accounting and program design, including voluntary and regulatory offset programs and programs to reduce emissions from deforestation and degradation (**REDD+**).

1.3. Prior to joining SEI, I was vice president for policy at the Climate Action Reserve in Los Angeles, where I oversaw development of the Reserve's voluntary carbon offset program and its transition into California's regulatory cap-and-trade program.

1.4. Previously, I worked on the Greenhouse Gas Protocol Initiative at the World Resources Institute, where I also managed work on the design of emissions trading programs, registry systems, and standards for carbon offsets. While at WRI, I testified twice before the United States Congress as an expert on the design of standards and policies related to carbon offsets.

1.5. I have a master's degree in public policy (MPP) from the University of California at Berkeley, and a bachelor's degree in international relations from Stanford University.

1.6. My publications include:

1.6.1. Broekhoff, D., Gillenwater, M., Colbert-Sangree, T., and Cage, P. (2019). "**Securing Climate Benefit: A Guide to Using Carbon Offsets**." Stockholm Environment Institute & Greenhouse Gas Management Institute. This guide is for companies and organizations who aim to use offsets in voluntary GHG reduction strategies.

1.6.2. Schneider, L., Duan, M., Stavins, R., Kizzier, K., Broekhoff, D., Jotzo, F., Winkler, H., Lazarus, M., Howard, A. and Hood, C. (2019). **Double counting and the Paris Agreement rulebook**. *Science* 366 (6462), pp. 180-183. This paper in Science identified three principles to guide the then upcoming UN negotiations on the rules for international carbon markets.

1.6.3. Schneider, L., Michaelowa, A., Broekhoff, D., Espelage, A. and Siemons, A. (2019). **Lessons Learned from the First Round of Applications by Carbon-Offsetting Programs for Eligibility under CORSIA**. Öko-Institut / Perspectives / Stockholm Environment Institute. This study, conducted on behalf of the German government and the ClimateWorks Foundation, assessed the quality of applications submitted by carbon offset certification programs – including the Gold Standard – to the International Civil Aviation Organization (ICAO) for approval to issue credits eligible for use under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

1.6.4. La Hoz Theuer, S., Schneider, L. and Broekhoff, D. (2019). **When less is more: limits to international transfers under Article 6 of the Paris Agreement**. *Climate Policy*, 19(4). 401–13. This study assessed the environmental integrity risks of international carbon markets under Article 6 of the Paris Agreement and discussed possible international rules to address them.

1.6.5. Bailis, R., Broekhoff, D. and Lee, C. M. (2016). **Supply and Sustainability of Carbon Offsets and Alternative Fuels for International Aviation**. Working Paper 2016-03. Stockholm Environment Institute, Stockholm. This paper examined the potential supply of carbon offsets and jet fuel alternatives available to help meet the international aviation sector's emission reduction needs in 2020–2035, with a focus on which types of mitigation projects yield more robust offsetting claims.

1.6.6. Broekhoff, D. and Zyla, K. (2008). **Outside the Cap: Opportunities and Limitations of Greenhouse Gas Offsets**. Climate and Energy Policy Series. World Resources Institute, Washington, DC. This paper likewise examined the degree to which different type of greenhouse gas mitigation activities (e.g., industrial gas destruction vs. tree planting) can provide reliable offsets, and argued that certain types of projects would be better supported through means other than selling offset credits because they cannot reliably support robust offsetting claims.

1.6.7. Gillenwater, M., Broekhoff, D., Trexler, M., Hyman, J. and Fowler, R. (2007). **Policing the voluntary carbon market**. *Nature Reports Climate Change*, no. 0711. 85–87. This article examined requirements for effective carbon offsetting and argued that government regulation should be required to ensure the quality of voluntary carbon offsets.

2. Declaration

2.1. The evidence which I have prepared and provide for in this proof of evidence is true, and I confirm that the opinions expressed are my true and professional opinions. I am acting as an independent expert offering my services based on my professional experience.

3. Introduction and summary of conclusions

3.1. I have been asked by Friends of the Earth England, Wales and Northern Ireland to act as an expert witness and prepare this proof of evidence for use in planning application reference APP/H0900/V/21/3271069. This is an application, promoted by West Cumbria Mining Ltd ('**WCM**'), for a new underground metallurgical coal mine in Whitehaven, Cumbria. My evidence relates to the use of carbon credits – such as those issued by the Gold Standard – as a means to offset or counterbalance greenhouse gas emissions for the purpose of mitigating climate change.

3.2. In preparing my evidence I have reviewed the proof of evidence of Caroline Leatherdale, dated 10 August 2021, and submitted on behalf of WCM [**WCM/CL/1**]. That includes a report, at Appendix 1 [**WCM/CL/2**], by Ecolyse also dated 10 August 2021 and entitled '*Greenhouse Gas Assessment for the Woodhouse Colliery, West Cumbria Mine*'. In addition to reviewing that version of the report I have also reviewed the updated version ('Version 2') dated 1 September 2021, which I shall refer to as '**the Ecolyse Report**'. I have also reviewed the letter from the Gold Standard Foundation to Friends of the Earth, which is undated but which I am told was received by Friends of the Earth on 26

August 2021 (‘**the Gold Standard letter**’). The Gold Standard letter is included at Appendix 9 [FOE/DB3/9], and the letter from Friends of the Earth to which it responds, dated 11 August 2021, is included at Appendix 8 [FOE/DB3/8].

3.3. The conclusions I have reached in this proof of evidence are, in summary:

3.3.1. Carbon credits should be seen as tool for channeling investment and accelerating action on mitigating climate change. As a means to compensate for (or “offset”) greenhouse gas emissions, they are an imperfect and unreliable solution.

3.3.2. If carbon credits are used to offset emissions, they should (1) exclusively come from mitigation activities that can reliably meet core criteria for offsetting – including that mitigation is truly permanent; and (2) must be associated with mitigation (i.e., greenhouse gas emission reductions, or carbon dioxide sequestration) that is not counted by any national government towards the achievement of mitigation pledges under the Paris Agreement.

3.3.3. Over the long term, offsetting is not a viable greenhouse gas mitigation strategy. As the world economy decarbonizes, opportunities for additional mitigation that could compensate for remaining emissions will dwindle. Scarce and uncertain capacity for removing carbon from the atmosphere should be conserved in order to compensate for truly hard-to-abate and unavoidable emission sources in the latter half of the century – the precise nature of which has yet to be determined.

3.3.4. For this reason, the fundamental question for any new source of greenhouse gas emissions should be whether the source itself is aligned with a broader “net zero” decarbonization scenario, not whether through offsetting it can claim to have a net zero carbon footprint. Offsetting is not a means for turning an otherwise incompatible new source into a compatible one.

4. Definitions

4.1. A “carbon offset” broadly refers to a reduction in greenhouse gas emissions – or a removal of greenhouse gases from the atmosphere (e.g., through tree planting or other means) – that is used to compensate for greenhouse gas emissions that occur elsewhere (Broekhoff et al. 2019). “Compensate” in this context means to counterbalance the greenhouse gas emissions, such that an actor’s net contribution to global warming is zero or negative. Below, I use the term “**mitigation**” to refer to either a reduction in greenhouse gas emissions or removal of CO_2 from the atmosphere.

4.2. The term “carbon” in this context is used as a shorthand for any of a number of greenhouse gases that contribute to global warming.

4.3. The act of “offsetting” emissions typically refers to enabling a carbon offset to happen.

4.4. “Carbon credits” are transferable instruments certified by governments or independent certification bodies to represent an emission reduction of one metric tonne of CO_2, or an equivalent amount of other greenhouse gases. The purchaser of an offset credit can “retire” it to claim the underlying reduction towards their own greenhouse gas reduction goals.

4.5. Purchase of carbon credits is the primary means through which most actors seek to offset their emissions. When the Ecolyse Report refers at paragraph 5.7 to the "purchasing of recognised Gold Standard offsets," I interpret this to mean that WCM would purchase Gold Standard-certified carbon credits as a means to offset those emissions identified by the Report as resulting from the proposed development.

5. Requirements for an effective carbon offset

5.1. Carbon offset claims or assertions are only defensible under a specific set of conditions. For the use of carbon credits to truly compensate for an actor's greenhouse gas emissions, there must be a causal connection between using credits and lowering global greenhouse gas emissions. The "quality" of a carbon credit refers to the *level of confidence* one can have that using a credit actually lowers global emissions, compared to a scenario where the credits are not purchased or used (Broekhoff et al. 2019; Schneider and La Hoz Theuer 2019).

5.2. To be truly effective at compensating for emissions, carbon credits must be associated with mitigation that meets the following five conditions (Broekhoff et al. 2019):

5.2.1. The mitigation **must be additional**. Mitigation is additional if it would not have occurred in the absence of demand for carbon credits. If mitigation would have happened anyway – i.e., without any prospect for the initiators of the mitigation to sell carbon credits – then it is not additional. "Additionality" is the most essential criterion for carbon credit quality. If mitigation claimed as an offset not additional, then purchasing carbon credits yields no change in global emissions. There is no compensatory value.

Unfortunately, the determination of additionality is deceptively difficult and subject to inherent uncertainty. It requires comparison to a counterfactual scenario where demand for carbon credits is not present. While carbon credit certification programs – like the Gold Standard – take pains to try to ensure that credited mitigation is additional, their determinations are unavoidably subjective and subject to error. Multiple studies have suggested that, for a wide range of mitigation activities certified as carbon offsets, additionality claims are not reliable (Alexeew et al. 2010; Cames et al. 2016; Haya 2009; Haya et al. 2020; Haya and Parekh 2011; Ruthner et al. 2011; Schneider 2009; Trexler 2019).

5.2.2. The mitigation **must not be overestimated**. If the actual effect of a mitigation activity on reducing or removing greenhouse gas emissions is overestimated, then its compensatory value will also be overestimated. This is sometimes referred to as "over-crediting": more credits are issued than the actual quantity of emission reductions or removals achieved. Overestimation can occur in several ways, including through inaccurate assessment of a mitigation activity's *baseline* emissions, under-estimation of the activity's *actual* emissions, and failing to account for an activity's *indirect effects* on greenhouse gas emissions at other sources (sometimes called "leakage") (Broekhoff et al. 2019). Again, uncertainty is inherent. A mitigation activity's effects must be quantified against a counterfactual baseline, representing emissions or removals that would have occurred in the absence of a carbon credit transaction. This will always be inherently subjective, even where the baseline scenario appears to be straightforward.

Another way emission reductions and removals can be overestimated is through "forward crediting." Under this practice, credits are issued for mitigation that is expected to occur but whose occurrence has not yet been verified. If the actual performance of a mitigation activity fails to live up to expectations, then forward crediting can lead to over-crediting. Note that, in some cases, the Gold Standard issues a distinct class of carbon credits – called 'Planned Emission Reductions" (or PERs) – that are based on current estimates of future mitigation that will be achieved. While these credits can be a useful source of financing for some types of mitigation activities, they should not be used to offset emissions. For example, the International Civil Aviation Organization (ICAO) expressly forbids the use of Gold Standard PERs for the purpose offsetting emissions from international aviation (ICAO 2021).

5.2.3. The mitigation **must be permanent**. One challenge with using carbon credits to compensate for carbon emissions is that the effects of carbon emissions are very long-lived. Most of the carbon in a tonne of CO_2 emitted today will – eventually – be removed from the atmosphere. However, around 25% remains in the atmosphere for hundreds to many thousands of years. This is an issue for methane (CH_4) emissions as well. While methane has a much higher warming effect over shorter time periods than CO_2, it ultimately degrades into CO_2 in the atmosphere, leading to similarly long-lived effects.

5.2.4. To compensate for carbon emissions, therefore, carbon credits must be associated with mitigation that is similarly permanent. If mitigation is "reversed" (i.e., carbon stored as a result of a mitigation activity is subsequently emitted, so that no net reduction or removal occurs), then it no longer serves a compensatory function. This is primarily a concern with mitigation activities that result in enhanced carbon storage in biospheric reservoirs (including trees, shrubs, soils, and other biological stores of carbon) such as activities that reduce deforestation or that lead to greater reforestation. More on this below, in section 6.

5.2.5. The mitigation **must be exclusively claimed**. This requirement is straightforward. If two different actors lay claim to the same mitigation, the sum of their claims will exceed the actual mitigation achieved. Mitigation that is "double counted" (e.g., counted by another party towards the achievement of an emissions target) has no compensatory value, because in the absence of double counting, the other party can be expected to still achieve the same quantity of mitigation. Double counting can occur in mundane ways, e.g., if more than one credit is issued for the same tonne of mitigation ("double issuance"), or if a credit is used by more than one actor ("double use") (Schneider et al. 2015). A more challenging problem, however, is the risk that mitigation may be "double claimed" by national governments when accounting for progress towards their mitigation pledges under the Paris Agreement (Fearnehough et al. 2020; Schneider, Duan, et al. 2019; Schneider, Broekhoff, et al. 2019). See section 7, below.

5.2.6. Mitigation activities **must avoid social and environmental harms**. Although this criterion is not directly related to the compensatory value of a carbon credit, it is essential for ensuring that carbon offsetting does not result in unintended and undesirable consequences. Unfortunately, there are multiple documented cases of carbon offset projects resulting in adverse effects unrelated to climate change. Projects involving waste incineration and hydroelectricity production in developing countries, for example, have led to adverse local health impacts, environmental degradation, displacement of local populations, and social conflict (Dufrasne 2018; Haya 2007). Care must be taken in selecting the types of mitigation activities used to offset emissions.

5.3. One question that often arises is whether carbon crediting programs, like the Gold Standard, do a sufficient job in ensuring that all of the conditions above are met for the credits they issue. This is a contested debate, and one that is perhaps impossible to objectively resolve given the *inherent uncertainties* associated with key criteria such as additionality and the estimation of counterfactual baselines. The quality of a carbon credit is essentially a matter of confidence, not something that can be objectively measured and assessed. A key challenge for carbon crediting programs, therefore, is that they must make a binary decision about whether or not to issue credits for a mitigation activity, when in fact the quality of any given credit exists along a spectrum of relative confidence (Broekhoff et al. 2019; Trexler 2019). For something as consequential as offsetting the greenhouse gas emissions from a new coal mine, it should not be a foregone conclusion that any given credit issued by a recognized program like the Gold Standard will provide sufficient confidence.

5.4. In light of these uncertainties, it is best to treat carbon credits as a means of channeling investment into climate change mitigation activities, not as a failsafe way to compensate for a given source of emissions (Broekhoff et al. 2019). The Gold Standard letter alludes to this when it suggests a "mitigation hierarchy" consisting of (1) avoiding (new) emitting activities; (2) reducing emissions from already existing activities; and (3) "**[taking] responsibility"** for unavoidable emissions (not offsetting per se) through mechanisms such as carbon markets.

6. The problem of permanence

6.1. A large segment of the voluntary carbon market today is focused on supporting mitigation activities such as reducing deforestation, tree planting, and other activities that effectively seek to enhance the storage of carbon in biospheric reservoirs (compared to what proponents claim would occur without those activities). These kinds of activities are often referred to under the umbrella of "nature-based climate solutions" ("NCS"). They are an essential part of comprehensive efforts to address climate change globally.

6.2. However, as *offsets* to greenhouse gas emissions from the combustion of fossil fuels, they pose serious risks. The fundamental issue is that NCS mitigation cannot reliably balance out fossil carbon emissions over the long run and at large scales. Substituting NCS mitigation for fossil fuel reductions means, in essence, shifting carbon from highly stable geologic reservoirs (such as coal seams) to more precarious terrestrial ones (such as forests), which may release carbon to the atmosphere due to natural and/or anthropogenic disturbances – including disturbances induced by climate change itself (Smith et al. 2014).

6.3. Already, there are examples of forests associated with offset projects being destroyed by catastrophic fires, including projects funded by BP and Microsoft affected by the increasingly prevalent wildfires in the American West (Hodgson 2021). Such impacts are leading credit buyers to re-evaluate the risks of such projects. While some carbon offset programs, such as the Gold Standard, maintain insurance mechanisms to address carbon losses (essentially, "buffer reserves" of credits that are issued but not circulated), there are questions about whether they are sufficiently robust (Hodgson 2021) and it is doubtful that such mechanisms can be effective over indefinite time periods (Schneider, Michaelowa, et al. 2019). Furthermore, in the case of the Gold Standard, the obligation to compensate for "reversals" (i.e., carbon losses) may extend for as little as 20 years – far short of what is needed to fully compensate for carbon emissions.

6.4. The fragility of biospheric carbon reservoirs has led some scientists to object to *any* use of NCS to offset fossil carbon emissions (Mackey et al. 2013; Becken and Mackey 2017). As a general rule, it is prudent to treat carbon credits for NCS as *helpful complements* to actions that reduce and avoid emission from fossil fuels, but not as substitutes or compensation for them (Mackey et al. 2013; McLaren et al. 2019).

7. The need to avoid double claiming

7.1. One currently under-recognized challenge with carbon offsetting is how it can be reconciled with mitigation pledges that all countries have now made under the Paris Agreement. In short, mitigation that countries have already pledged to achieve cannot credibly be used to compensate for an entity's emissions. This would represent a form of double counting called "double claiming" (Schneider et al. 2015; Schneider, Broekhoff, et al. 2019). The presumption must be that, in the absence of any carbon credit transactions, countries will make good on their pledges and achieve mitigation that would otherwise be enabled through carbon credits.

7.2. The possibility of double claiming has long been recognized as a challenge for emissions trading in a world with universal climate action pledges (Schneider et al. 2015). The Paris Agreement formally recognizes this challenge and calls on countries to avoid double claiming through the application of "corresponding adjustments" (UNFCCC 2015, para.36) – essentially a form of bookkeeping to ensure that no two countries can count the same mitigation towards achievement of their pledges (called Nationally Determined Contributions, or "NDCs").

7.3. Although a consensus about how to avoid double claiming has eluded negotiators over the past several years, it seems likely that robust accounting rules will be adopted and applied broadly (Schneider, Duan, et al. 2019), including to backstop offsetting claims by the international aviation industry (Avoiding Double Counting Working Group 2019; Schneider, Broekhoff, et al. 2019). The idea is that a country hosting a mitigation activity would apply an "adjustment" to the ledger it uses to track progress towards achievement of its NDC, to reflect that the aviation industry (or another credit buyer) has used the mitigation activity to offset its emissions.

7.4. The same principle applies to voluntary carbon credit transactions, something the Gold Standard in particular has explicitly recognized. Actors who wish to use Gold Standard-certified carbon credits for the purpose of offsetting emissions must ensure that mitigation associated with those credits is not counted by any national government in the fulfillment of its mitigation pledge. This must be done by obtaining a commitment from the government of the country where the mitigation occurs to apply an appropriate accounting "adjustment" (Gold Standard 2021).

7.5. Note that this requirement applies logically to any mitigation achieved within the United Kingdom, not just in other countries. Any mitigation used to compensate for a source's emissions must be over and above what a country has pledged, or it must be assumed that the mitigation would have occurred anyway. If carbon credits sourced from projects located in the United Kingdom were used as offsets, therefore, they would need to be backed by a commitment to apply accounting adjustments from the UK government.

8. Sticking to "lower risk" mitigation activities

8.1. As all of the foregoing suggests, a commitment to acquire generic carbon credits – without further specification of the types of mitigation activities involved and the measures taken to avoid double claiming – is not sufficient on its face to provide a robust assurance that a source's emissions will be effectively offset. This is true even if the credits are sourced from a recognized certifier such as the Gold Standard or its "equivalent" (as the commitment is worded in the draft Section 106 Agreement, in the definition of "Acquisition of Carbon Offsets").

8.2. My work has identified several types of greenhouse gas mitigation that are "lower risk" for carbon offsetting, in the sense that it is easier for these types of activities to meet the required criteria for a robust offset (i.e., additionality, no overestimation, permanence, and no double counting) (Broekhoff et al. 2019; Bailis et al. 2016; Broekhoff and Zyla 2008). These types of mitigation activities include certain types of industrial gas destruction, a subset of measures that reduce or avoid methane emissions, destruction of ozone depleting substances, and certain types of long-term carbon removal and storage (for example, direct air capture and geologic storage of CO_2).

8.3. As a general strategy, confining carbon credit purchases to credits derived from these types of activities could enhance the likelihood of obtaining a robust offset (Broekhoff et al. 2019). However, the additionality, accurate quantification, and permanence of even these activities is not a foregone conclusion. For the reasons cited above – specifically, that credits issued may reflect a wide range of relative confidence (paragraph 5.3) – additional due diligence should still be required.

8.4. Furthermore, many of these mitigation opportunities are likely to become increasingly scarce as the world takes steps to reduce and eliminate greenhouse gas emissions, making it questionable at the least– if not untenable – to rely on them over the long run for offsetting emissions.

9. Offsetting as a long-term solution

9.1. In a deep decarbonization scenario aligned with achieving net zero emissions by mid-century, most activities that reduce emissions should be undertaken as a matter of course. Most measures involving the destruction or avoidance of industrial gases and methane, for example, can be easily achieved through regulation and should be pursued as part of general mitigation policies. This is acknowledged in the UK Climate Change Committee's "Sixth Carbon Budget" report of December 2020 [**CD8.10**], which states at page 38:

> "The Net Zero target requires deep reductions in all sources of emissions, with any remaining sources **offset by removals** of CO_2 from the atmosphere…" (emphasis added)
>
> and
>
> "Net Zero is a different challenge from the previous 2050 target for at least an 80% reduction in emissions – all UK emissions must be tackled, without reliance on offsets from elsewhere.

> It is not sufficient to simply reduce emissions – where zero-carbon options exist these must be deployed (for example, in homes and in manufacturing)…"

In this context – where all available options to reduce greenhouse gas emissions must be pursued – there should be no room to use a subset of emission reductions to "compensate" for emissions.

9.2. It is for this reason that "The Oxford Principles for Net Zero Aligned Carbon Offsetting" ('**the Oxford Principles**') call for transitioning over time to basing carbon offsets strictly on activities that permanently remove CO_2 from the atmosphere, by storing it in geologic reservoirs or mineralizing carbon in stable forms (Allen et al. 2020). The Oxford Principles also emphasize the need for any given source to cut emissions (not increase them) before turning to any offsetting.

9.3. Notwithstanding the Oxford Principles' emphasis on permanent removals as the basis for offsetting, there is a real risk of over-reliance on these mitigation options over the longer term. The primary means for achieving permanent removals – geologic sequestration through carbon capture and storage (CCS) – is still a largely unproven approach (Minx et al. 2018). In particular, geologic reservoirs for CCS are finite, and it is unclear what the total viable long-term storage potential might be (Fuss et al. 2018). This has led a number of commentators to warn against making premature assumptions about the reliability of "negative emission technologies" (Larkin et al. 2018), and to argue for developing emission reduction targets separate from considerations about sequestration or negative emissions (McLaren et al. 2019). A prudent strategy would be to act *as if* CCS and other negative emission technologies will not be widely available, even over the long term (van Vuuren et al. 2018).

9.4. For any new source of greenhouse gas emissions, therefore, the fundamental question should be whether the source itself is aligned with a broader "net zero" decarbonization scenario – one that does not rely heavily on CO_2 removal – not whether through offsetting it can claim to have a net zero carbon footprint. Offsetting is not a means for turning an otherwise incompatible new source into a compatible one. While my analysis here does not address whether the proposed Whitehaven coal mine is aligned with UK and global efforts to achieve net zero greenhouse gas emissions, this is the question that should be dispositive as far as climate change impacts are concerned, not whether mine owners commit to an offsetting strategy.

9.5. I would agree in principle with the Gold Standard letter that "a new coal mine in 2021 is an activity that must be avoided in the context of the climate emergency." If this is the case, then seeking to offset the proposed Whitehaven mine's emissions using carbon credits does not alter the equation. Aside from the points I have made about the inherent uncertainty of carbon offsetting, just because a facility or operation claims to have (or even does have) "net zero" emissions on the basis of using carbon credits does not mean it is compatible with the achievement of *global* net zero emissions by the middle of the century.

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Untangling the confusion around land carbon science and climate change mitigation policy

Brendan Mackey, I. Colin Prentice, Will Steffen, Joanna I. House, David Lindenmayer, Heather Keith & Sandra Berry

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This article has been updated

Abstract

Depletion of ecosystem carbon stocks is a significant source of atmospheric CO_2 and reducing land-based emissions and maintaining land carbon stocks contributes to climate change mitigation. We summarize current understanding about human perturbation of the global carbon cycle, examine three scientific issues and consider implications for the interpretation of international climate change policy decisions, concluding that considering carbon storage on land as a means to 'offset' CO_2 emissions from burning fossil fuels (an idea with wide currency) is scientifically flawed. The capacity of terrestrial ecosystems to store carbon is finite and the current sequestration potential primarily reflects depletion due to past land use. Avoiding emissions from land carbon stocks and refilling depleted stocks reduces atmospheric CO_2 concentration, but the maximum amount of this reduction is equivalent to only a small fraction of potential fossil fuel emissions.

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  In the version of this Perspective originally published, in Table 2, section (c), the fossil fuel carbon emissions were incorrectly described in the Land and Ocean categories. This error has now been corrected in the HTML and PDF versions.

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Ethics declarations

Competing interests

The authors declare no competing financial interests.

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THE CLEAN DEVELOPMENT MECHANISM: LOCAL IMPACTS OF A GLOBAL SYSTEM

October 2018

Executive Summary

The Clean Development Mechanism (CDM) was set up under the 1997 Kyoto Protocol to allow developed countries to buy emissions reductions from developing countries in the form of credits, called *Certified Emissions Reductions* (CERs). The objectives of the CDM are to help developed countries achieve their climate commitment and to assist developing countries in achieving sustainable development, but evidence on the success of the mechanism is, at best, mixed.

This publication summarizes scientific findings on the climate impacts of the CDM, and concludes that it is unlikely to have reached its objective of producing high-quality credits which can be used to compensate a country's emissions. Most CDM credits have been issued from projects which would probably have happened anyway, and in some cases the mechanism even set an incentive for companies to increase their production of pollutants in order to generate credits for their destruction.

In addition to its lack of climate benefits, the CDM has also failed to adopt sufficiently stringent safeguards against harms to the environment or local people, especially indigenous communities. This publication presents 4 cases where CDM projects ended up hurting people.

In Uganda, a private company blocked access to land vital for the livelihoods of local communities in order to claim credits for planting forests in that area. In India, a waste incinerator project diverted waste from landfills, where it would get sorted by local informal workers, and burned them in a facility located close to villages. In Chile and Guatemala, hydroelectricity projects exacerbated land right conflicts, destroyed social cohesion within villages, and damaged ecosystems and biodiversity.

While future schemes are being negotiated at various institutional levels, it is important that those designing these mechanisms take stock of the experience with the CDM, and adopt measures to prevent that projects such as the ones described in this publication receive support in the name of fighting climate change.

Recommendations:

- Do not allow the use of any CDM credits to meet post-2020 climate targets
- Adopt more ambitious rules to improve the environmental integrity of credits in future mechanisms
- Design future mechanisms with good social and environmental safeguards, including rules for stakeholder consultations and a grievance mechanism

Introduction: The Clean Development Mechanism 101

The Clean Development Mechanism (CDM) was set up under the 1997 Kyoto Protocol to allow developed countries to buy emissions reductions from developing countries in the form of credits, called *Certified Emissions Reductions* (CERs). This would allow developed countries to meet their climate targets at a lower overall cost, with the view of subsequently increasing their ambition. At the same time, it would promote mitigation activities in developing countries which, under the Kyoto Protocol, were not subject to any climate targets.

To be eligible for selling credits under the CDM, projects must meet a set of criteria, and be approved and verified by organizations registered under the UNFCCC. Many project-specific methodologies have been developed since the inception of the mechanism, in order to determine the contribution of a specific activity to emissions reductions.

In order to ensure that credits traded under the CDM embody effective climate action, they must be backed by emissions reductions which are **real, additional, verifiable, and permanent**. This means that the emissions reductions achieved (*real*) would not have happened in the absence of the mechanism (*additional*), will have been reduced or avoided forever (*permanent*), and can be traced back to a specific project and activity (*verifiable*). Additionally, projects issuing credits should benefit communities at a local level, and contribute to their sustainable development.

Verifying that CDM credits truly meet all these criteria has been subject to a lot of research, and evidence is, at best, mixed. This publication reviews these findings and presents some of the real-world local impacts of the CDM. It demonstrates that the mechanism suffers from serious shortcomings which justify a shift away from it after 2020 and a focus on financing systems which will incentivize new and additional emission reductions.

The future of carbon markets

Experiences with existing carbon markets need to be reflected in future rules, drawing on lessons from the past. Two major international agreements are set to shape their future: the Paris Agreement and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

The Paris Agreement sets up a market for the exchange of carbon credits, called the *Sustainable Development Mechanism (SDM)*, the rules of which are currently being negotiated at the UNFCCC. This market must meet several objectives, including achieving overall mitigation of emissions, promoting sustainable development, and avoiding double counting. In setting up this new market, countries will also need to decide on the "transition" of the CDM, i.e. agree on what will happen to existing CDM credits, projects, and methodologies.

In addition to this new mechanism, the International Civil Aviation Organization (ICAO) is currently negotiating the rules of its own offsetting scheme, which will be used to compensate the growth in aviation emissions above 2020 levels, starting in 2021. At this stage, countries are yet to define which types of carbon credits will be eligible for use under this mechanism, and allowing CDM credits is one of the options on the table. This would strongly undermine the already weak contribution of CORSIA to fight climate change, as most of the demand for credits (estimated around 3Gt CO_2e) could be met with cheap CDM credits at a cost below €1 (DEHSt, January 2018) and issued from projects which reduced emissions before CORSIA was started.

CDM achievements and failures: reviewing the literature

Is a tonne a tonne? Assessing the environmental integrity of the CDM

The environmental integrity of the CDM hinges on whether or not projects are additional to business-as-usual and thereby help to reduce emissions. While gradual improvements to the CDM additionality rules have been made following early-stage research on their lack of stringency (Michaelowa & Purohit, 2007), a 2016 study published by the European Commission still found that 85% of CDM projects, generating 73% of the potential 2013-2020 CER supply, have a low likelihood of generating emissions reductions which are additional and not over-estimated (DG Clima, 2016). This means that the use of CDM credits towards climate targets has increased global greenhouse gas emissions. In the EU alone, emissions increased by over 650 million tonnes of CO2 as a result of the use of low-quality CDM credits in the EU Emissions Trading System[1].

Beyond additionality, a major concern in the early phases of the CDM was the existence of perverse incentives whereby the prospect of issuing credits from the destruction of harmful industrial gases provided an incentive for industries to increase the production of such gases. This lead project developers to increase destruction and hence increase the number of credits available, like with the case for HFC-23, a powerful greenhouse gas generated from the production of HCFC-22, a refrigerant. CDM methodologies were modified to correct this perverse incentive but this experience highlights the need to robustly designed methodologies to avoid perverse incentives.

A similar result was found in a sector-specific study, focused on adipic acid projects, which found that, although the CDM contributed significantly to finding new ways of reducing emissions from such activities, about 20% of CDM credits issued to adipic acid projects between 2008 and 2009 did not represent real emission reductions, because the emissions were displaced to another plant ("carbon leakage").

Furthermore, evidence is also mixed regarding the CDM's ability to financially support mitigation projects, given the oversupply of credits and their low prices. As of October 2018, CER prices linger around $0.30, of which $0.20 is used to cover administration costs (UNFCCC/CCNUCC, 2005). A 2015 study from Ecofys and the New Climate Institute analysed a large sample of CDM projects and concluded that revenues from the CDM were insufficient for financing the registered projects (Warnecke, Day & Klein, May 2015). This prompted a follow-up study which proposed that Corporate Social Responsibility, and the prospect of increased future demand, were bigger drivers in the continuation of certain CDM projects (Sachweh & Zhu, 2015)[2].

This impact of low prices on the continuation of CDM crediting activities could have had an indirect effect on overall mitigation. Looking at CDM supply up to 2020, one study finds that, ironically, the failures of the CDM have contributed to overall mitigation of emissions, which the study estimates at around 1% of global emissions in 2014. This is because many CDM projects have continued to reduce emissions after prices crashed, but stopped issuing credits because the costs of validation and verification were too high relative to the credit prices (Warnecke, Day & Klein, November 2015). This effect is however largely dependent on the additionality assessment of CDM projects (Erickson, Lazarus & Spalding-Fecher, 2014), as non-additional CDM credits would counterbalance it. Rather, it is the symptom of a dysfunctional market, in which investor confidence has been broken due to a crash in prices which made it unattractive to carry out the verification and validation stages necessary to the issuance of credits.

While the criticisms mentioned above are very real problems, the CDM has also been beneficial in several ways. One study in particular reflects this, while acknowledging the mixed evidence surrounding additionality and the problematic cases of fossil fuel projects. It highlights the important contribution of the CDM to technology transfer, as well as to employment and building capacity in low carbon development for developing countries (CDM Policy Dialogue, 2012).

1 So far ,900 million CDM credits have been used under the EU ETS and it is assumed that 73% of these credits may not represent actual emission reductions.
2 The study focused on HFC-23 and N2O CDM projects in China and India.

Case studies: Taking stock of the situation on the ground

Case Study 1 - Afforestation in Kachung Central Forest Reserve, Uganda

Name of Author of this case study: Kristen Lyons, The Oakland Institute

- Name of the project: Kachung Forest Project
- CDM project number: 4653
- Host country: Uganda
- Project developer: Green Resources AS (also trading under Busoga Forestry Company and Lango Forestry Company)
- International Funders: Norfund, FMO and Finnfund have collective investments in Green Resources of approximately US $33 million
- Number of credits issued: 30 000

Summary of the project:
The Kachung Central Forest Reserve afforestation project is an industrial forestry plantation project, led by Green Resources, a company specialised in forestry and renewable energy. Afforestation operations commenced in 2006, and planting is now completed, with the establishment and management of mostly monoculture plantations on approximately 2,050 hectares of 'degraded' grass and shrub land. The project is certified with the Forest Stewardship Council (FSC), it is recognised as a Clean Development Mechanism (CDM) project, and was validated under the Climate Community and Biodiversity Standard (CCBS) in 2011.

Following severe negative impacts on local communities, the Swedish Energy Agency – Green Resources sole carbon credit buyer – stopped payments to the company in November 2015. In explaining its decision to withdraw from the project, the Swedish Energy Agency stated that "*Villagers were (being) deprived of vital resources and experienced threats and violence, and there is a lack of clarity regarding ownership in the reserve*".

Key information about the harms associated with this project
There are 17 villages adjacent to the Kachung industrial monoculture plantation and many of the villagers have been denied access to the plantation. This land was vital for growing food and grazing livestock, as well as for collecting forest resources (including firewood). As designated Central Forest Reserve, this was land villagers previously had access to, and relied upon for vital livelihood activities. Food insecurity, hunger and poverty are acute in these villages.

Villagers also describe observing pollution of land and waterways by agrochemicals used in forestry plantations, resulting in crop losses and livestock deaths. Many of those evicted, as well as those seeking to use land now licensed to Green Resources, also report being subjected to physical violence at the hands of the police.

Stakeholder Consultation
Since the Swedish Energy Agency ceased payment, alongside mounting international pressure, two assessment processes were carried out, both of which have involved a consultation with local communities. In November 2016, Green Resources commissioned a Socioeconomic Impact Assessment of its operations in the Dokolo District, and, in 2017, the Swedish Energy Agency commissioned a Community Development Plan Performance Audit to assess the company's progress related to the stated reform requirements.

While these assessments involved some consultation with local communities, the findings presented in the reports have ignored substantial issues of concern, which were documented in independent research, conducted prior and after the Green Resources and SEA audits. Importantly, this independent research has recognised the acute problem of food insecurity for the 17 villages living adjacent to the Green Resources license area. It also acknowledged the extent to which loss of land to the companies' plantation has exacerbated the challenges of achieving food security, including by having access to land for grazing and cultivation.

Environmental impact

Local impacts on the environment include encroachment into fragile ecosystems, including by planting trees and spraying chemicals in riparian zones. Chemical runoff has led to the killing of vegetation and animals, and the replacement of biodiverse ecosystems with monoculture tree farms has destroyed the habitat for insects, birds, and other animals. This is in contradiction with the approval of Green Resources' Environmental Impact Statement (EIS) which was conditional upon the implementation of several environmental safeguards.

Picture: A sign forbidding grazing to local communities' animals at the border of the forest

Communication with the project developer or designated national authority

The Oakland Institute has engaged over a number of years with Green Resources staff in Uganda and Norway. Green Resources is aware of concerns raised by several organizations, and to date has failed to substantially engage with them.

Sprayers - workers explained they could earn a maximum of $2 – 2.50 per day, while Pruning workers earned just $0.50 per day. As one worker explained, it is desperation that leaves him working for the company, despite the poor pay rate and other conditions on offer: "It is the lack of any other job, and pressing family problems, that forced me to take work with this company".

Lessons learned from Kachung

This project highlights the limits of carbon market regulations to adequately consider the social, environmental and other costs associated with carbon projects. The lesson from the Kachung Central Forest Reserve project is clear: if the world is to take seriously the challenges posed by climate change, we must look beyond markets and corporate capital for solutions.

You can also read Swedwatch's article on lessons learned from Kachung, here!

Case Study 2 - Methane-reduction through waste incineration in Delhi, India

Name of Author of this case study: Pratibha Sharma, Global Alliance for Incinerator Alternatives (GAIA)

- Name of project: The TIMARPUR-OKHLA Waste Management Company Pvt Ltd's (Towmcl) integrated waste-to-energy (WTE) project in Delhi
- CDM project number: 1254
- CDM registration year: 2007
- Host country: India
- Project developer: TIMARPUR-OKHLA Waste Management Company Pvt Ltd's (Towmcl)
- Offset credits issued: 329, 591CERs have been issued between 30/03/2011 and 09/03/2016

Summary of the project

The "integrated waste-to-energy project" in Delhi aims to provide a sustainable waste management solution to the city of Delhi by processing 2050 tons of municipal solid waste per day using a 20.9 MW waste-to-energy incinerator plant at the Okhla site. However, it has achieved far fewer emissions reductions than predicted and has harmed local employment as well as the environment, violating industrial siting laws and laws prescribing emissions standards set by the regulatory bodies. It has also provided misleading and false information about design and impacts of the plant activity.

The unsegregated municipal waste incinerated in the Okhla plant causes serious health hazards to thousands of people living in this densely populated and ecologically-sensitive region. The plant is a serious departure from the approved technology and is a major source of toxic air emission. It also undermines Delhi's recycling sector by burning recyclables, thus threatening the livelihood of thousands of recycling workers.

Key information about the harms associated with this project

Several sources of harm have been identified from the incinerator project. First, in the report submitted by the expert committee appointed by the National Green Tribunal (India's tribunal for environmental cases), the plant has been found to emit toxic carcinogenic chemicals in excess of the allowed standards, and on several occasions. Second, the plant's location is in violation of the Delhi Master Plan which requires the location of this type of waste treatment plant to be either in the vicinity of a landfill site, or as an integral part of a landfill site. Third, there has been a misrepresentation of facts in the environmental impact assessment (EIA) report which shows the distance between the plant and Sukhdev Vihar locality to be around 5 km, but the actual distance is around 30 m. This means local residents are much more heavily affected by the harmful gases generated by the plant than what the assessment reports. Fourth, the plant is in complete deviation from the approved technology. Rather than pellets and biomethanation, the project developer installed mass burn incinerator facilities for mixed solid waste, emitting toxins beyond the permissible limits. This led the regulatory agencies to temporarily shut down the incinerator plant, from 2012 to 2015.

Finally, the plant reduces the amount of waste that is being recycled, which is in complete contradiction with the waste management hierarchy which prioritises recycling over incineration.

Stakeholder consultation

An announcement for a public hearing was made via two local newspapers. However, the announcement failed to communicate the nature of the project and excluded crucial facts about emissions and the plant's proximity to a residential area[3]. Moreover, instead of being held at the site of the plant, the meeting was held 10 km away from the location. As a result, no member of the public appeared at the hearing, and the project was passed without any objections. In its Project Design Document for the CDM, the project developer communicated that: "*The project will be providing both direct and indirect employment opportunity to the local people. The project does not propose to displace any community; it does not have any direct conflict with the people of the region*". This does not reflect the reality of the project's impact, as it is still facing stiff resistance from local communities, including the residents of Okhla and the waste-pickers of Delhi.

Environmental impact

The Environmental Impact Assessment (EIA) report was not made available to the public. In a petition for access made to the court by the Sukhdev Vihar Resident Welfare Association, it was found that the EIA report had distorted critical facts to make its case. This included a serious deviation in the final project from the technology for which environmental clearance had been obtained. Despite this change and the modified plan, no updated EIA report was produced and no new public hearing was conducted. In addition to this, the EIA report mentioned that the proposed project is at the landfill site, whereas in reality it was 30 meters away from the residential area.

Picture: This is a picture of bottom ash on the conveyor of the Okhla incinerator plant. The fact that paper and plastic are only half-burnt shows clearly that the furnace temperature is nowhere as high as it should be (850 degrees centigrade – the condition required to eliminate generation of toxic emissions such as dioxins and furans) - Image Credit: Ranjit Devraj

Communication with the project developer / Designated National Authority

The health hazard posed by the Okhla incinerator sparked a court case raised by the affected communities, which is now being heard at the Supreme Court of India, after failing to receive justice from the Delhi High Court and the National Green Tribunal for the last ten years. The community has also filed a written complaint with UNFCCC, but despite such tainted record of the plant, UNFCCC has allowed the issuance of over 225.000 CERs between 2011 and 2017[4].

"The Okhla incinerator is best described as a monument of illegality. It is an example of a highly polluting project that was set up in defiance of major laws relating to waste management, industrial siting norms and zoning laws. The plant was set up in the guise of a pilot but right from the start it was evident that this was going to be a full-fledged incinerator. Far from taking the public into confidence, the operators have repeatedly lied to us as well as to the authorities on the true nature of the plant."

Ranjit Devraj, Resident- Sukhdev Vihar, Okhla, Delhi

3 The announcement read "Public Hearing for environmental clearance to the construction of proposed integrated municipal solid waste processing complex at Okhla —adjacent to existing Sewage Treatment Plant (STP) Delhi."
4 CDM Monitoring report form (Version 6), UNFCCC reference number of the project activity - 1254

Lessons learned

The CDM's support to this waste incineration plant demonstrates flaws in both the carbon credit mechanism as well as the corporate-driven, technology-focused approach to climate change mitigation. The project had planned to reduce emissions by an average of 308,262[2] tons of CO_2 equivalent (tCO_2e) per year whereas Delhi's waste-pickers are responsible for annual emissions reductions of approximately 962,133tCO_2e through recycling (Chintan, 2009). If the incinerator project burns even one-quarter of Delhi's recyclables, it will effectively wipe out its own emissions savings, resulting in no net emissions reductions. There is hence a clear gap in the CDM methodology which promotes the incineration of waste rather than recycling. Instead of continuing to support such thermal waste-to-energy projects which generate significant toxic and greenhouse gas emissions, and destroy local jobs, public authorities should ensure that climate finance is devoted to truly sustainable, low-carbon, and toxic-free projects that have regard for recycling and circular economy processes.

Case Study 3 - Hydroelectricity project in Alto Maipo, Chile

***Author of this case study: Fernanda Miranda, Javiera Valencia. Geógrafas Fundación Terram* (Translated from Spanish by Carbon Market Watch)**

- Name of project: Proyecto Hidroeléctrico Alto Maipo
- CDM number: At Validation
- CDM registration: 2012
- Host country: Chile
- Project developer: AES Gener (USA), Strabag (Austria), Grupo Luksic (Chile). The latter was withdrawn for losses of USD $380 million.
- International Funders: Overseas Private Investment Corporation (OPIC), Inter-American Development Bank (IDB), International Finance Corporation (IFC) of the World Bank (WB), Corpbanca, Banco de Crédito e Inversiones (Bci), Banco Itaú Chile, Banco Estado (Chile), KfW Ipex-Bank GmbH (Germany), and DNB Bank ASA (Norway)

Summary of the project

The Alto Maipo project is a "run of the river" electricity generation project with an installed capacity of 530 MW. This technology generates electricity from the natural flow of water, without construction of a dam. It is located in the Maipo river basin which supplies millions of people with clean water.

The project has had adverse impacts on local biodiversity and the environment, and land rights conflicts with the project developer have increased social tensions within communities.

Key information about the harms associated with this project

The project has both environmental and social impacts. First, it has adverse effects on the upper part of the Maipo river basin, by diverting water from its tributaries: the Volcán, Yeso and Colorado rivers through a 70 kilometers tunnel, therefore drastically decreasing the Maipo river's flow. This in turn endangers the quality and availability of water supply to the capital city, Santiago.

It has further destroyed the social fabric of the towns of El Alfalfal and Los Maitenes, by dividing the population with economic tactics to favor some parts of the population while excluding others from the benefits of the project. Livestock, beekeeping and tourism activities, developed by the communities of El Alfalfal and Los Maitenes, have suffered irreversible impacts with

direct consequences on the economic development of these villages.
The project companies have even built a perimeter wall in El Alfalfal to supposedly isolate it from the noise and pollution produced by the removal of the soil, further altering the life of the inhabitants of El Alfalfal.

Stakeholder consultation
As part of the Environmental Impact Assessment, a non-binding process was carried out to engage with citizens. This means that even if the affected communities were informed about the project, it was not compulsory for local authorities to take into account people's opinions and concerns.

Environmental and social impacts
An Environmental Impact Assessment (EIA) was carried out, but it was reported in highly technical language which made it extremely difficult for local communities to understand the results and engage with the project developers. The non-binding citizen participation process also reduced the incentive for local people to participate, undermining the influence they could have on the project design.

Furthermore, there were differences between the impacts identified in the EIA, and real changes on the ground. This is due to synergistic impacts, which were not considered in the EIA, and which affect the availability of water for the capital of Chile. The project is located in the upper part of the Maipo river basin, an area which typically receives some amount of snowfall. However, due to the impacts of climate change, this area has had increasing amounts of rain rather than snow, which has generated mudslides that have affected the sanitary plants supplying water to the capital of the country.

Moreover, the Alto Maipo construction site has replaced land which was used by the local people for grazing.

Communication with the project developer / Designated National Authority

Picture: In the background, the initial stages of the construction of a red wall can be seen. The wall was justified by the company as a means to limit excess noise and contamination, but it blocks access to land for the local people and their animals

Opposition groups have raised questions to the Parliament which as a result has created a «Special Investigative Commission» for Alto Maipo. The investigation showed a series of inconsistencies in the evaluation of sectoral agencies on environmental issues such as the protection of natural monuments, native forest, aggregates and water availability. Groups also filed a complaint to the National Institute of Human Rights (INDH), as well as to lenders of the project in the USA, among them the Inter-American Development Bank (IDB) and the World Bank (WB).

"My father spends a lot of money on forage and to have the animals enclosed, because there is no more meadow to graze... Alto Maipo destroyed all the native vegetation that we had here"
"It is sad to see how we are all locked up."
"We who were born and raised here cannot even have a piece of land"

Anonymous quotes from local people

Lessons learned

By applying a "divide and conquer" tactic to get the project approved, the company in charge of the Alto Maipo project destroyed important social ties within communities. In the future, it is important that the benefits of projects are shared in a fair and balanced way, guaranteeing a binding citizen participation in the assessment of local environmental projects. In addition, climate change impacts should better be reflected in Environmental Impact Assessments.

Case Study 4 - Xacbal Hydroelectric Project, Guatemala

Name of Author of this case study: Anne Bordatto, International Platform Against Impunity

- Name of project: Xacbal Hydroelectric Project
- CDM project number: 1834
- CDM registration year: 2008
- Host country: Guatemala
- Project developer: Hidro Xacbal S.A. (a subsidiary of Terra Group, Honduras), Corporación Andina de Fomento (acting as administrator of the CAF-Netherlands CDM Facility for the Government of the Netherlands)
- Financial backers: Royal Bank Trinidad & Tobago Merchant Bank (US$25 millions), GTC Bank of Panamá (US$15 millions), InterAmerican Development Bank (US$90 millions), Netherlands Development Finance Company (US$30 millions), G&T Continental bank and German Development bank (no information found on amount contributed)
- Offset credits issued: 1 323 000 CERs as of 1 September 2018 (source:UNEP DTU CDM Pipeline)

Summary of the project
The Xacbal project is the biggest private hydroelectric plant (94 MW) in Guatemala. It was implemented by a Honduran company in the La Perla property, which local communities claim to own. It aims to optimize the use of local hydraulic resources, reducing CO_2 emissions caused by fossil fuel combustion, improving forest coverage in the river basin and lessening soil degradation through activities established in the Xacbal River Basin Management Plan. It includes the development of maps, support to the local Municipal Forestry Office, and meetings with interested groups in order to present technical and administrative management information. It also aimed to support local initiatives through a Cooperation Agreement between HidroXacbal, S.A. and the Municipality of Chajul, including improvement to local infrastructure (bridges and roads), and primary distribution grids for electrification.

The project has run into multiple problems and severely affected communities. It has damaged natural resources such as water and forests, blocked access to sacred sites, and created social tensions among local communities.

Key information about the harms associated with this project
The implementation of the project broke the fragile social peace of the Mayan-Ixil inhabitants of communities from Chajul and Nebaj in the surroundings of the project. It has also generated deforestation, impairment of water and river resources, and landslides.

Access to the archaeological and ceremonial site Panchita, the Ixil population's oldest site, has been restricted as the site was included in Xacbal's property. This restriction has also affected access to water which was used for coffee washing, baptisms and fishing.

Physical damages have also occurred, with the tragic death of two young people from Santa Cecilia la Pimienta who were dragged by the water released from the machines. The lack of information regarding the plant's operation is partly to blame for this, as it is difficult to know when it operates at full capacity or not.

Stakeholder consultation

Since 2007, communities affected by the project have been complaining about the project and the lack of information made available by the company. Communities have asked for the implementation of a roundtable to establish a dialogue between them and the company, under government supervision. However, construction continued during the roundtables and the company left the roundtable as soon as the plant started operations. This eroded trust from local communities.

Other regional developments

The Terra Group constructed a second hydroelectric plant (Delta Xacbal) upstream of the Xacbal river (the outflow of the Delta Xacbal plant isat the Xacbal plant intake). This construction generated social problems, including the death of two people in a road accident involving a truck, and the violent eviction of a communitarian blockade demanding payment for the land purchased.

There are currently six different hydroelectric projects in development in the Xacbal river basin (two of them, La Vega and La Vega II, have been demanded for the lack of Indigenous People's free, prior and informed consultation and the State is currently carrying them in).

Environmental and social impacts

Local impacts on the environment include decrease in the river flow, destruction of ecosystems, and loss of aquatic biodiversity. Consequently, several are the adverse effects on the affected communities such as limited access to the river as well as severe reduction in fishing, recreation activities, coffee washing, and water usage.

Furthermore, hydroelectric plants and electricity transportation have caused deforestation, landslides, and soil erosion, impacting negatively the whole landscape.

Communication with the project developer / Designated National Authority

Due to a lack of information from the Government and the project developers, ancestral and community authorities have risen their voice not only for gaining more knowledge on the Xacbal hydroelectric project, but also for obtaining a compensation for the caused damage.

However, the affected communities did not achieve any commitment. Rather, the Hidro Xacbal S.A. carried on in corrupting representatives of the communities, the municipality, and the central Government for continuing with the construction site.

Picture: View of the Xacbal project during construction
(Credits: Memoria Historica)

"They are going from a house to another in order to convince, ask [to sell] and even if we do not want to sell, we are sometimes compelled to do so because there are no alternatives to make money. Some people have denounced others for selling their land and this has created conflicts."
"They say they made studies and asked people but these surveys were private, not a public consultation."

Interview with a focal group of Viucalvitz COCODE

Lessons learned

The case of the Xacbal hydroelectric plant shows the importance of engaging with local communities on the identification and respect of land rights and ownership. Contested property titles have led to serious conflicts and the lack of dialogue has only reinforced these tensions.
Local consultations and empowerment of communities are crucial to avoid conflicts and a prerequisite to the start of any construction.

Looking ahead towards a better mechanism

In the years up to 2020, particularly at COP24 and COP25, countries will have the opportunity to adopt measures which would prevent projects such as those presented in this publication to be accredited under an international market mechanism. For this, improved rules and new safeguards must be adopted as part of the rules agreed under Article 6 of the Paris Agreement.

To ensure that the new carbon markets truly reduce emissions, they should move away from offsetting and towards results based climate finance, i.e. financing emissions reductions projects without claiming the resulting credits towards the buyer's targets. Rules to ensure additionality, avoid double counting, and achieve overall mitigation will also need to be carefully designed (CMW, 2018).

To prevent that mitigation projects harm local people and the environment, new safeguards must be set up. First, clear rules on how to conduct local stakeholder consultations should be agreed. They should ensure that local people, as well as indigenous communities, are empowered to contribute to the design and implementation of projects. At least, they should ensure that such peoples are invited to submit their views in ways which are appropriate to the local circumstances, and that these views are reflected in the agreed project (CMW, 26 April 2018). Second, the new UN market should include a grievance mechanism, to allow affected stakeholders to seek recourse against a project if it has had adverse impacts on them or the environment. This mechanism should be inclusive, transparent, and governed by an independent body.

These measures would help promote projects with positive impacts on people, climate, and the environment. Market mechanisms have the potential to spur investments in truly beneficial projects, and a set of improved rules for the next generation of markets would help achieve this. Under the CDM, some projects have been truly beneficial, showing that there isn't anything inherent to markets which would prevent projects from having positive impacts. What is needed are rules which help increase the number of such projects, and social and Human Rights safeguards such as the two mentioned above are a crucial part of this.

A positive example for future schemes

Author of this case study: Ram Esteves, Project Director, ADATS

One positive example of a CDM project is the Bagepalli CDM Biogas Programme (India), which not only represents a success in tackling climate change challenges while promoting sustainable development, but also allowed the empowerment of Indian women, who nowadays can "cook like the rich city women!".

Name of the project: Bagepalli CDM Biogas Programme
CDM project number: 0121
CDM registration year: 2005
Host Country: India
Project developer: Agricultural Development & Training Society (ADATS), Bagepalli 561207

Carbon investor: Velcan Energy (France)

The Bagepalli CDM Biogas Programme aims to build 5,500 domestic biogas units in 1,252 villages of Chickballapur District (India), replacing non-renewable biomass and generating 19,553 Gold Standard CERs every year for 21 years (since 2006).

This project has improved local people's lives in two ways. First, it has had a positive health impact by significantly improving indoor air quality. With the introduction of biogas digesters to replace biomass cookstoves, the 5,500 women involved in the project have started to cook in a cleaner environment. Furthermore, they spend less time collecting firewood which allows them to spend more time on other activities.
The great environmental benefit of the project, through the reduction of greenhouse gas emissions, is coupled with a concrete step towards women empowerment. In fact, thanks to this project, local women have started to consider themselves as business women with one main task: providing a vital, environmental service to society.

"Now I cook without burning my eyes and lungs in less than half the time it used to take before. I can now concentrate on generating income for the house. I don't need to rush to forest to get wood. I get time to spend with my family." - Hansi Devi

Looking ahead at future schemes, initial research on the risk of discontinuing needed support to useful projects, and that of failing to supply a sufficient number of credits post-2020 to meet demand, has shown that both of these risks would only materialize to a limited extent. Recent research (DEHSt, May 2017) investigated the vulnerability of projects to discontinuation, i.e. the risk of a project ending its emission reduction activities due to a lack of support, and concluded that this risk varies greatly depending on the project type. For example, renewable energy projects have a low vulnerability, because of their ability to sell electricity which generates revenues, while cook stove projects in India and Kenya are at high risk of discontinuation due to the absence of financial support other than the CDM.

This debate prompted another study, enquiring into the potential supply from CDM credits for post-2020 markets. It found that CDM credits could potentially flood future markets as potential supply exceeds demand (DEHSt, January 2018). From a potential supply of 4.7bn CERs over the period 2013-2020, the study estimates that 3.8bn could be supplied at a price below 1€. In the absence of any restriction, this means that existing projects under the CDM could supply more than the total estimated demand for CORSIA, the aviation sector's new offsetting scheme which has an estimated demand of 1.6-3.7bn credits between 2021 and 2035 (Healy, 2017).

Conclusion

This publication highlights the lessons learned with the CDM, both from literature sources, as well as from experiences on the ground. This is useful basis for designing the Sustainable Development Mechanism, and ensure that the next generation of trading mechanisms do not repeat the mistakes of the CDM.

Research on the CDM has shown that it has fallen short of its objectives. A large amount of credits lack environmental integrity and, combined to the perverse incentive and carbon leakage issues, this has led to an increase in overall emissions compared to a situation where emissions reductions would have been met through domestic action. In addition, the accumulated surplus of cheap, low-quality credits represents a real and significant threat for the future of the next generation of carbon markets.

Moreover, the case studies in this publication demonstrate that the CDM has had severe negative impacts on local people and the environment, through the implementation of low-quality projects by careless developers. These cases also highlight how these impacts were exacerbated by the absence of safeguards and grievance channels in the CDM.

Countries have it in their hands to set up the next generation of markets in a way which truly benefits people, climate, and the environment. This will require:

- A shift away from offsetting (i.e. relying on others to clean up your pollution) towards financing emissions reductions in less-wealthy countries;
- Robust social and human rights safeguards, including clear rules on how to conduct local stakeholder consultations, and the set up of a grievance mechanism governed by an independent body;
- Improved environmental integrity rules to ensure that emissions reductions are real, additional, permanent, and verifiable;
- Detailed accounting rules to avoid double counting of emissions reductions;
- No use of the large surplus of non-additional CDM credits for post-2020 climate targets.

Looking for more information?

Below are some useful resources to start further research on each of the case studies.

Afforestation in Kachung Central Forest Reserve

Lyons K., Westoby P., (2014) "Carbon colonialism and the new land grab: plantation forestry in Uganda and its livelihood impacts*", Journal of rural studies, 36, p.13-21*

See here

In this study, the authors argue that the privatisation of public land for carbon sequestration in the Kachung central forest reserve has led to a significant harm for local people, which tends to be neglected as a mere negative externality for the greater environmental good.

Hajdu R., Fischer K., (2016) "Questioning the use of "degradation" in climate mitigation: A case study of a forest carbon CDM project in Uganda*", Land-use Policy, 59, p.412-422*

See here

In this study, the authors contest Green Ressources' initial justification of the project which they argue over-emphasizes the impact of local activities on "land degradation". Through analysis of satellite data, the authors provide elements to disprove GR's claims according to which significant degradation of land had occured in their project area, which was used as a major reason for implementing their project.

The Oakland Institute, (2014) "The darker side of green"

See here

This is an extensive version of the case study reported in this booklet, with a more detailed review of field research carried out in 2012 and 2013 in and around the Kachung Central Forest Reserve.

The Okhla Waste Incineration plant

Ferris D., (2013): "Out of India's trash heaps, A controversy on incineration"

See here

This article provides further information on the Okhla plant and its impact on local people and the environment, including on Delhi's informal recycling workers and how they have been affected by the plant.

Swapan Kumar P., Demaria F., (2018): "Okhla waste to energy plant, Delhi, India"

See here

This interactive article provides an accurate location-image of the Okhla incinerator, highlighting at the same time how local protests and contestations arised in these last few months for protecting environmental integrity and human health. Two fundamental rights that incineration projects cannot guarantee.

Nandi J., (2015): "Delhi's waste-to-energy plants toxic, costly, inefficient"

See here

This article summarizes key arguments against the use of waste-to-energy plants

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What if negative emission technologies fail at scale? Implications of the Paris Agreement for big emitting nations

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ABSTRACT

A cumulative emissions approach is increasingly used to inform mitigation policy. However, there are different interpretations of what '2°C' implies. Here it is argued that cost-optimization models, commonly used to inform policy, typically underplay the urgency of 2°C mitigation. The alignment within many scenarios of optimistic assumptions on negative emissions technologies (NETs), with implausibly early peak emission dates and incremental short-term mitigation, delivers outcomes commensurate with 2°C commitments. In contrast, considering equity and socio-technical barriers to change, suggests a more challenging short-term agenda. To understand these different interpretations, short-term CO_2 trends of the largest CO_2 emitters, are assessed in relation to a constrained CO_2 budget, coupled with a 'what if' assumption that negative emissions technologies fail at scale. The outcomes raise profound questions around high-level framings of mitigation policy. The article concludes that applying even weak equity criteria, challenges the feasibility of maintaining a 50% chance of avoiding 2°C without urgent mitigation efforts in the short-term. This highlights a need for greater engagement with: (1) the equity dimension of the Paris Agreement, (2) the sensitivity of constrained carbon budgets to short-term trends and (3) the climate risks for society posed by an almost ubiquitous inclusion of NETs within 2°C scenarios.

POLICY RELEVANCE

Since the Paris meeting, there is increased awareness that most policy 'solutions' commensurate with 2°C include widespread deployment of negative emissions technologies (NETs). Yet much less is understood about that option's feasibility, compared with near-term efforts to curb energy demand. Moreover, the many different ways in which key information is synthesized for policy makers, clouds the ability of policy makers to make informed decisions. This article presents an alternative approach to consider what the Paris Agreement implies, if NETs are unable to deliver more carbon sinks than sources. It illustrates the scale of the climate challenge for policy makers, particularly if the Agreement's aim to address 'equity' is accounted for. Here it is argued that much more attention needs to be paid to what CO_2 reductions can be achieved in the short-term, rather than taking a risk that could render the Paris Agreement's policy goals unachievable.

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Introduction

When establishing measures to mitigate greenhouse gas emissions at national and even sub-national scales in line with the Paris Agreement, policy makers are informed, either directly or indirectly, by CO_2 pathways derived from academic research. It is therefore essential that such pathways evolve from a diverse range of inputs and relationships as well as capture differing national circumstances. Yet what is clearly evident is that the analyses informing national energy decision making are dominated by a significant reliance on the large-scale and global implementation of negative emissions technologies (NETs). In theory, such technologies effectively increase the available carbon budget and thereby reduce the rates of actual mitigation of CO_2 emissions necessary to deliver on the commitment under the Paris Agreement to limit warming to 'well below' 2°C. Certainly such NET-based scenarios should be considered as a theoretical possibility. However, and as a complement to the wealth of scenarios with NETs, this article eschews their widespread deployment as technically too speculative, uncertain in terms of efficacy and feedbacks, and with critical issues on the scale and scope of available biomass inadequately understood (Gough & Vaughan, 2015; Mann, 2009). Building on Anderson and Bows (2011), this analysis explores the implications of near-term CO_2 trajectories of the biggest emitters for delivering on the 2°C commitment. Using a cumulative emissions framing, the article highlights how the existing literature typically under-represents socio-technical opportunities for near-term mitigation, and in so doing significantly elevates the risk of potentially irreversible damage to the climate system.

Cumulative emissions and climate sensitivity dictate future temperatures (Allen et al., 2009). Both are important for communicating implications of climate science to decision makers. 'Cumulative emissions' refers to the stock of GHG emissions that can be released into the atmosphere over time, for a given probability of a change in global mean surface temperature, while climate sensitivity is the temperature change associated with doubling atmospheric CO_2 concentration compared with pre-industrial levels. The *transient climate response* is the temperature rise above pre-industrial levels induced when CO_2 concentration doubles following a 1% increase in concentration each year. The *equilibrium climate sensitivity* describes the stabilized temperature at equilibrium, following a sustained long-term doubling of CO_2 concentration. Uncertainty in either leads to uncertainty in the cumulative emissions associated with future temperatures. The likely (>66% probability) range for the transient climate response is 1.0°C to 2.5°C (IPCC, 2013) and 1.5°C to 4.5°C for the equilibrium climate sensitivity, although some studies challenge these ranges (Hansen et al., 2013; Sherwood, Bony, & Dufresne, 2014). It is feasible that temperature changes could be higher, although current consensus is that the empirically measured temperature response makes such changes less likely (Otto et al., 2013).

The *transient climate response to cumulative carbon emissions* (TCRE) is the global mean surface temperature change for every 3670 $GtCO_2$ (1000 GtC)[1] emitted, and provides a preferential measure of the warming response to CO_2 when radiative forcing varies over decadal timescales (Millar, Allen, Rogelj, & Friedlingstein, 2016). Its likely range is 0.8°C to 2.5°C (pp. 17; IPCC, 2013) and important in determining cumulative budgets associated with 2°C. However, even within the Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report (AR5), including 'summaries for policy makers' (SPM), there remains substantial room for misunderstanding. Table A1 draws attention to the assorted means by which emissions associated with temperature change are communicated, a point made by Rogelj, Schaeffer, et al. (2016). A variety of units, timeframes and probabilities are used throughout AR5 to present a 2°C carbon budget. There are differences in how probabilities of exceeding 2°C are presented: qualitatively (likely, etc.), approximate ranges (>50%, etc.) and precise ranges, and units (e.g. GtC, PgC) vary within and across reports, and different budgets for the same probabilities of staying below 2°C. This variety partly arises from some results being generated by CMIP5 ESM (Coupled Model Inter-comparison Project Phase 5, Earth System Models) ensemble using four Representative Concentration Pathways, with others generated by Integrated Assessment Models (IAMs) using several hundreds of scenarios. Clarity is further hindered by the treatment of non-CO_2 forcings. Such a minefield of potentially confusing information obstructs informed critique by policy makers of the mitigation scenarios forthcoming from the community, and therefore of the scope, scale and deployment rates of energy supply and demand socio-technical options.

Given the implications of exceeding 2°C, there is a responsibility on academics to adhere to scientific evidence and provide clarity for decision makers. Yet when scrutinizing the solution space presented, it can be argued that the community not only offers confusing information, but subjectively chooses to give greater credence to some options – such as extensive deployment of NETs – over others. The aim of this article is two-fold. Firstly, to complement existing IAM-based outputs commonly informing decision makers, to illustrate the implications of a broader solution space. Secondly, to use this space to illustrate to policy makers, especially within big emitting nations, that overlooking now the full range of mitigation options available, poses a real risk of creating greater lasting damage to the climate system, that may become too late to remedy.

Methods

Applying a carbon budget framing highlights the importance of delivering high (>4% p.a.) mitigation rates and curbing emissions within a plausibly short timeframe (Anderson & Bows, 2011; Rogelj et al., 2010). By contrast, 2°C IAM scenarios typically output global mitigation rates of 2–4% p.a., sometimes made possible by global emissions peaking in 2010 and routinely before 2020 (Anderson, 2015; UNEP, 2014). Moreover, for all scenarios in the IPCC database with a >50% chance of avoiding 2°C, and 'policy delay' to 2020, 'negative emissions' through technologies such as bioenergy with carbon capture and storage (BECCS) are assumed to play a critical role (Anderson, 2015; Gough & Vaughan, 2015; Rogelj et al., 2011; UNEP, 2014; van Vuuren et al., 2011). While some IAM studies draw attention to the importance for avoiding 2°C of long-term technological availability (van Vliet et al., 2014), cost-optimal frameworks point to the alternatives as being simply an issue of technology, cost and potential. They fail to sufficiently address social aspects of technology change (Ackerman, DeCanio, Howarth, & Sheeran, 2009), an issue of deep importance when considering social acceptability in futures with extensive BECCS deployment (Braun, Merk, Pönitzsch, Rehdanz, & Schmidt, 2017; Fuss et al., 2014; Gough & Vaughan, 2015). Although technical efficiency plays a role in IAMs, they are ill-equipped or ill-designed to deliver solutions with substantial socio-economic/demand-side change. Specifically, their economic foundations are mostly based on traditional equilibrium models that cannot capture the complexity of social systems and emergent behavioural patterns (Pahl-Wostl et al., 2013). Thus, current IAM outputs risk delivering overly optimistic, unrealistic and potentially flawed messages about future change (Moss, Pahl-Wostl, & Downing, 2001). This is problematic given their dominance in the literature, underpinning a common view that challenging, but incremental energy policy is sufficient to deliver on the Paris Agreement.

Grouping 'big emitters'

With over 80% of global CO_2 emissions from energy and industry emitted by 25 nations, the largest CO_2 contributors – 'big emitters', are clustered by energy and macro-economic characteristics. Each group's energy and development context is considered, enabling assessment of the sensitivity of decarbonization rates to short-term inertia and lock-in. Although some analyses recognize the importance of approaches grounded in a practical understanding of social, technical and economic factors (for instance, Deetman, Hof, & van Vuuren, 2015), here significant attention is paid to near-term (typically ~5 year) trends. The results present a complementary perspective to the existing literature.

To derive big emitter groups, territorial and consumption-based CO_2 emission inventories were scrutinized to rank nations (Le Quéré et al., 2014). Under both consumption and territorial accounts, the big emitter countries are the same, and contribute over 80% of global emissions (and 65% of the population). They are:

> Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Iran, Italy, Japan, Kazakhstan, Mexico, Poland, Russia, Saudi Arabia, South Africa, South Korea, Spain, Taiwan, Thailand, Turkey, UK, Ukraine and US.

To build a contextual understanding of these nations, absolute and relative characteristics of energy systems including levels and rates of gross domestic product (GDP)/per capita, CO_2 intensity of energy consumption etc., were compared. These Kaya-type indicators reflect social, economic and environmental aspects of sustainability allowing countries and groups of countries to be assessed in terms of energy system demand- and supply-side characteristics, contextualizing trends in annual CO_2 emissions. Normalizing the indicators for 2000, 2010 and 2012 and absolute CO_2 trends over five year intervals from 1990, the 25 nations[2] were ranked, then expert judgement[3] used to group countries based on if they (a) express similar[4] characteristics, and (b) do not alone exceed >4% of the global budget[5] (Figure 1). The groups are:

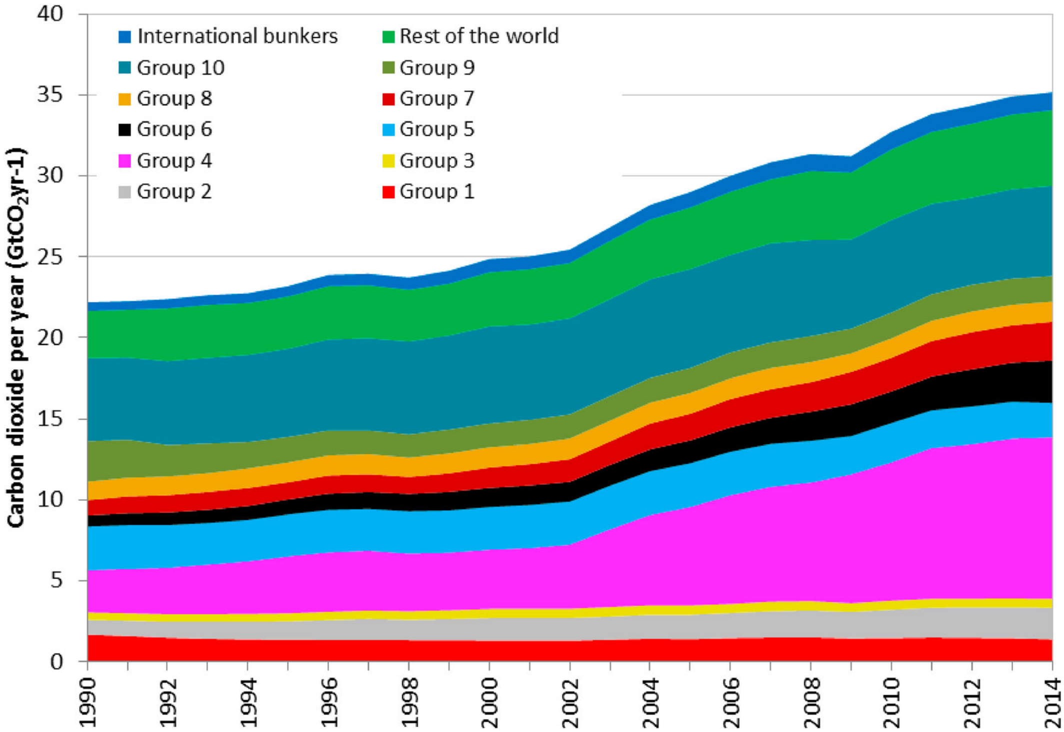

Figure 1. Group annual CO_2 emissions from 1990 to 2014 (equivalent consumption-based figures shown in Appendix Figure A1). Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

- Australia, Poland, South Africa, Ukraine (Group 1)
- Brazil, Mexico, South Korea, Turkey (Group 2)
- Canada (Group 3)
- China, Hong Kong, Taiwan (Group 4)
- France, Germany, Italy, Spain, UK (Group 5)
- India (Group 6)
- Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand (Group 7)
- Japan (Group 8)
- Russia (Group 9)
- US (Group 10)

Fuel use from international aviation and shipping ('bunkers') is unaccounted for within national budgets. With over 3% of global CO_2 in 2014 (some sources suggest 5%, with ~3% from shipping (Smith et al., 2015)), a share anticipated to grow (Bows-Larkin, 2015), here they are classed as a big emitter. For completeness, all other nations are within a Rest of the World 'RoW' group.

Figure 2 illustrates that CO_2 from China, India, Group 2, Group 7 and 'bunkers' have grown most rapidly since 1990, while Russia's emissions fell dramatically before 1997 growing slowly since. The Western European Group 5, and also Group 1 (heavy coal users) have lower CO_2 emissions in 2014 than in 1990; though consumption emissions were rising prior to the global economic downturn (Figure A2). The US, Canada and Japan have higher CO_2 emissions in 2014 than 1990, although emissions were relatively stable in recent years. As is evident from Figure 1, China, has ~ 30% share of global CO_2 emissions in 2014 (territorial accounting, 25% for consumption based), and its short-term CO_2 growth rate critically influences global CO_2 emissions. Similarly, with ~18% share of emissions (and per capita consumption emissions almost three times that of China),

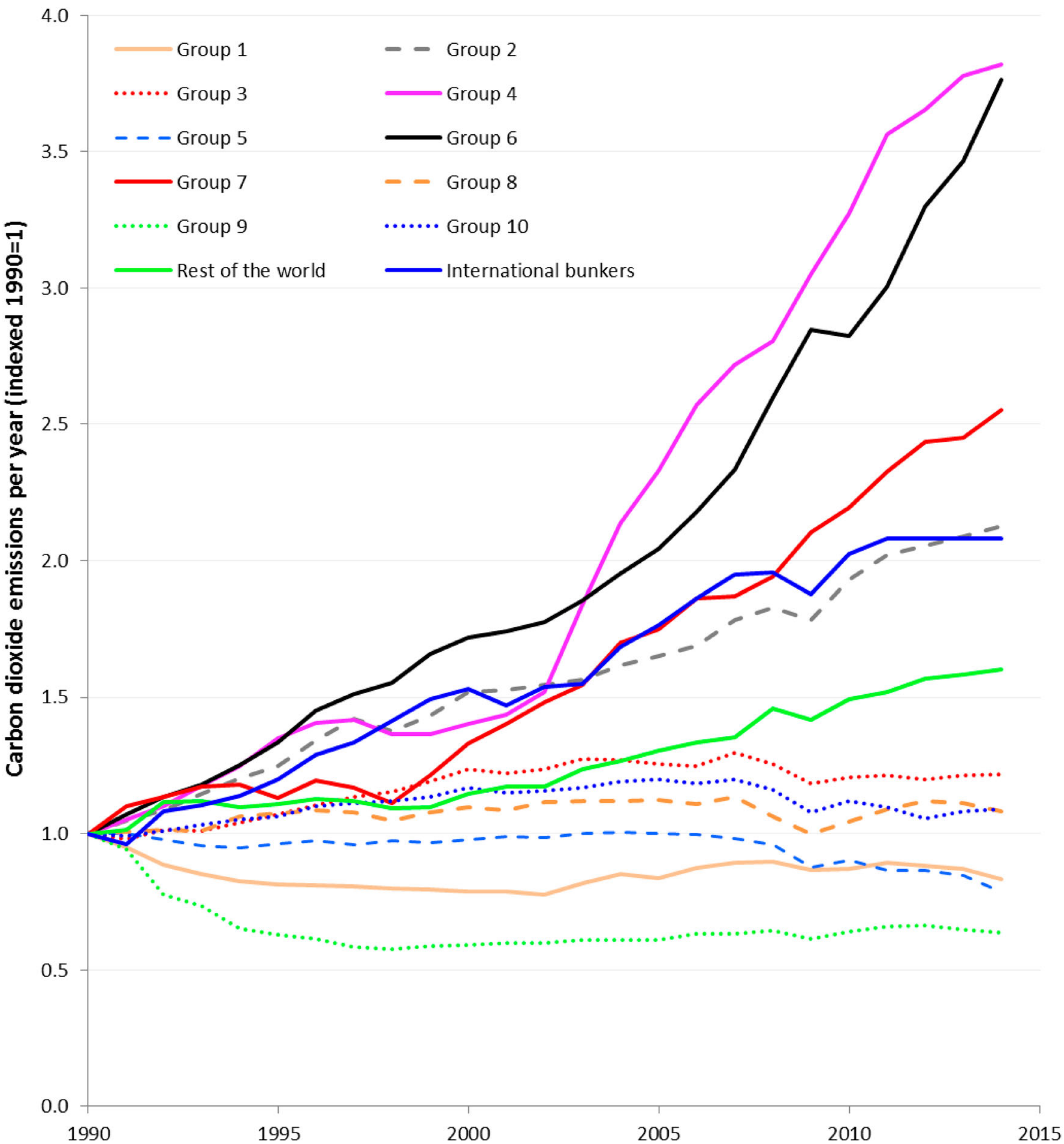

Figure 2. CO_2 emissions from the high emitting groups, bunkers plus RoW, normalized to 1990=1 (consumption-based equivalent in Appendix Figure A2). [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

emissions from the US strongly influence global CO_2. To explore the implications of current trends, Nationally Determined Contributions (NDCs) submitted by countries in accordance with the Paris Agreement, and issues of energy system lock-in, 'what if?' emission pathways are developed, commensurate with avoiding 2°C.

Developing scenario pathways

The 2°C framing of climate change has emerged as a scientifically informed, but ultimately political 'anchor point' (Jordan et al., 2013) associated with carbon budgets. This was reinforced by the Paris Agreement, with the additional qualifier of 'well below 2°C', arguably implying a probability of a greater than 50% chance. The emission pathways developed here are premised on budgets constrained by a 50% or 66% probability of avoiding 2°C.

While deforestation emissions are subject to large uncertainties (Houghton et al., 2012; Jain, Meiyappan, Song, & House, 2013; Le Quéré et al., 2015; Saatchi et al., 2011) it is important to estimate twenty-first century cumulative deforestation emissions to determine the remaining CO_2 budget. Here, assumptions around deforestation use historical data from temperate and tropical regions based on the Woods Hole Research Centre (WHRC) book keeping method (Houghton et al., 2012) as the most robust source to 2010 at the time of analysis. Cumulative emissions for deforestation from 1850–2013 are estimated as 571 $GtCO_2$. Land-use change emissions have remained relatively constant at around 1.3 ± 0.5 GtC/yr during 1960–2015, although Federici, Tubiello, Salvatore, Jacobs, and Schmidhuber (2015) suggest there were some decreases during 2011–2015. Here an optimistic assumption is assumed of an on-going 2–3% per year reduction, resulting in a budget for 2000–2100 of 150 $GtCO_2$.

CO_2-only budgets used are from the AR5 Synthesis SPM (IPCC, 2014b). Acknowledging debate over greenhouse gas emissions associated with agriculture and non-CO_2 forcers (Bows-Larkin et al., 2014; Calvin et al., 2013; Kyle, Müller, Calvin, & Thomson, 2014; Rogelj, Meinshausen, Schaeffer, Knutti, & Riahi, 2015), the figures used are: >50% of 2°C, 3000 $GtCO_2$[6]; >66% 2900 $GtCO_2$,[7] updating similar analysis (Anderson & Bows, 2011; Anderson, Bows, & Mander, 2008; Bows, Mander, Starkey, Bleda, & Anderson, 2006). Emissions between the 1860–80 mean and 2014 (Le Quéré et al., 2015), along with those from deforestation (Houghton et al., 2012), are removed to leave a CO_2-only budget *for energy and industry* from 2015 to 2100: >50%, 898 $GtCO_2$; >66%, 798 $GtCO_2$, consistent with Rogelj, Schaeffer, et al. (2016). While a next step could allocate shares of the budget to each big emitter, as in Raupach et al. (2014), here the focus is on developing pathways using each group's short-term CO_2 trend, and subsequently 'backcasting' reduction rates to remain within budget. Recognizing the range of burden-sharing frameworks (Höhne, den Elzen, & Escalante, 2014; IPCC, 2014a; Raupach et al., 2014) a very constrained carbon budget raises the question of whether a formal burden-sharing regime for 2°C remains viable (Sharmina, Bows-Larkin, & Anderson, 2015). This study takes a pragmatic approach, contextualizing short-term trends within the global budget available.

Analysis

Three families of scenarios are designed to illustrate the sensitivity of a constrained carbon budget to short-term emission trends of big emitters, when annual CO_2 emissions remain above zero. Consequently, none of the scenarios assume explicit inclusion of NETs to contrast with the majority of 2°C scenarios in the literature.[8] The 'Sustain' pathway family represents a highly inequitable world successfully recovering from the economic downturn, with limited efforts to implement new mitigation policy prior to 2020. Quantitatively, groups sustain post-recession (2009–2014) rates to 2020, decreasing by 1 percentage point p.a. until reaching a peak in emissions (e.g. a 2% rate in 2020 reduces to 1% in the following year, and peaks the year after). Post-peak, the mitigation rate increases year-on-year to the maximum necessary to remain within budget. These pathways are similar to the 'Policy Start in 2020', Table 1 of Fuss et al., 2016. The '*Immediate'* family illustrates another highly inequitable world where the economic downturn resumes and more positive mitigation effort materializes prior to 2020 (closer to Fuss et al., 2016's Table 1 'Policy Start in 2010'). Quantitatively it is similar to the '*Sustain*' family, but with only one year post-recession rate sustained for all groups unless specified (Table 1). The '*Development*' scenario aims to capture a more equitable distribution of mitigation effort, where nations with low per-capita emissions expand fossil energy systems for an extended period. Quantitatively, Groups 6, 7 and RoW maintain post-recession growth rates, reaching a peak in 2030. China's emissions grow at 2% p.a. peaking by 2025. Other groups continue with post-recession rates for one year. All groups have post-peak mitigation rates rising by one percentage point p.a. to remain within the 50% budget. Figure 3 illustrates *Sustain* (50%) and *Immediate* (50%). Other scenarios are illustrated in the Appendix.

Table 1. Scenario names and sustained mitigation rates for the scenario pathways.

Name (probability of exceeding 2°C)	Maximum sustained annual mitigation rate for groups (%)
Sustain (66%)	14.0
Sustain (50%)	8.5
Immediate (66%)	6.0
Immediate (50%)	5.0
Immediate-China-Sustain (66%)	7.5
Immediate-China-Sustain (50%)	6.0
Immediate-China-2% (66%)	6.5
Immediate-China-2% (50%)	5.0
Development	11.0

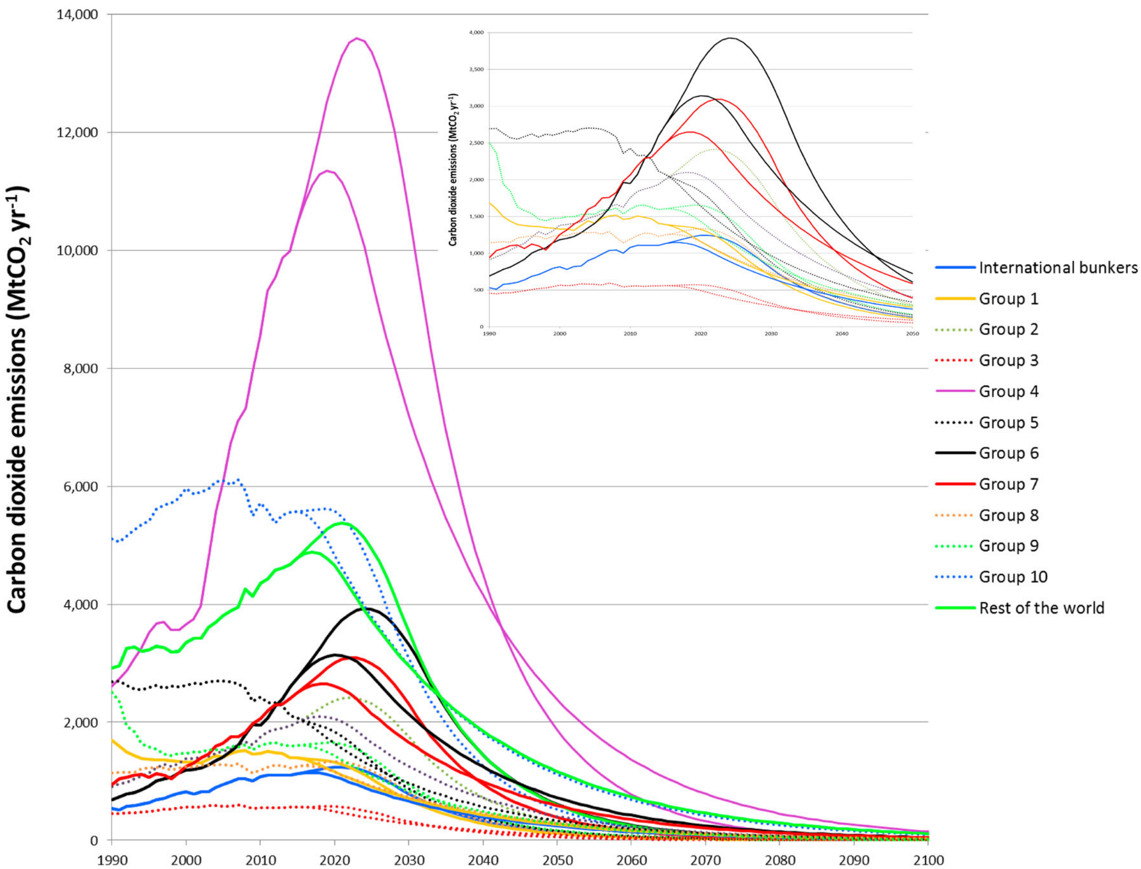

Figure 3. CO_2 from energy and industry under the Sustain (50%) (later peaks for same colour) and Immediate (50%) (early peaks for same colour) scenarios, sustaining either 5-year and 1-year post-economic downturn growth rates respectively. Rates of mitigation are in line with a 50% chance of avoiding 2°C. Inset shows all Groups other than RoW, China and US at a higher resolution. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

The scenarios differ by the date when all groups on aggregate start to mitigate. Any group already on a downward trajectory (e.g. Group 5) will continue at that reduction rate for either one (*Immediate*) or five years (*Sustain*) with the rate increasing post-2020. Any group exhibiting a near-term trend of CO_2 growth will start to reduce this growth rate either after one (*Immediate*), or five years (*Sustain*). The difference between the *Immediate* and *Sustain* families demonstrate that for every year's delay in extending or initiating mitigation effort, there is an increase in the maximum reduction rate required across groups of around 1% p.a. for the 50% budget and nearer 1.5% for the 66% budget. Table 1 in Fuss et al. (2016) suggests no clear signal within IAMs that a delay in policy requires a greater extent of BECCS. Here, with no scope for CO_2 emissions falling below zero later in the century, any delay in policy implementation has a direct impact on the rate of decarbonization necessary in later years.

Immediate-China-Sustain (50%) contrasts a scenario where China's emissions continue to grow at post-recession rates to 2019 with a scenario (*Immediate-China-2% (50%)*) where CO_2 growth reduces to 2% from 2015 to 2019, reducing further thereafter (Figure A3). Comparing this with the scenarios where all groups curb growth rates immediately (e.g. *Immediate (50%)* in Figure 3), illustrates that if mitigation could happen five years sooner in China, or the rate of growth reduced to 2% on average from 2015 onwards, other groups could reduce their sustained reduction rates by 1% to 1.5% per annum under the most constrained budget. A similar analysis can be conducted for the US with its estimated 16% share of global CO_2 emissions in 2015, but the recent low CO_2 growth rate (0.2% from 2009 to 2014) means that mitigation rates for other countries are less sensitive to US pathways than they are to China's.

The *Development* pathways make explicit an allowance for increasing emissions from industrializing nations, while other groups have peaked emissions by 2018. In *Development*, even when constrained by a 50% budget, India, for instance, still needs to decarbonize its energy system such that per capita emissions remain below 4 tonnes of CO_2 per person when emissions peak (compared with the US at 17 tonnes per person, Figure A4).

Even in the *Development* scenario (*Development*, Figure A5), the distribution of cumulative emissions is disproportionately weighted towards wealthier and rapidly industrializing nations. India's 2050 emissions are below 0.6 tCO_2 per person, demonstrating a need to take a much lower-carbon development route than taken by industrialized nations (Lamb & Rao, 2015). All pathways explicitly require industrializing nations to 'leapfrog' carbon intensive development.

Discussion

All scenario pathways illustrated have sustained CO_2 reductions that exceed the 4% p.a. rate typical of 2°C scenarios in the literature, but consistent with budget-focused analysis of Raupach et al. (2014) and Peters, Andrew, Solomon, and Friedlingstein (2015). This divergence arises from three principal factors.

First, all IAM scenarios within the IPCC scenario database for a >50% chance of avoiding 2°C and with a policy delay to 2020, expand the available budget through the large-scale uptake of NETs, specifically BECCS (Gough & Vaughan, 2015). As Peters (2016) notes, in the absence of CCS 'there needs to be a radical reduction in the consumption of fossil fuels for a likely chance to keep global average temperatures below 2°C'. While BECCS may yet prove effective *at scale*, for reasons highlighted below, this is judged as too speculative an assumption to include, providing an important complement to dominant literature.

The scale and rate of assumed BECCS deployment is typically high in 2°C scenarios, providing the equivalent of up to one third of current global electricity demand by 2040, rising to 50% by 2050.[9] The absence of robust operating costs for a CCS power station, let alone BECCS, also raises concerns given that it is repeatedly found to be a key least-cost policy option in many scenarios.

Second, the potential for socio-technical and socio-economic change to deliver reductions in energy consumption in the near term is something IAMs are ill-equipped to model given their conventional economic frameworks, assumptions and failure to reflect the path-dependent nature of technical change (Ackerman et al., 2009; Pahl-Wostl et al., 2013; Stern, 2016). Third, the inertia constraining the rate of transition to low-carbon energy supply is characterized here by focusing on the dynamics of short-term trends, postulating a mix of both challenging but deliverable, and theoretical changes to these trends.

The essential characteristics of the scenarios draw particular attention to the importance of existing levels of CO_2, and near-term CO_2 growth rates. The groups whose recent emissions rates differ by more than 1% compared with historical rates (Table 2) are Japan and Russia. In Japan's case, emissions are expected to rise at a higher rate than pre-2011, if it continues to move away from nuclear (Crastan, 2014;

Table 2. Comparison between growth/decline rates across groups. Low growth or a reduction: G1, G3, G5, G10; low–medium growth: G8, G9, RoW; medium growth: G2, Bunkers; medium–high growth: G4, G6 and G7.

		G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	RoW	Bunkers	World
		Australia Poland South Africa Ukraine	Brazil Mexico South Korea Turkey	Canada	China	France Germany Italy Spain UK	India	Indonesia Iran Kazakhstan Saudi Arabia Thailand	Japan	Russia	US			
Annual rates of energy & industry CO_2 change	1990–2014	−1%	3%	1%	6%	−1%	6%	4%	0%	−2%	0%	2%	3%	2%
	2000–2014	0%	2%	0%	7%	−2%	6%	5%	0%	1%	0%	2%	2%	3%
	2009–2014	−1%	4%	1%	5%	−2%	6%	4%	2%	1%	0%	2%	2%	2%
Pledges, NDCs or Kyoto targets as of 2016 interpreted for fossil fuel & industry (UNEP, 2014, Climate Action Tracker 2015) [for a range, the average is used]		Australia: 23–48% above 1990 by 2020; ±5% above 1990 by 2030 Poland: as G5 South Africa: 101% above 1990 by 2020; 20–82% by 2025–2030 Ukraine: 22% below 1990 by 2020, 41% by 2030	Brazil: 60–76% above 1990 by 2020; 116% by 2030 Mexico: 22%–36% below a baseline as defined by the NDC by 2030 (assume recent growth of 1.3% pa to 2020) South Korea: 84% above 1990 by 2020; 81% by 2030 Turkey: 389% above 1990 by 2030 [continue trend to 2020 at 3.4%]	7% above 1990 by 2020; 30% cut from 2005 by 2030	Intensity target of 60–65% below 2005 by 2030. Intention to peak by 2030.	20–30% below1990 by 2020; 40% below by 2030	Intensity targets of 20–25% below 2005 by 2020; 33–35% below by 2030	Indonesia: 330% above 1990 by 2020; 450–540% relative to 1990 by 2030. Iran: 4% below BAU by 2030 Kazakhstan: 19% below 1990 by 2020; 10% by 2030 Saudi Arabia: 600% increase on 1990 levels by 2030 Thailand: 20% below BAU by 2030	+5.2% above 1990 levels by 2020; 15% below 1990 by 2030	6–11% below 1990 by 2030	17% below 1990 by 2025	Assumes recent growth to 2020 then reduced to a peak in 2030	Intensity targets for shipping and potential trading scheme for aviation	
CO_2 change p.a. 2014–2020		5%	−2%	−2%	1%	−1%	6%	1%	0%	4%	−2%	2%	2%	2%
CO_2 change p.a. 2020–2030		−3%	1%	−2%	0%	−2%	0%	4%	−2%	1%	−2%	1%	0%	0%

Huang & Nagasaka, 2012). For Russia, falling oil prices linked to increased production from OPEC and Russia, rising consumption of indigenous shale oil in the US influencing trade, and a highly volatile Russian economy (Connolly, 2015; Korppoo & Kokorin, 2017; Russell, 2015) all add to uncertainty around Russia's CO_2 trends.

How China's shifting economy impacts on CO_2 growth is a key source of uncertainty. With nearly 30% of global CO_2 from fossil fuel and industry, any short-term change in China's CO_2 growth rate has a significant impact on mitigation rates required by all. Recent developments, such as China's reduction in coal consumption, have already influenced global CO_2 growth (Qi, Stern, Wu, Lu, & Green, 2016). A critical issue, is the possibility that data for China for 2000 to 2013 may have underestimated cumulative emissions by nearly 11 $GtCO_2$ (Liu et al., 2015) and that Chinese energy statistics are frequently found to contain large anomalies (Korsbakken, Peters, & Andrew, 2016). Moreover, many IAMs fail to capture near-term issues adequately, as they often involve ten-year time-steps and use modelled, rather than empirical, 2010-to-present data.

India's recent growth rate continued at the 1990 to 2014 average despite the global economic downturn. Its emissions grew by 6% between 2013 and 2014 and 5% 2014–2015, dominating the marginal increase in global emissions. With rising demand for fossil fuels, and India's very low per-capita CO_2, its growth rates might not be expected to fall for at least a decade. India's recent Environment Minister suggested emissions will not peak before 2045, given the need to focus on poverty eradication (Davenport, 2014). This view is buttressed by India's NDC where, even by the start of the NDC period, emissions are estimated at 30% higher than in 2013. In a similar vein, the International Energy Agency concludes that there are few signs of any disconnect between India's energy demand growth and CO_2 emissions out to 2030 (International Energy Agency, 2015).

While not a 'country group', international aviation and shipping (bunkers) are assumed to undertake urgent and rapid decarbonization. This is in contrast to expectations and their exclusion from the Paris Agreement. Stakeholders representing aviation and shipping generally assume that their industries will become net purchasers of emissions rights from others (Bows-Larkin, 2015). This position was reinforced by an International Civil Aviation Organisation agreement to implement its Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to 'address any annual increase in total CO_2 from international civil aviation' (ICAO, 2016). The analysis here shows that, as a big emitter, emissions from bunker fuels are highly influential. Consequently, there is a clear imperative for this sector to urgently deliver absolute mitigation.

Virtually all nations submitted NDCs for the 2015 Paris Conference of the Parties (COP) 21 meeting. These NDCs, alongside broader energy contexts, are built on (Table 2) to form an NDC-based scenario, constructed for comparison. Using NDCs, other national pledges, targets under the 1997 Kyoto Protocol or the 2009 Copenhagen Accord, or, where none exist, a scenario building on a continuation of post-downturn trend, Table 2 shows emissions mitigation rates for each group for 2014 to 2030. Post-2030, all groups are assumed to accelerate mitigation by one percentage point p.a. to a maximum of 6% (Figure 4). The cumulative budget of this scenario is around 1450 $GtCO_2$ from 2014–2100 for energy and industry only, breaching both the 66% and 50% budgets for staying below 2°C.[10]

Considering the pathways generated here, what stands out is that even a weak consideration of equity[11] (i.e. the *Development* scenario), leaves the 66% chance of avoiding 2°C as arguably infeasible.[12] A similar conclusion can be drawn for the 50% probability of avoiding 2°C, given 11% p.a. reductions would require unprecedented whole-system change. If no allowance is made for equity, the 66% chance of avoiding 2°C is only achievable with a program of deep and immediate mitigation. The Paris Agreement makes no provision for significant pre-2020 efforts. If post-recession emission rates for each country-group continue until 2020, remaining within the 50% budget is practicable, but only with global mitigation rates by 2025 well beyond the aggregated NDCs submitted to the Paris COP. Put simply, failure of the international community to deliver immediate (pre-2020), deep and absolute mitigation from the big emitters, will effectively put the carbon budgets for '*well below*' 2°C (or 'likely' 66–100%, chance) beyond reach, unless NETs are both proved viable at scale and urgently deployed.

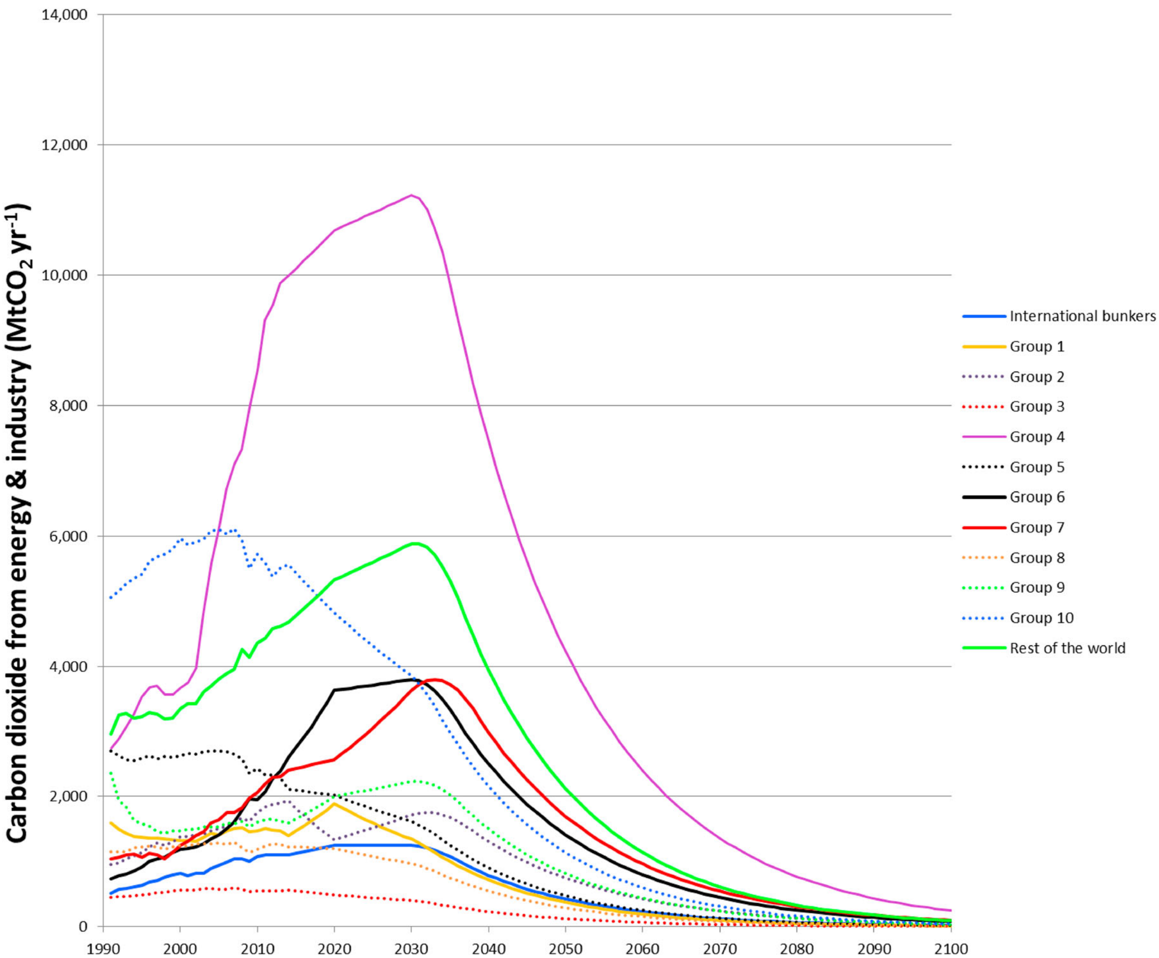

Figure 4. CO_2 from energy and industry pathways for the groups under the NDC scenario where rates are as in Table 2, reducing rapidly from 2030. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

Conclusions

This article analyses recent emission trends of big emitting nations, and of the aviation and shipping sectors, and considers these in relation to energy system characteristics, technical, social and political inertia, and issues of development. The analysis explicitly eschews widespread use of NETs, both because there are many major and potentially insurmountable obstacles to their successful uptake *at scale* (Brack, 2017; Fuss et al., 2016; International Energy Agency, 2016; Smith & Torn, 2013; Vaughan & Gough, 2016), and to provide a complement to the wealth of scenarios that do include them.

Bringing together this analysis with the IPCC's carbon budgets leads to challenging and uncomfortable conclusions. First, the on-going failure of any 'big emitter' to begin a comprehensive and rapid transition of its energy systems, suggests that constraining emissions to a carbon budget with a greater than 66% chance of avoiding 2°C, if applying even weak equity criteria, is now infeasible (with the NETs caveat as outlined). A similar conclusion arises for the 50% budget (and again assuming that NETs fails at scale). In essence, there exists a conflict within the Paris Agreement between its temperature and equity commitments.

While big emitting nations and international aviation and shipping are pivotal to delivering early and global-scale mitigation, overlooking how emissions may rise as other nations necessarily improve their standards of well-being would be a mistake. It is clear that rapidly industrializing nations need to leapfrog the high-carbon infrastructures of their industrialized counterparts, and establish low-carbon alternatives from the outset.

In 2016, global CO_2 emissions were ∼60% higher than they were at the time of the IPCC's first report in 1990. Despite a quarter of a century of repeated scientific evidence, there has been limited success in delivering meaningful levels of absolute mitigation. Against this backdrop, and with the successful adoption of the Paris Agreement, it is essential that the academic community captures the breadth of opportunities for constraining emissions within carbon budgets associated with '*well below 2°C*' and, ideally, '*pursuing … 1.5°C*'. While suites of 2°C scenarios exist in the literature, the IAM approach typically underplays the scope and importance of near-term mitigation and in particular the socio-technical opportunities for reducing energy demand as a way to reduce mitigation rates in later years (Anderson & Bows, 2011; Anderson & Peters, 2016). The pathways presented in this article pay greater attention to these issues and the inertia of existing energy-systems (Millar et al., 2016; Otto et al., 2013; Pfeiffer, Millar, Hepburn, & Beinhocker, 2016; Rogelj, den Elzen, et al., 2016) to broaden the view of available mitigation options, and implications thereof for the Paris commitments. They offer a complement to scenarios from the IAMs, virtually all of which have a significant reliance on future NETs to remove hundreds of billions of tonnes of CO_2 directly from the atmosphere in future decades, thereby avoiding a steeper CO_2 reduction pathway.

Providing complementary visions ensures policy makers have a broader solution space than offered by the economically optimized outputs of IAMs. Equipped with this richer portfolio, a more comprehensive assessment of the challenges posed by the Paris Agreement can be readily articulated. Specifically, this article points to how new climate-focused policies in the big emitting nations, and across the aviation and shipping sectors, need to be informed by: (1) the equity dimension of the Paris Agreement, (2) the sensitivity of constrained carbon budgets to short-term trends and (3) the climate risks for society posed by an almost ubiquitous inclusion of NETs within 2°C scenarios. Focusing on the scale of the challenge *without* widespread NETs draws greater attention to how delays to implementing stringent mitigation policy, including curbing energy demand, threatens the feasibility of the Paris commitments. The sooner the scale of the mitigation challenge informs meaningful action to curtail emissions, the greater will be the likelihood of avoiding a 2°C rise in the global mean surface temperature – even if this likelihood is now very low.

Notes

1. This works for CO_2 only, not equivalent, and does not hold beyond 2000 GtC (pp. 17; IPCC, 2013).
2. Taiwan is included in China due to the aggregation of economic indicators for this region.
3. Statistical clustering employed provided no more robust a grouping system than comparison and expert judgment.
4. A gap not greater than 1, where 1 is the difference between two nations if all nations were to be ranked in order across each indicator.
5. More information on the clustering method available in the Appendix.
6. A range of 2900–3200 $GtCO_2$ depending on non-CO_2 drivers.
7. A range of 2550–3150 $GtCO_2$ depending on non-CO_2 drivers.
8. Mitigation technologies or approaches are not specified in the pathways, so in theory some negative emissions technologies could be providing a reduction in absolute CO_2 emissions, but not sufficient to take the pathway below zero.
9. Based on a conversion efficiency of 35% (net of the CCS process), using BECCS primary energy data in Fuss et al. (2016) and background data provided by a co-author.
10. The NDCs formulated in either CO_2 and other GHGs separately, or CO_2 equivalent. Assumptions for CO_2 are either derived directly from information provided, or interpreted using analysis by the Climate Action Tracker, 2015.
11. This is an area where different equity principles (Bretschger, 2013) and interpretations of fairness give different outcomes for carbon budget allocations. However, the Paris Agreement draws particular attention to the importance of ethical issues such as equity and how poorer nations will need a significant grace period to decarbonize energy systems. Specifically, 'peaking will take longer for developing country Parties' (Paris Agreement, Article 4.1). However, as Anderson and Bows (2011) note, even when allowance is made for a delay, current significant differences in CO_2 per capita between wealthy and poorer nations still leaves cumulative emissions per capita within 2°C scenarios larger in wealthier nations. Here, the specific text 'weak consideration of equity' refers to the Development scenario where poorer groups reach a peak in CO_2 at a later date than the other groups (Figure A5).
12. What is or isn't feasible is subjective. Here 'infeasible' is specifically defined as long-run mitigation of over 10% p.a. While such mitigation has not been delivered in practice, and is twice that following the economic breakup of the Soviet Union,

provisional work suggests a combination of supply and demand technologies, allied with policies on behaviour and practices, could deliver mitigation rates of up to 10% p.a. (Anderson, Quéré, & McLachlan, 2014; Watson et al., 2014).

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Appendix

Table A1. Cumulative emission budgets from IPCC AR5.

Cumulative CO_2 emissions parameter	Value	Probability	Source	Notes
2011–2100 for a **1.5°C** target	90–310 $GtCO_2$	A **more likely than not** chance to bring temperature change *back to* below 1.5°C by 2100	WG3 TS, p. 56; WG3 Ch.6, p. 441	'Assessing this goal is currently difficult because no multi-model study has explored these scenarios. The limited number of published studies exploring this goal have produced associated scenarios that are characterized by (1) immediate mitigation; (2) the rapid up-scaling of the full portfolio of mitigation technologies; and (3) development along a low-energy demand trajectory.' (WG3 TS, p. 56) 'Global CO_2eq emissions in 2050 are between 70–95% below 2010 emissions, and they are between 110–120% below 2010 emissions in 2100.' (WG3 TS, footnote 12, p. 56)
2012–2100 for **RCP2.6**	Mean 270 GtC (990 $GtCO_2$). Range 140–410 GtC (510–1505 $GtCO_2$) (Table SPM.3, p. 27)	Warming by 2100 is '**unlikely** to exceed 2°C for RCP2.6' (p. 20)	WG1 SPM (pp. 4, 20, 27).	RCP2.6. Warming by 2100 is unlikely to exceed 2°C. '*Unlikely*' stands for a 0–33% probability (footnote 2, p. 4). Budgets generated by the CMIP5 ESM (Coupled Model Intercomparison Project Phase 5, Earth System Models) ensemble. Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 93), the Exec. Summary of Ch.6 (WG1 Ch.6, p. 468) and main text of Ch.6 (WG1 Ch.6 Table 6.12, p. 526), although the unit is 'PgC'.
From all anthropogenic sources since the period 1861–1880 *(not discussed till when)*	<1000 GtC (3670 $GtCO_2$)	Probability of **>66%** of limiting warming to less than 2°C	WG1 SPM (p. 27)	This amount decreases to ~**790 GtC** (2900 $GtCO_2$) when accounting for non-CO_2 forcings as in RCP2.6. Note that 515 [445–585] GtC (1890 [1630–2150] $GtCO_2$) was emitted by 2011. Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 103) and Ch.12 (WG1 Ch.12, p. 1113), although units are 'PgC'. 'These estimates were derived by computing the fraction of CMIP5 ESMs and EMICs that stay below 2°C for given cumulative emissions following RCP8.5 […]. The non-CO_2 forcing in RCP8.5 is higher than in RCP2.6. Because all likelihood statements in calibrated IPCC language are open intervals, the provided estimates are thus both conservative and consistent choices valid for non-CO_2 forcings across all RCP scenarios' (WG1 Ch.12, p. 1113)
2012–2100 for **RCP2.6**	275 PgC	*Not discussed*	WG1 Ch.6 Table 6.12 (p. 526)	These cumulative budgets are generated by IAMs (Integrated Assessment Models) as opposed to the CMIP5 ESM ensemble in the first four rows of this table.
2011–2100 for **RCP2.6**	630–1180 $GtCO_2$	**Likely** to stay below 2°C	WG3 SPM Table SPM.1 (p. 13)	'*Likely*' stands for a 66–100% likelihood (WG3 SPM, footnote 8, p. 13) Same values for cumulative emissions and probabilities for

(*Continued*)

Table A1. Continued.

Cumulative CO_2 emissions parameter	Value	Probability	Source	Notes
				temperatures as in the Technical Summary (WG3 TS, Table TS1, p. 54)
2011–2100 for **430–480 ppm**	630–1180 $GtCO_2$	12–37% of exceeding 2°C	WG3 Ch.6, Tables 6.2 and 6.3 (pp. 430–431)	**RCP2.6** is 'the corresponding RCP falling within the scenario category based on 2100 CO_2 equivalent concentration' range (WG3 Ch.6, note 3 to Table 6.2, p. 430).
From all anthropogenic sources since 1870 *(not discussed till when)*	<2900 $GtCO_2$ (2550–3150 $GtCO_2$ 'depending on non-CO_2 drivers')	>66% of less than 2°C	SYN SPM (p. 10)	'About 1900 $GtCO_2$ had already been emitted by 2011' (SYN SPM, p. 10). Subtracting these historical emissions from the values in the second column gives a remaining cumulative CO_2 budget of **1000 $GtCO_2$** (range 650–1250 $GtCO_2$ 'depending on non-CO_2 drivers'), from 2011.
From 2011 *(not discussed till when)*	1000 $GtCO_2$ (750–1400 $GtCO_2$)	66% of simulations staying below 2°C ['Fraction of simulations meeting goal', rather than a 'probability']	SYN, Table 2.2 (p. 64)	' … assuming non-CO_2 forcing follows the RCP8.5 scenario. Similar cumulative emissions are implied by other RCP scenarios' (SYN, note (c) to Table 2.2, p. 64) 'Note that the 66% range in this table should not be equated to the likelihood statements in [SYN] Table SPM.1 and [SYN] Table 3.1 and WGIII Table SPM.1. The assessment in these latter tables is not only based on the probabilities calculated for the full ensemble of scenarios in WGIII using a single climate model, but also the assessment in WGI of the uncertainty of the temperature projections not covered by climate models.' (SYN, note (b) to Table 2.2, p. 64)
From all anthropogenic sources since the period 1861–1880 *(not discussed till when)*	<1210 GtC (4440 $GtCO_2$)	Probability of **>50%** of limiting warming to less than 2°C	WG1 SPM (p. 27)	This amount decreases to ∼**820 GtC** (3010 $GtCO_2$) when accounting for non-CO_2 forcings as in RCP2.6. Note that 515 [445–585] GtC (1890 [1630–2150] $GtCO_2$) was emitted by 2011. Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 103) and Ch.12 (WG1 Ch.12, p. 1113), although units are 'PgC'. 'These estimates were derived by computing the fraction of CMIP5 ESMs and EMICs that stay below 2°C for given cumulative emissions following RCP8.5 […]. The non-CO_2 forcing in RCP8.5 is higher than in RCP2.6. Because all likelihood statements in calibrated IPCC language are open intervals, the provided estimates are thus both conservative and consistent choices valid for non-CO_2 forcings across all RCP scenarios.' (WG1 Ch.12, p. 1113)
From all anthropogenic sources since the period 1861–1880 *(not discussed till when)*	<1570 GtC (5760 $GtCO_2$)	Probability of **>33%** of limiting warming to less than 2°C	WG1 SPM (p. 27)	This amount decreases to ∼**900 GtC** (3300 $GtCO_2$) when accounting for non-CO_2 forcings as in RCP2.6. Note that 515 [445–585] GtC (1890 [1630–2150] $GtCO_2$) was emitted by 2011. Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 103) and Ch.12 (WG1 Ch.12, p. 1113), although units are 'PgC'. 'These estimates were derived by computing the fraction of CMIP5 ESMs and EMICs that stay below 2°C for given cumulative emissions following RCP8.5 […]. The non-CO_2 forcing in RCP8.5 is higher than in RCP2.6. Because all likelihood statements in

				calibrated IPCC language are open intervals, the provided estimates are thus both conservative and consistent choices valid for non-CO_2 forcings across all RCP scenarios.' (WG1 Ch.12, p. 1113)
2012–2100 for **RCP4.5**	Mean 780 GtC (2860 $GtCO_2$). (2180–3690 $GtCO_2$) (Table SPM.3, p. 27)	Warming by 2100 is '**more likely than not** to exceed 2°C for RCP4.5' (p. 20)	WG1 SPM (pp. 4, 20, 27).	'*More likely than not*' stands for a >50–100% probability (footnote 2, p. 4) These cumulative budgets are generated by the CMIP5 ESM (Coupled Model Intercomparison Project Phase 5, Earth System Models) ensemble, rather than by IAMs (Integrated Assessment Models). Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 93), the Exec. Summary of Ch.6 (WG1 Ch.6, p. 468) and main text of Ch.6 (WG1 Ch.6 Table 6.12, p. 526), although the unit is 'PgC'.
From all anthropogenic sources since 1870 *(not discussed till when)*	<3000 $GtCO_2$ (2900–3200 $GtCO_2$)	>50% of less than 2°C	SYN SPM footnote 7 (p. 10)	'About 1900 $GtCO_2$ had already been emitted by 2011' (SYN SPM, p. 10). Subtracting these historical emissions from the values in the second column gives a remaining cumulative CO_2 budget of **1100 $GtCO_2$** (range 1000–1300 $GtCO_2$ 'depending on non-CO_2 drivers'), from 2011.
From 2011 *(not discussed till when)*	1500 $GtCO_2$ (1150–2050 $GtCO_2$)	33% of simulations staying below 2°C ['Fraction of simulations meeting goal', rather than a 'probability']	SYN, Table 2.2 (p. 64)	' … assuming non-CO_2 forcing follows the RCP8.5 scenario. Similar cumulative emissions are implied by other RCP scenarios' (SYN, note (c) to Table 2.2, p. 64)
2012–2100 for **RCP4.5**	735 PgC	*Not discussed*	WG1 Ch.6 Table 6.12 (p. 526)	These cumulative budgets are generated by IAMs (Integrated Assessment Models) as opposed to the CMIP5 ESM ensemble in the first four rows of this table.
2011–2100 for **RCP4.5**	1870–2440 and 2570–3340 $GtCO_2$	**Unlikely** to stay below 2°C	WG3 SPM Table SPM.1 (p. 13)	'*Unlikely*' stands for a 0–33% likelihood (WG3 SPM, footnote 8, p. 13) Same values for cumulative emissions and probabilities for temperatures as in the Technical Summary. (WG3 TS, Table TS1, p. 54)
2011–2100 for **580–650 and 650–720 ppm**	1870–2440 and 2570–3340 $GtCO_2$	74–93% and 88–95% of exceeding 2°C	WG3 Ch.6, Tables 6.2 and 6.3 (pp. 430–431)	**RCP4.5** is 'the corresponding RCP falling within the scenario category based on 2100 CO_2 equivalent concentration' range. (WG3 Ch.6, note 3 to Table 6.2, p. 430)
From 2011 *(not discussed till when)*	1300 $GtCO_2$ (range 1150–1400 $GtCO_2$)	50% of simulations staying below 2°C ['Fraction of simulations meeting goal', rather than a 'probability']	SYN, Table 2.2 (p. 64)	' … assuming non-CO_2 forcing follows the RCP8.5 scenario. Similar cumulative emissions are implied by other RCP scenarios' (SYN, note (c) to Table 2.2, p. 64)
2012–2100 for **RCP6.0**	Mean 1060 GtC or 3885 $GtCO_2$. 840–1250 GtC (3080–4585 $GtCO_2$) (Table SPM.3, p. 27)	Warming by 2100 is '**likely** to exceed 2°C for RCP6.0 and RCP8.5' (p. 20)	WG1 SPM (pp. 4, 20, 27).	'*Likely*' stands for a 66–100% probability (footnote 2, p. 4) These cumulative budgets are generated by the CMIP5 ESM (Coupled Model Intercomparison Project Phase 5, Earth System Models) ensemble. Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 93), the Exec. Summary of Ch.6 (WG1

(*Continued*)

Table A1. Continued.

Cumulative CO_2 emissions parameter	Value	Probability	Source	Notes
				Ch.6, p. 468) and main text of Ch.6 (WG1 Ch.6 Table 6.12, p. 526), although the unit is 'PgC'.
2012–2100 for **RCP6.0**	1165 PgC	*Not discussed*	WG1 Ch.6 Table 6.12 (p. 526)	These cumulative budgets are generated by IAMs (Integrated Assessment Models) as opposed to the CMIP5 ESM ensemble in the first four rows of this table.
2011–2100 for **RCP6.0**	3620–4990 $GtCO_2$	**Unlikely** to stay below 2°C	WG3 SPM Table SPM.1 (p. 13)	'*Unlikely*' stands for a 0–33% likelihood (WG3 SPM, footnote 8, p. 13) Same values for cumulative emissions and probabilities for temperatures as in the Technical Summary. (WG3 TS, Table TS1, p. 54) 'For scenarios in this category no CMIP5 run […] as well as no MAGICC realization […] stays below the respective temperature level. Still, an unlikely assignment is given to reflect uncertainties that might not be reflected by the current climate models.' (WG3 SPM, footnote 11, p. 13)
2011–2100 for **720–1000 ppm**	3620–4990 $GtCO_2$	97–100% of exceeding 2°C	WG3 Ch.6, Tables 6.2 and 6.3 (pp. 430–431)	**RCP6.0** is 'the corresponding RCP falling within the scenario category based on 2100 CO_2 equivalent concentration' range. (WG3 Ch.6, note 3 to Table 6.2, p. 430)
From all anthropogenic sources since 1870 *(not discussed till when)*	<3300 $GtCO_2$ (2950–3800 $GtCO_2$)	>33% of less than 2°C	SYN SPM footnote 7 (p. 10)	'About 1900 $GtCO_2$ had already been emitted by 2011' (SYN SPM, p. 10). Subtracting these historical emissions from the values in the second column gives a remaining cumulative CO_2 budget of **1400 $GtCO_2$** (range 1050–1900 $GtCO_2$ 'depending on non-CO_2 drivers'), from 2011.
2012–2100 for **RCP8.5**	Mean 1685 GtC or 6180 $GtCO_2$. 1415–1910 GtC (5185–7005 $GtCO_2$) (Table SPM.3, p. 27)	Warming by 2100 is '**likely** to exceed 2°C for RCP6.0 and RCP8.5' (p. 20)	WG1 SPM (pp. 4, 20, 27).	'*Likely*' stands for a 66–100% probability (footnote 2, p. 4) These cumulative budgets are generated by the CMIP5 ESM (Coupled Model Intercomparison Project Phase 5, Earth System Models) ensemble, rather than by IAMs (Integrated Assessment Models). Same values for cumulative emissions as in the Technical Summary (WG1 TS, p. 93), the Exec. Summary of Ch.6 (WG1 Ch.6, p. 468) and main text of Ch.6 (WG1 Ch.6 Table 6.12, p. 526), although the unit is 'PgC'.
2012–2100 for **RCP8.5**	1855 PgC	*Not discussed*	WG1 Ch.6 Table 6.12 (p. 526)	These cumulative budgets are generated by IAMs (Integrated Assessment Models) as opposed to the CMIP5 ESM ensemble.
2011 to 2100 for **RCP8.5**	5350–7010 $GtCO_2$	**Unlikely** to stay below 2°C	WG3 SPM Table SPM.1 (p. 13)	'*Unlikely*' stands for a 0–33% likelihood (WG3 SPM, footnote 8, p. 13) Same values for cumulative emissions and probabilities for temperatures as in the Technical Summary (WG3 TS, Table TS1, p. 54) 'For scenarios in this category no CMIP5 run […] as well as no

				MAGICC realization […] stays below the respective temperature level. Still, an unlikely assignment is given to reflect uncertainties that might not be reflected by the current climate models.' (WG3 SPM, footnote 11, p. 13)
2010–2100, without 'any explicit mitigation efforts'	'potentially well over 4000 $GtCO_2$'	*Not discussed*	WG3 TS (p. 50)	The exact phrase: 'the scenarios strongly suggest that absent any explicit mitigation efforts, cumulative CO_2 emissions since 2010 will exceed 700 $GtCO_2$ by 2030, 1500 $GtCO_2$ by 2050, and potentially well over 4000 $GtCO_2$ by 2100' (WG3 TS, p. 50) AN ENIGMATIC PHRASE: 'Note that cumulative CO_2 emissions are presented here for different periods of time (2011–2050 and 2011–2100) while cumulative CO2 emissions in WGI AR5 are presented as total compatible emissions for the RCPs (2012–2100) or for total compatible emissions for remaining below a given temperature target with a given likelihood.' (WG3 TS, footnote 3 to Table TS1, p. 54)
2011–2100 for **>1000 ppm**	5350–7010 $GtCO_2$	100–100% of exceeding 2°C	WG3 Ch.6, Tables 6.2 and 6.3 (pp. 430–431)	**RCP8.5** is 'the corresponding RCP falling within the scenario category based on 2100 CO_2 equivalent concentration' range (WG3 Ch.6, note 3 to Table 6.2, p. 430).

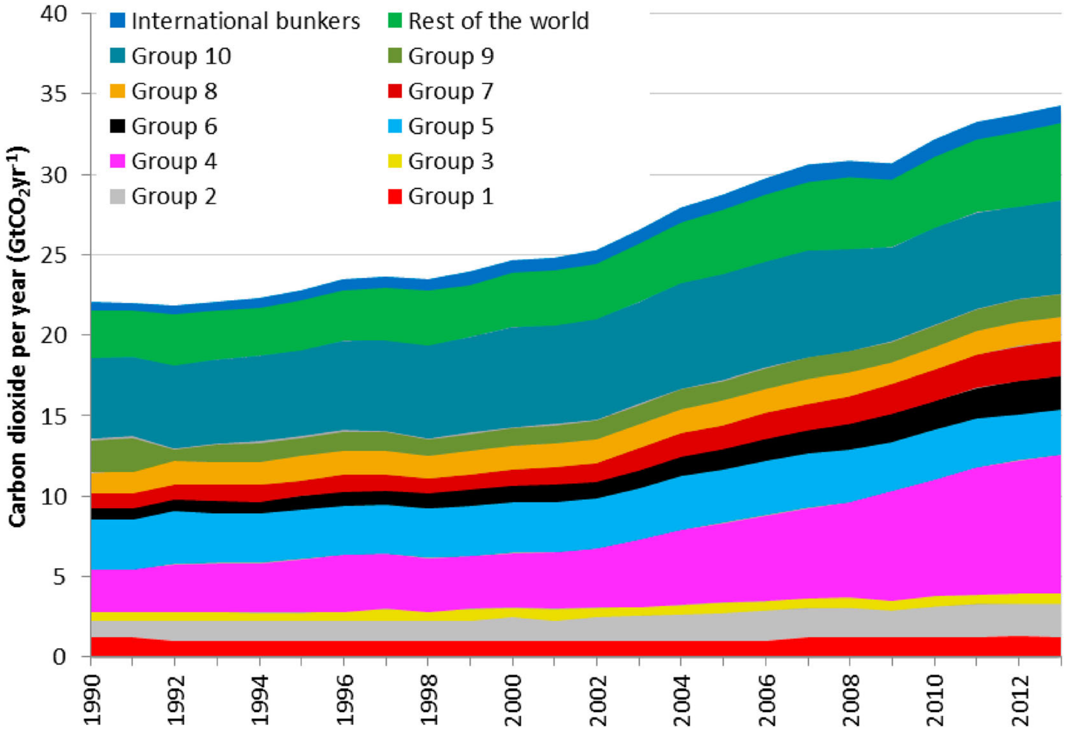

Figure A1. Group annual CO_2 emissions 1990–2014 for consumption-based accounts. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

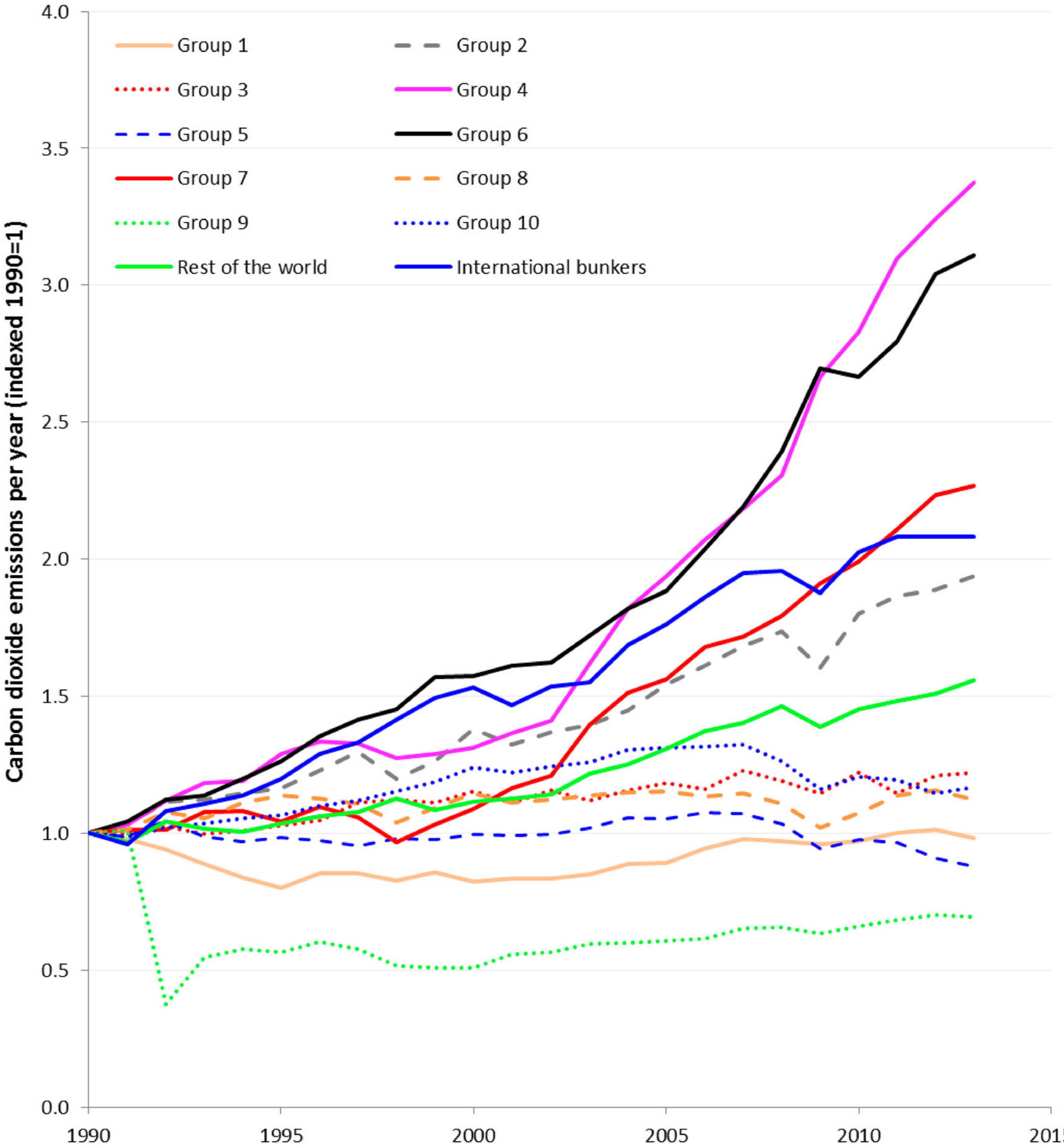

Figure A2. CO_2 emissions from the high emitting groups, bunkers plus RoW, normalized 1990=1 for consumption-based accounts. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

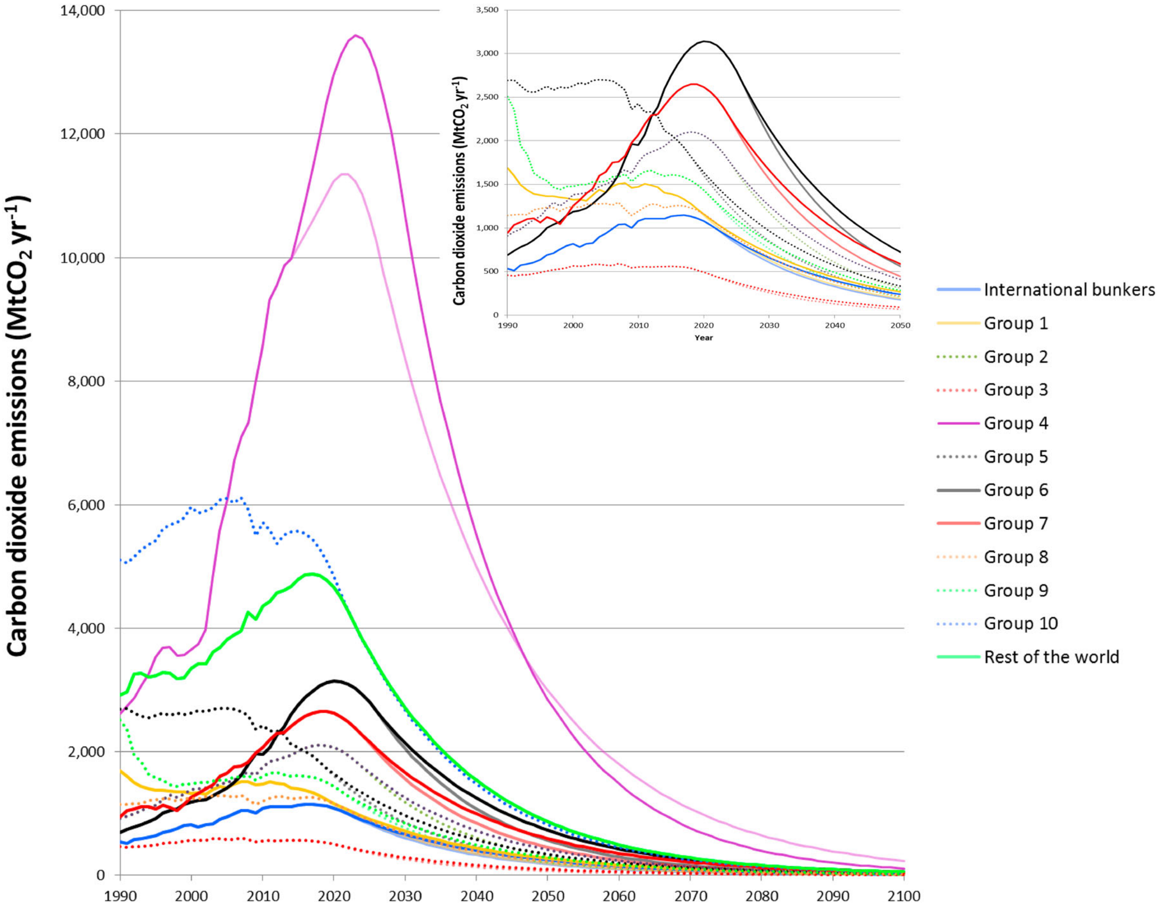

Figure A3. CO_2 from energy and industry pathways for *Immediate-China-Sus (50%)* (strong lines) and *Immediate-China-2% (50%)* (weaker coloured lines) scenarios with 1-year's post-economic downturn rate continued towards a peak for all groups apart from in China, where post-recession rates continue for 5-years in '*Sustain*' and 2% growth assumed to 2020 in '2%'. Both have a 50% chance of avoiding 2°C. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

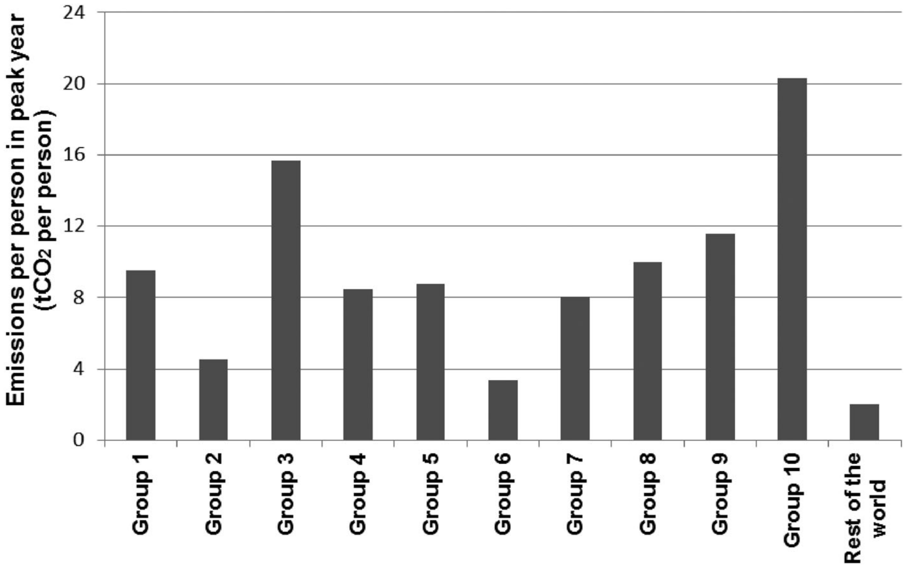

Figure A4. CO_2 emissions per capita in each group's emission peak year for '*Development*'. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

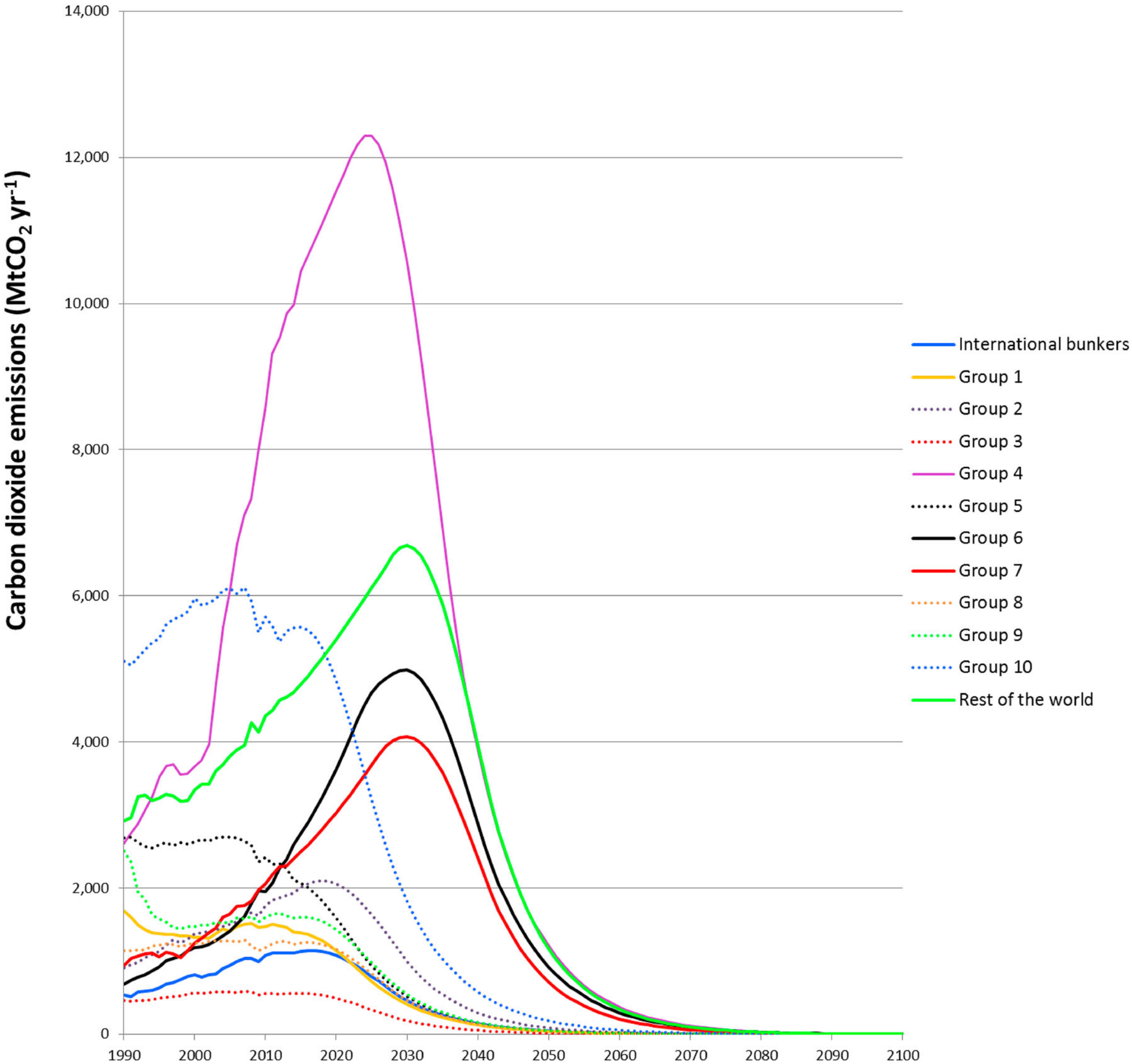

Figure A5. CO_2 from energy and industry pathways under the *Development* scenario where CO_2 in the RoW, India and Group 7 grow until a peak in 2030, with all other groups mitigating after only 1 year of post-recession CO_2 rate. The CO_2 budget is commensurate with a 50% chance of avoiding 2°C. [Group 1: Australia, Poland, South Africa, Ukraine. Group 2: Brazil, Mexico, South Korea, Turkey. Group 3: Canada. Group 4: China, Hong Kong, Taiwan. Group 5: France, Germany, Italy, Spain, UK; Group 6: India. Group 7: Indonesia, Iran, Kazakhstan, Saudi Arabia, Thailand. Group 8: Japan. Group 9: Russia. Group 10: US.]

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Lessons learned from the first round of applications by carbon-offsetting programs for eligibility under CORSIA

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Summary

In 2016, the International Civil Aviation Organization (ICAO) adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The scheme requires participating airline operators to purchase carbon offset credits to compensate for the increase in their carbon dioxide emissions from international flights above 2019/2020 levels.

This paper synthesizes key lessons learned from an assessment of the first 14 applications of carbon-offsetting programs for eligibility under CORSIA, focussing on five out of eight eligibility criteria established by ICAO. The evaluation shows that the degree to which the applicants satisfy the ICAO requirements differs substantially. Some applicants hardly meet any of the requirements and may not even be considered carbon-offsetting programs. However, there are also notable differences in relation to specific criteria.

With regard to ensuring additionality and establishing baselines, key shortcomings are that many programmes apply approaches that do not guarantee environmental integrity of the generated credits. Not all programs regularly reassess whether their approaches are still appropriate in the light of new circumstances, such as lower costs of renewable energy technologies, and programs may still need to update their approaches for assessing additionality and establishing baselines in the light of the new context of the Paris Agreement. Some programs also do not require an independent third-party assessment of baseline methodologies. Most programs do not yet have procedures in place or planned for avoiding double counting between CORSIA and nationally determined contributions (NDCs) under the Paris Agreement. However, a few programs are in the process of implementing detailed procedures, based on voluntary Guidelines developed by a multi-stakeholder group. To address non-permanence, most programs use "buffer" approaches. The duration for which non-permanence is ensured, the avoidance of moral hazard risks of intentional reversals, and the "capitalization" of buffers vary considerably among programs. The Clean Development Mechanism's provisions to address non-permanence were in principle robust but do no longer work, given that the Kyoto Protocol will not have a third commitment period. Lastly, only two programs have a process in place which requires the assessment of environmental and social risks, the adoption of safeguards, and the monitoring and reporting on risks.

The paper also identifies several cross-cutting issues. First, we recommend that ICAO only approve programs as eligible for CORSIA once programs have amended their standards and procedures to fulfil *all* criteria. Second, the evaluation identified that ICAO still needs to clarify several matters that are not explicitly addressed in current criteria, such as what global warming potentials programs should use to convert non-CO_2 emissions into CO_2 equivalents; whether offset credits will be eligible if the host country does not participate in the Paris Agreement; with what type of international mitigation targets double counting must be avoided; and the treatment of emission reductions not covered by NDCs. Clear international rules on these matters would greatly facilitate the approval of programs and the implementation of CORSIA. Third, we recommend that ICAO adopts a transparent procedure for the initial approval, ongoing supervision, re-approval, suspension and termination of eligibility of programs. This procedure could also address the insufficient level of information in current applications, by requiring programs to provide more detailed information. Lastly, we recommend that the Parties to the Paris Agreement include specific provisions in the international rules on Article 6 for how countries should account for offset credits used under CORSIA.

1. Introduction

In 2016, the International Civil Aviation Organization (ICAO) adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The scheme requires participating airline operators to purchase carbon offset credits to compensate for the increase in their carbon dioxide emissions from international flights above 2019/2020 levels. Over its operational period from 2021 to 2035, the scheme could generate a demand for about 1.6 to 3.7 billion offset credits (Healy, 2017).

In 2019, the ICAO Council adopted Emission Unit Eligibility Criteria (EUCs) which specify the requirements that must be fulfilled for carbon offset credits to be eligible under CORSIA (ICAO, 2019). Carbon-offsetting programs need to fulfil these criteria and be approved by the ICAO Council as eligible programs. The ICAO Council also set up a Technical Advisory Body (TAB) and tasked it with evaluating whether carbon-offsetting programs satisfy the EUCs and making recommendations on their approval to the Council. In June 2019, the first window for applications by carbon-offsetting programs was opened. The TAB also published further information, including guidelines for interpretation of the EUCs and application forms. In total, 14 programs and entities responded to the call and submitted information to the TAB.

This paper synthesizes key lessons learned from an assessment of the first round of applications by carbon-offsetting programs for eligibility under CORSIA. The paper is based on a detailed evaluation of the 14 program applications and focuses on five out of the eight 'Carbon Offset Credit Integrity Assessment Criteria'. These include that "offset credit programs should deliver credits that represent emission reductions, avoidance or sequestration that: which we consider particularly important deemed particularly important EUCs:

1. Are additional (section 3);
2. Are based on a realistic and credible baseline (section 4);
3. Represent permanent emission reductions (section 5);
4. Are only counted once towards a mitigation obligation (section 6); and
5. Do no net harm (section 7)."

The paper first identifies cross-cutting and procedural issues observed with the applications (section 2) and then synthesises the lessons learned for each of the five criteria above (sections 3 to 7). This is followed by brief conclusions (section 8). This paper does not include an assessment of specific programs but rather summarizes general observations from the evaluation of the 14 program applications. Specific comments to program applications were provided by the authors as part of public comments submitted to ICAO and are attached to this paper in the Appendix.

The evaluation of programs and this synthesis paper are co-funded by Gesellschaft für Internationale Zusammenarbeit (GIZ) based on funding from the German Environment Ministry and by ClimateWorks Foundation.

2. Cross-cutting issues

The evaluation of the 14 program applications revealed several cross-cutting issues:

- **Need for a transparent procedure for program approval, program surveillance, and termination of program eligibility.** The current application process for carbon-offsetting programs does not seem to follow any publicly available procedure. We recommend that the TAB develops a clear and transparent procedure for the initial establishment of program eligibility, the subsequent continuous surveillance of programs in relation to their performance against the EUCs, as well as procedures for suspension or termination of program eligibility if the programs do not continue to meet all requirements. This procedure should be publicly available and public comments should be invited on the procedure prior to its final adoption. As carbon-offsetting programs regularly change or amend their program requirements, we recommend that initial eligibility is established for a limited duration and regularly re-assessed, and that the procedure establishes means to ensure that programs continue to satisfy all EUCs. If a program no longer satisfies the EUCs, ICAO should suspend or terminate its eligibility and determine the conditions for re-establishing eligibility.

- **Timing of approving programs as CORSIA eligible:** None of the carbon-offsetting programs currently have standards and procedures in place that address all EUCs. This is understandable, given the adoption of the EUCs by the ICAO Council just recently in February 2019, and the new context of CORSIA and the Paris Agreement. Many programs claim that they will address requirements in the future. This raises questions for the timing of the approval of programs by ICAO. We believe that it is essential that programs are not approved based on "plans" to fulfil requirements in the future, but only once they have adopted all necessary amendments to their standards, procedures, guidelines, forms and program operations, and only after these amendments have been assessed by the TAB. This also raises timing issues for programs, as amendments to standards and procedures that specifically target CORSIA should only become effective once the program is CORSIA eligible. To address this, the TAB could require that programs *adopt* any necessary amendments to their standards and procedures before their final evaluation by the TAB but *confirm* the date of their entry into force only once they have been approved as CORSIA eligible.

- **Lack of sufficient information to inform public comments.** Some programs do not include any substantive information on how they plan to meet a criterion in the future. We recommend the TAB to make any further information provided by the applicants in the course of the application process publicly available and to launch a second call for public comments once the programs have prepared amendments to their standards and procedures in order to satisfy the EUCs. Moreover, a procedure for the application of programs, as recommended above, could address the insufficient level of information in current applications, by specifying more clearly what detail of information should be provided in program applications.

- **Lack of guidance on values for global warming potentials (GWPs).** ICAO has not established a requirement regarding what GWP values programs should use to convert non-CO_2 emission reductions/removals into CO_2 equivalents. If different programs use different GWP values under CORSIA, this could have two adverse outcomes. First, this could create a risk that project owners pick the program which results in higher CO_2 equivalents of emission reductions, depending on which gases are abated. In aggregate, this could lead to higher emission reduction claims compared to a situation where all programs use the same GWP values, and thus undermine the integrity of CORSIA. Second, as the same emission reduction would have a different value under different programs, this could distort the market. We recommend that ICAO clarifies what GWP values programs should use for which relevant time periods (up to 31 December 2020 and as of 1 January 2021). Following relevant decisions under the Kyoto Protocol and the Paris Agreement, we recommend that ICAO clarifies that programs should use the 100-year time-horizon values from the 4th assessment report of the Intergovernmental

Panel on Climate Change (IPCC) for emission reductions or removals that occur before 1 January 2021 (if such emission reductions are deemed eligible in accordance with relevant decisions on vintage and timeframe) and the values from the 5th assessment report for emission reductions or removals that occur on or after 1 January 2021.

- **Need to restrict applications to actual carbon-offsetting programs.** The applicants Myclimate, REDD.plus and the State Forests of the Republic of Poland do not have some of the basic features of carbon-offsetting programs, such as procedures for the approval of projects and issuance of carbon market units, managing protocols for the quantification of emission reductions, and operating or accessing a registry system. Similarly, the Forest Carbon Partnership Facility is a fund that supports programs that may generate carbon certificates but lacks key elements of a full carbon-offsetting program.
- **Lack of a procedure to qualify offset credits for use under CORSIA.** Offset credits issued by carbon-offsetting programs are often used for multiple purposes. In some instances, these different uses may involve different requirements than those under CORSIA. For the integrity of CORSIA it is important that programs distinguish units that meet all CORSIA requirements from those that do not meet these requirements. To address this matter, all programs that intend to issue, or have already issued, offset credits for which not all EUCs and other relevant decisions under ICAO (such as decisions on the eligible vintage and timeframe of offset credits) are initially satisfied should establish a procedure under which project owners or offset credit holders can request that offset credits be qualified for meeting offsetting requirements under the CORSIA.

3. Additionality

The requirement of additionality means that eligible offset credit programs should clearly demonstrate that the program has procedures in place to assess/test for additionality of the activities for which credits are issued, and that those procedures provide reasonable assurance that the emission reductions or emission avoidance would not have occurred in the absence of the offset program. There are different approaches used to test additionality that differ in the degree they provide the required assurance.

Some programmes test additionality through investment analysis tests, in particular those that apply CDM rules for additionality assessment. These tests, which have been refined over the years, have the advantage that they take the specific economic circumstances of an activity into account, but they also face the challenge of information asymmetry between project owners and regulators. Very few standards rely solely on barrier analysis and common practice tests, which can be considered insufficient in many cases if applied without investment analysis.

Recently, standardization of additionality assessment through benchmarks, positive lists or eligibility criteria has gained ground for some technologies under the CDM, and some programs only use standardized approaches to test additionality. These approaches were introduced to address concerns raised with the investment analysis, in particular the ability of project owners to “game” additionality determinations by exploiting information asymmetries and uncertainty of assumptions on future developments of key parameters such as fuel costs. However, standardized approaches have serious disadvantages: any form of standardization needs to be either highly conservative or updated regularly (for instance every 3-5 years, but this should be determined on a technology-specific level) to account for technology developments within the respective regional or national circumstances in which the offset activities are being implemented. For instance, under the CDM, some positive lists became less conservative over time and their non-revision led to the automatic eligibility of renewable energy projects, whose additionality became more questionable after costs of renewable energy technologies had fallen substantially. Most applicants do not address this issue, but some programs are in the process of narrowing the scope of eligible activities to address the falling costs of some technologies. We recommend that programs should have procedures in place that ensure that any standardized additionality approaches are regularly updated to reassess whether relevant circumstances affecting the additionality have changed.

In general, additionality testing, but also baseline calculation, is heavily influenced by the overall context of the international climate policy regime. This was particularly true for the issue of consideration of national mitigation policies during the Kyoto Protocol era, as non-Annex B Parties did not have emission targets. Under the CDM, the so-called “E+/E-“ rules were adopted to avoid a perverse incentive for host country governments not to implement mitigation policies in order to protect CER revenues.[1] The application of this rule, however, led to the registration of some projects which would have been deemed non-additional if national policies (e.g. national renewable energy feed-in-tariffs) had been taken into account, and it was therefore subject to criticism.

As all countries now have NDCs to achieving the Paris Agreement objectives, all host country policies and measures should be taken into account in additionality determination. The precise rules for assessing additionality in the context of NDCs and related national policies and measures are still subject to international negotiations. However, it is clear that the paradigm shift from a bifurcated climate regime to one in which all countries make contributions through their NDCs should affect the international rules for the assessment of additionality (Michaelowa, Hermwille, Obergassel, & Butzengeiger, 2019). Depending on the rules to be adopted for additionality assessment in the context of Article 6 of the Paris Agreement, additionality testing rules of CORSIA eligibility programs should be re-evaluated and harmonized. Most probably, additionality assessment will take into account implemented policies, but maybe even planned policies.

4. Baselines

There are different approaches to baseline setting that are appropriate in different contexts. When assessing baseline requirements of carbon-offsetting programs at a general level, a necessary condition for credibility is that the baseline methodologies are approved following independent third-party assessment and are accompanied by full public transparency regarding the assumptions and parameters used to establish baselines.

Several program applications, mostly those that build to a large extent on CDM rules, have a clear and detailed process in place and provide for the necessary transparency. However, this is not the case for all applications, and some do not provide public information on the process in their application nor on their websites. Also questionable are “fast track procedures” for the approval of methodologies from other (including non-UNFCCC) carbon-offsetting programs. If these methodologies are not developed in the context of full transparency and third-party assessment, this introduces the risk of increased use of non-conservative baseline methodologies across different programs. In addition, some applicants do not publish their methodologies in English, which limits transparency in an international context.

[1] When establishing baselines, policies that provide a comparative advantage to more emission-intensive technologies (E+) were only taken into account if their adoption predated the adoption of the Kyoto Protocol in 1997. Policies that provided a comparative advantage to less emission-intensive technologies (E-) were only taken into account if adopted prior to the adoption of the Marrakech Accords in 2001. This rule is also referred to in the additionality tool of the CDM but the meaning of the reference has been interpreted in different ways over time and has been subject to considerable debate.

All types of standardized baselines must be subject to regular updates in order to reflect developments in economic, technological or other circumstances in a global, regional or country-specific context. This is however only addressed by very few applicants and in some cases, lack of regular updates has led to significantly less conservative baseline methodologies, at least if compared to the development of baseline setting for large-scale projects under the CDM.

Similar to additionality assessment, a decision on the principles for the establishment of baselines is expected to be taken under Article 6 of the Paris Agreement, at least in the context of the Article 6.4 mechanism. In the medium term, baseline setting rules for eligible offsets under CORSIA should be harmonized with UNFCCC requirements.

5. Addressing non-permanence

Because offset credits will be used to compensate for emissions that will effectively raise atmospheric concentrations of CO_2 for many thousands of years, they should be associated with emission reductions or removals that are similarly permanent. If an emission reduction or removal is “reversed” (e.g., subsequently emitted so that no net reduction occurs), then it can no longer function as an offset. This is primarily a concern for sequestration or carbon-storage in the land-use sector (Schneider, Conway, Kachi, & Hermann, 2018).

Of the candidate programs that issue credits for reversible reductions/removals, most use a pooled “buffer reserve” to address the risk of reversals. Under this approach, offset credits are set aside from individual projects into a common buffer reserve, which can be drawn upon to cover reversals from any project. Although buffer reserves are a common mechanism for addressing permanence, they have some potential shortcomings:

1. *Buffer reserves only guarantee permanence for a limited time period.* No risk can be insured against in perpetuity, including reversal risks (i.e. over the very long run, the chance of reversal for any given project approaches 100%). Programs adopting buffer reserves are therefore implicitly or explicitly transferring an obligation to maintain carbon storage (or compensate for reversals) to future decisionmakers (Murray, Galik, Mitchell, & Cottle, 2012). From a policy standpoint, the question is what sort of *minimum guarantee* is sufficient to deem an emission reduction “permanent.” As a convention, international policymakers have adopted 100 years as a standard benchmark for evaluating the climate impacts of mitigation actions (Fearnside, 2002). This is the basis, for example, for using 100-year global warming potentials (GWPs) to convert quantities of non-CO_2 emissions into CO_2-equivalent emissions. The same benchmark should be used for evaluating the “permanence” of carbon offsets used by the aviation industry. However, only two of the programs that submitted applications – British Columbia and Climate Action Reserve – provide a minimum guarantee of compensating for reversals for 100 years or more. Other programs guarantee permanence for shorter periods of time, have shorter monitoring periods, and/or are vague about their guarantees. We recommend that programs should only be approved if their procedures and standards ensure permanence for 100 years or more. This includes that monitoring of any reversals should continue throughout this period and that appropriate mechanisms are in place to compensate for potential reversals if monitoring is no longer conducted.

   Related to this, a larger question is what the recourse may be in situations where programs with 100-year permanence guarantees cease operation before these obligations are fulfilled. This could be a particular concern with programs administered by private companies or non-governmental organizations. This is something that should be further explored by ICAO in the context of CORSIA. Possible solutions, for example, could be the establishment of public trusteeships (e.g., at a national level, or administered by ICAO) to manage buffer reserves and enforce legal obligations against intentional reversals; assumption by governments of ultimate liability or trusteeship responsibilities; or other forms of collective (re)insurance.

2. *Buffer reserves are not sufficient (by themselves) to address the risk of intentional, human-caused reversals*. Buffer reserves could be effective at compensating for reversals due to natural disturbance risks, such as fire, disease, or drought affecting forests and soils. They can present a “moral hazard” problem, however, if used to compensate for human-caused reversals, such as intentional harvesting. If a landowner faces no penalty for harvesting trees for their timber value, for example – because any reversals caused by harvesting would be compensated out of a buffer reserve – then the landowner could face a strong incentive to harvest. Such perverse incentives can make a buffer reserve approach unviable, unless programs use alternative mechanisms or penalties to cover “intentional” or “avoidable” reversals. At least two of the applying programs either do not explicitly address this distinction or apply approaches that are insufficient to address the “moral hazard” problem. We recommend that programs are only approved if they have robust penalties and procedures in place to address “moral hazard” risks.

3. *Buffer reserves must be sufficiently “capitalized” to cover reversal risks over time.* As with any kind of insurance, buffer reserves can only be effective at guaranteeing permanence if they are sufficiently “capitalized” to cover reversal risks over time. Only two of the applicants provided explicit quantitative information indicating that their buffer reserves are sufficiently large to cover possible reversal events, including catastrophic losses across multiple projects. Given the potential volume of demand for carbon offsets that may arise under CORSIA, it is important to ensure that the buffer reserves of approved programs are robust. We recommend that rigorous stress testing of the applicants’ buffer reserves be conducted prior to approval by ICAO, and that such stress testing be conducted on a regular basis as CORSIA progresses. Stress testing should demonstrate that buffer reserves are sufficient to cover potential catastrophic events, taking into account the geographical locations of projects.

Another issue that can arise with buffer reserves is the possible mixing of credits from different project *types* in reserve pools, including project types not subject to reversal risks. This can bolster the effectiveness of buffer reserves, because at least some of the buffer will not be subject to reversal (as it could be if only AFOLU-project credits are used). On the other hand, this could create the risk that credits not eligible under CORSIA could be used to compensate for the reversal of credits that *are* CORSIA-eligible. Program approval should be conditional on having procedures in place to ensure that ineligible credits are not used to compensate for reversals of CORSIA-eligible credits.[2]

Finally, it should be noted that the CDM addresses permanence for afforestation/reforestation (A/R) projects through an entirely different mechanism: temporary (expiring) credits. Under this approach, offset credits expire after a predefined period and must be replaced with other units issued under the Kyoto Protocol (this holds for both tCERs and lCERs). In clearly defined instances – the end of a commitment period under the Kyoto Protocol for tCERs, or a non-permanence event or non-submission of a monitoring report for lCERs – the credits must be replaced. tCERs may be reissued for subsequent commitment periods. At the end of a project’s final crediting period, how-

[2] A separate concern is that allowing different types of credits to compensate for reversals could create arbitrage opportunities for project developers. As a worst-case example, a developer could sell credits from an AFOLU project, terminate the project, and cover any liability using cheaper credits from other project types. While this presents no direct environmental integrity risks - as long as projects that are not CORSIA-eligible have the same quality as CORSIA-eligible projects - it could create issues for buyers who paid a higher price assuming they were also supporting the co-benefits of an AFOLU project.

ever, no more credits may be issued and all credits must be replaced with permanent Kyoto units, regardless of whether a reversal occurred or not. This approach ostensibly guarantees permanence by ensuring that all offset credits associated with potentially non-permanent reductions or removals are replaced with units representing permanent reductions – even if no reversals occur during a project's crediting period. This is arguably a stronger guarantee than the one provided by buffer reserves.

However, there are several challenges with the approach applied by the CDM. First, it was developed in the context of the Kyoto Protocol, and specific requirements are linked to elements of the Kyoto regime. For a certain subset of temporary credits, for example, expiry is linked to the end of the next Kyoto Protocol commitment period, which has yet to be defined (and likely will not be defined, as countries to the UNFCCC do not intend to adopt a third commitment period under the Kyoto Protocol). Moreover, in the absence of a third commitment period, permanent Kyoto units will no longer exist after the end of the true-up period of the second commitment period after 2023. After the end of that period, no units can be transacted within the Kyoto registry system. It may thus be technically impossible to compensate for any reversals after 2023. Furthermore, the requirements to replace units legally apply only to Annex B Parties to the Kyoto Protocol; so it is unclear how the requirement to replace expiring credits would be enforced in the context of CORSIA.[3]

In summary, while the CDM's approaches to addressing non-permanence are in principle conservative and appropriate, they are functionally insufficient due to a lack of subsequent commitment periods under the Kyoto Protocol. Effectively, permanence for these activities is no longer ensured. We therefore recommend that these project types be excluded from the scope of eligible units should the CDM be approved as an eligible program.

6. Avoiding double counting

The EUCs distinguish three forms of double counting that must be avoided: (1) double issuance of emissions units; (2) double use of emissions units; and (3) double claiming of the same emission reductions or removals by both the country in which the emission reductions or removals occur and an aeroplane operator using emission units under CORSIA.

None of the 14 program applications have procedures in place that effectively avoid all forms of double counting. Four of the applicants, jointly with three non-governmental organizations and the International Emissions Trading Authority (IETA), have developed the Guidelines on Avoiding Double Counting for CORSIA (ClimateWorks Foundation, Meridian Institute, & Stockholm Environment Institute, 2019). These Guidelines aim to help carbon-offsetting programs in implementing standards and procedures to avoid double counting for CORSIA. Some programs applications explicitly refer to these Guidelines and express the intent to incorporate the Guidelines into their standards and procedures. The Guidelines could also be a useful resource for other programs that intend to become eligible under CORSIA.

With regard to *double issuance*, most programs have procedures for avoiding that the same project be registered twice under the same program. However, several programs seem to lack procedures to avoid double issuance due to double registration of the same project with other programs. To avoid such double issuance, these programs should develop procedures to verify that registered

[3] Note that the CDM applies a different approach to ensuring the permanence of CCS projects, involving buffers for each project (i.e., CCS buffers are not "pooled"), combined with a state liability either by the acquiring country or the host country. Although this appears to be a conservative approach in general, it faces the same issues with regard to the operational ending of the Kyoto Protocol.

projects have not been issued offset credits in any other program for emission reductions, such as legal attestations from project owners which confirm that they have not and will not request issuance of offset credits for emission reductions or removals from more than one program. If a project is registered with more than one program, offset credits should be cancelled by one program before offset credits are issued by another program for the same emission reductions and removals. Double issuance can also occur indirectly, through overlapping claims by different entities involved in carbon offset projects, for example, if one program credits the production of biofuels, whereas another program credits the use of biofuels. With the exception of the Climate Action Reserve, none of the programs have procedures in place that fully avoid such overlapping claims, in particular with projects registered under other programs.

With regard to *double use*, most programs have, or plan to implement, registry systems that effectively prevent a unit from being duplicated and cancelled or retired twice. However, none of the programs currently have procedures in place that effectively avoid that a single unit cancellation could be claimed for more than one purpose. Programs should therefore develop cancellation procedures that ensure that a cancellation is clearly indicated, irreversible and unambiguously designated for a specific purpose. The registry functionalities of the program should require the registry user to specify the aeroplane operator for which the offset credits were cancelled and the calendar year for which an offsetting requirement is fulfilled through the cancellation in order to conduct a CORSIA-related cancellation (e.g. "XYZ Airlines, 2024 offsetting requirement, covering the 2021-2023 offsetting compliance period under CORSIA").

Double claiming is most challenging to address because it requires coordinated action among multiple actors: the host countries of emission reduction projects, the carbon-offsetting programs and the project owners. The EUC and the guidelines for interpretation envisage that programs obtain a letter from host countries in which the country commits to taking the necessary steps for avoiding double claiming. Most programs are not clear what information in host country attestations would be regarded as sufficient for the program to qualify offset credits as being CORSIA eligible. We recommend that host country letters not only identify the project and acknowledge the project but also explicitly authorize the use of the project's emission reductions or removals, issued as offset credits, by aeroplane operators in order to meet offsetting requirements under CORSIA and declare that the country will not use the project's emission reductions or removals to track progress towards, or for demonstrating achievement of, its NDC and will account for their use by aeroplane operators under CORSIA by applying relevant corresponding adjustments.

By approving programs, the TAB will implicitly also take decisions on important policy matters related to accounting for offset credits which are *not* explicitly addressed in the EUC and the guidelines for interpretation.

First, depending on the outcome of international negotiations on Article 6 of the Paris Agreement at COP25 in December 2019, the TAB will need to consider whether, and under what conditions, emission reductions that are not covered by NDCs should be eligible for CORSIA and, if yes, whether host countries will need to declare in their letters that they will apply adjustments. This matter cannot be resolved by carbon-offsetting programs and should ideally be addressed by the Parties to the Paris Agreement, including for offset credits used under CORSIA. In the absence of clear international rules under the Paris Agreement, however, this issue is a relevant matter for the process of approval of programs by ICAO. Effectively, by approving programs, ICAO would either approve the use of such emission reductions (if the program's procedures allow them to be qualified for use under CORSIA) or not approve them (if the program's procedures do *not* allow them to be qualified).

A second policy matter not addressed in the EUC is whether offset credits will be eligible if the host country does not participate in the Paris Agreement. Several applicant programs mainly issue emission reductions from projects in the United States which has announced its intention to withdraw from the Paris Agreement. None of the applicant programs provide information on whether they would issue and qualify credits for use under CORSIA if the host country does not participate in the Paris Agreement, or has not communicated an NDC, but nevertheless issues a letter authorizing the use of the emission reductions under CORSIA. In our view, ensuring that countries participate in the Paris Agreement and have an NDC is not only essential to satisfy the EUCs with regard to the requirement to account for offset credits, but also to avoid that CORSIA creates a perverse incentive for countries to withdraw from the Paris Agreement. Such perverse incentives could undermine global mitigation ambition beyond CORSIA. Lastly, qualifying offset credits from countries that currently do not participate in the Paris Agreement could also lead to double claiming if a country joined the agreement again at a later stage and crediting baselines extended into the period when the country has a new NDC. We recommend that all programs clarify as part of their procedures that offset credits issued for emission reductions after 2020 can only be qualified by a program as CORSIA eligible if the relevant country participates in the Paris Agreement and has communicated an NDC for the applicable NDC implementation period.

A third policy matter that is not explicitly addressed in the EUC is whether double counting needs to be avoided with international mitigation targets that countries agreed or communicated for the period up to 2020. The EUC do not refer to any specific agreements under the UNFCCC but generally to double counting with regard to ‘mitigation obligations’ and ‘mitigation efforts’. The programs take diverse approaches towards this matter. Some programs avoid double counting with Kyoto Protocol targets (e.g. by requiring cancellation of AAUs if offset credits are issued). Some programs also avoid double counting with Cancun targets communicated by Annex I countries (mostly by not allowing projects in these countries), while others ignore these targets. Some programs are not entirely clear. In our view, double claiming should be avoided with both Kyoto and Cancun targets. In the negotiations following the adoption of the Cancun targets, Parties agreed that “various approaches, including opportunities for using markets … must meet standards that … avoid double counting of effort” (decision 2/ CP.17, paragraph 79). Decision 1/CP.21, adopting the Paris Agreement, also refers to avoiding double counting in the context of action prior to 2020, urging “host and purchasing Parties to report transparently on internationally transferred mitigation outcomes, including outcomes used to meet international pledges, and emission units issued under the Kyoto Protocol with a view to promoting environmental integrity and avoiding double counting.” International decisions under the UNFCCC thus point to the need to avoid double counting. Moreover, the EUCs are not limited to NDCs but cover mitigation efforts or obligations more broadly. A related policy matter is whether double counting should also be avoided with countries’ targets under the Montreal Protocol, including its Kigali amendment, once these targets become binding. Programs crediting reductions in emissions of HFCs or ozone depleting substances would have to show that the reduction goes beyond the legally binding targets to reduce these emissions.

Most programs also lack technical procedures that are necessary to effectively avoid double claiming, including: to identify overlap with NDCs (in the case that no adjustments are needed for emission reductions not covered by NDCs); to determine in which calendar years emission reductions occurred; to determine the emission reductions in the GWP metrics that the host country uses; or to determine and track whether the country has applied the necessary corresponding adjustments. Moreover, none of the programs have procedures in place to “compensate for, replace, or otherwise reconcile double-claimed mitigation”, as referred to in the guidelines for interpretation of the EUC. We recommend that programs develop such procedures prior to their approval as CORSIA eligible programs.

Lastly, programs also differ on whether they avoid double claiming with mandatory domestic climate change mitigation targets. Some programs have explicit procedures to avoid such double counting, for example, requiring that emission reductions covered by an ETS can either not be issued as offset credits or that a respective amount of ETS allowances must be cancelled. Others do not at all address such forms of double claiming. We recommend that programs develop respective procedures prior to their approval as CORSIA eligible programs.

7. No net harm

No net harm can only credibly be ensured if the program requires that specific social and environmental safeguards must be satisfied and if it has procedures in place to publicly demonstrate compliance on an ongoing basis. Project proponents should be obligated to identify, mitigate, monitor and report on risks. In addition, the program should require the information and consultation of local stakeholders and have specific provisions for how to address concerns once raised.

Unfortunately, only two standards have a process in place which requires the assessment of risks, the adoption of safeguards and the monitoring and reporting on these risks. Only one standard foresees the cancellation of credits in case harm has occurred during a certain period. Almost half of the offset standards analyzed have no procedure in place and therefore fail to address this criterion. A few other programs enshrined the “no harm” principle in their templates for activity design documents and require an ex-ante risk assessment; however they do not have provisions for continuous monitoring or reporting of risks during the crediting period. One applicant is currently updating its rules and procedures with a view to strengthen stakeholder consultation requirements. Another applicant points out that it will strengthen requirements for projects seeking eligibility under CORSIA for their offset credits. However, as pointed out in the section on cross-cutting issues, final approval of the standard should not be given before the necessary procedures are in place.

8. Conclusions

The evaluation of the 14 applicants provided important insights which should inform the ongoing approval process under ICAO. First, the degree to which the applicants satisfy the EUC differs substantially. Some applicants hardly meet any of the EUC and may not even be considered carbon-offsetting programs. However, there are also notable differences on how applicants perform in relation to specific EUCs. For each EUC, there are good and bad examples. This is good and bad news: the good news is that the good examples demonstrate that it is possible to satisfy all of the EUC with solid procedures. The bad news is that none of the programs currently performs well against *all* of the five EUCs evaluated in this paper. The applicants could thus learn from each other, and adopt their peers’ best approaches, such that they satisfy all requirements.

A second important lesson is that all programs need to revise and amend their standards and procedures in order to satisfy the EUC. This, however, requires time, as revisions to project cycle procedures and key standards usually involve several drafts and stakeholder consultation. While airlines wish to have certainty on what carbon offset units will be eligible, we consider it essential that programs are only approved by ICAO once they have *adopted* the necessary standards and procedures to satisfy all EUCs. An approval based on "plans" to revise standards and procedures in the future could bear considerable risks for the integrity of the CORSIA. As long as offset credits are not yet eligible for use under CORSIA, ICAO may alternatively consider approving programs "provisionally", subject to changes that they need to implement and subject to a final assessment by ICAO of whether these changes have been implemented appropriately.

A third lesson is that the EUC and other ICAO documents are not explicit on a number of features that are important for the overall integrity of the scheme. This holds, for example, for the duration for which non-permanence should be ensured, which differs considerably among the applicants. Another example is the lack of clarity on which GWP values the programs should use when issuing CORSIA eligible offset credits. Similarly, it is unclear for how long programs will be approved and how it will be ensured that they continue to satisfy the EUC after their approval. ICAO thus needs to provide further clarity on these matters. We recommend specifically that the TAB develops a transparent and publicly available procedure for the initial approval, ongoing supervision, re-approval, suspension and termination of program eligibility for CORSIA.

Lastly, several issues interact with the ongoing negotiations on Article 6 of the Paris Agreement. The integrity of CORSIA and the program approval process under ICAO would be greatly facilitated if Parties managed to adopt international rules for Article 6 at the forthcoming climate change conference in December 2019 in Santiago and if these rules explicitly address the use of carbon offset credits under CORSIA. This could, for example, provide clarity on how emission reductions not covered by NDCs should be treated, what key elements are necessary for letters of attestation and authorization by host countries, what baseline setting procedures may be appropriate in the future in the light of NDCs, how additionality of activities can credibly be proven, and what actions should trigger the application of corresponding adjustments in order to account for the use of offset credits under CORSIA.

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Appendix: Comments submitted to ICAO

- Submission by Perspectives Climate Group
- Joint submission by Öko-Institut and Stockholm Environment Institute

TAB Public Comment Template Form

The public is invited to submit comments on the responses to the call for applications, including regarding their alignment with the emissions units criteria (EUC).

The public is requested to use this form to provide structured comments on the responses to the call for applications that were submitted for assessment by the TAB. Public comments regarding the information submitted may be published online, along with the commenter name and organization.

Commenter Name: Axel Michaelowa

Commenter Organization: Perspectives Climate Group

Generic comments on nature of applicants

Programme Name	Reference in Programme Application Form	Emissions Unit Criteria reference*	Comment
Forest Carbon Partnership Facility	All	All	The FCPF is a World Bank operated fund that supports forest programmes generating carbon certificates, but did not develop its own offset standard. It thus is not an eligible standard.
Myclimate	All	All	Myclimate is not an offset standard, but an offset developer applying different offset standards. It thus is not an eligible standard.
REDD.plus	All	All	REDD.plus is an initiative to provide support to REDD+ activities which lacks critical features of an offset standard. It may develop such features of an offset standard in the future but currently does not have them, and thus should not be eligible.

<u>Specific comments on EUC compliance of candidate programmes regarding additionality (3.1), realistic and credible baseline (3.2), absence of net harm (3.8)</u>

<u>Initial comment on additionality testing:</u>

We interpret the requirement of additionality to be that “eligible offset credit programs should clearly demonstrate that the program has procedures in place to assess/test for additionality and that those procedures provide a reasonable assurance that the emissions reductions or avoided emissions would not have occurred in the absence of the offset program”. There are different approaches used to test additionality that differ in the degree they provide the required assurance.

Investment tests proved to have worked well to determine additionality, with significant experience accumulated under the CDM, whereas barrier and common practice tests can be considered insufficient in many cases, if applied without an investment analysis. Recently, standardization of additionality assessment through benchmarks or positive lists gained ground for some technologies. However, any form of standardization of parameters needs to be either highly conservative or updated regularly (for instance every 3-5 years, but this should be determined on a technology-specific level) to account for technology developments within the respective regional or national circumstances in which the offset activities are being implemented. For instance, under the CDM, some positive lists got “sticky” (i.e. less conservative) over time and their non-revision led to the crediting of renewable energy projects, whose additionality became more questionable after costs for the deployment of renewable energy had fallen substantially.

In general, additionality testing, but also baseline calculation, is heavily influenced by the overall context of the international climate policy regime. This is particularly true for the issue of consideration of national mitigation policies, which used to be ignored during the Kyoto Protocol era, as non-Annex I Parties were not expected to make mandatory contributions to global climate action. Under the CDM, the so-called E+/E- rules were adopted to avoid a perverse incentive for host country governments not to develop mitigation policies in order to protect CER revenues. When assessing additionality and establishing baselines, policies that provide a comparative advantage to more emission-intensive technologies (E+) were only taken into account if their adoption predated the adoption of the Kyoto Protocol in 1997. Policies that provided a comparative advantage to less emission-intensive technologies (E-) were only taken into account if adopted prior to the adoption of the Marrakech Accords in 2001. The application of this rule, however, led to the registration of projects which would have been deemed non-additional if national policies such as national renewable energy feed-in-tariffs would have been taken into account, and was therefore subject to criticism.

As all countries are contributing NDCs to achieving the Paris Agreement objectives, all national policies and activities need to be taken into account when reinterpreting additionality. The precise rules for assessing additionality in the context of NDCs and related national policies and measures future are still subject to international negotiations. However, it is clear that the paradigm short from a bifurcated climate regime to one in which all countries make contributions through their NDCs will affect the international rules for the assessment of additionality. Therefore, this criterion is not assessed in the comment on the standards applications.

Initial comment on baselines:

In the assessment, the focus is on the methodology development process. Baseline development is considered credible if the baselines are approved following independent third-party assessment and accompanied by full public transparency regarding the assumptions and parameters used to establish baselines. All types of standardized baselines must be subject to regular updates in order to reflect developments in economic, technological or other circumstances in a global, regional or country-specific context.

Initial comment on absence of net harm:

No net harm can only credibly be ensured if the program publishes specific social and environmental safeguards and publicly demonstrates compliance. Project proponents should be obligated to identify, mitigate, monitor and report on risks. In addition, the program should ensure consultation of local stakeholders and information on specific provisions on how to address concerns once raised.

Programme Name	Reference in Programme Application Form	Emissions Unit Criteria reference*	Comment
American Carbon Registry	4.1	3.1	**Insufficient**: Applies either benchmarks or barrier tests, after additionality to current regulation is checked. Evidence for positive lists is provided. Investment test is not used. Common practice and barrier tests are generally not sufficient to test additionality, but might be sufficient for certain ACR project types.
British Columbia Offset Program	4.1	3.1	**Sufficient**: Applies investment analysis and a regulatory test. No positive lists are used, so they do not need to be updated or justified. However, they do not reply to the question how the procedures provide a reasonable assurance that mitigation would not have occurred in the absence of the programme.
China GHG Voluntary Emission Reduction Program	4.1	3.1	**Sufficient**: Applies investment analysis as per the CDM rules. There are provisions in place to address over-issuance.
Climate Action Reserve	4.1	3.1	**Insufficient**: Standardized additionality testing based on benchmarks and positive lists, but no investment analysis. The program manual (currently under revision) specifies that the performance standard test should also assess financial returns and implementation barriers of certain project types, there is no project-specific analysis undertaken. The program manual explains that “most reserve protocols” do contain an appendix explaining the analysis undertaken to establish the standard, partially also including an assessment of “typical” financial conditions. No regular revision of these performance standards is foreseen, even if the Reserve “may” review and update standards and baselines where it considers needed.

Clean Development Mechanism	4.1	3.1	**Sufficient for large scale activities, partially insufficient for small-scale / micro-scale activities:** Applies highly elaborated additionality tests developed over a period of more than a decade. Principally, the investment analysis, if applied in a conservative manner, will weed out non-additional projects. However, depending on the activity size and type positive lists have been applied recently, which have not been sufficiently updated over time. For example, micro-scale solar PV activities are generally deemed additional which may be inconsistent in some circumstances in light of recent massive cost decreases of solar PV.
Global Carbon Trust	4.1	3.1	**Insufficient**: Refers to tests used by Verra, CAR, CDM, allows both positive lists and benchmarks. Whether an investment analysis is always applied is unclear: first, the application of CDM methodologies is presented as the main approach to additionality testing, yet, then the application states that VCS, CAR and GS methodologies can also be used. It uses CDM positive lists for small-scale and micro scale activities (for critique on this approach, see comment to CDM). Of concern is the fact that GCT is currently developing project-specific simplified methodologies, however, the supporting documents used for analysis of technologies/fuels/feedstocks that lead to the positive lists are referred to as internal - documents that are not publicly accessible.
Gold Standard	4.1	3.1	**Sufficient, except “simplified approaches”, partially insufficient for small-scale / micro-scale activities (as it applies CDM methodologies, see above)**: Essentially applies additionality tests from the CDM but does allow further additionality tests.
Nori	4.1	3.1	**Insufficient**: Only uses barrier test.
Thailand Greenhouse Gas Management Organization	4.1	3.1	**Grossly insufficient**: Small projects are automatically deemed additional without any explanation or justification for this. Simple payback period threshold of 3 years for large scale projects is not conservative, as this is not in line with standard commercial investment decision and commercial interest rates for project finance in Thailand.
State Forests of the Republic of Poland	4.1	3.1	**Grossly insufficient**: Neither application nor publicly available documents provide evidence of additionality testing.

Verra/VCS	4.1	3.1	**Insufficient**: For renewable energy and energy efficiency projects either performance benchmarks or positive lists are used (see: VCS standard, sections 3.14 and 4.1, http://verra.org/wp-content/uploads/2018/03/VCS_Standard_v3.7.pdf). Benchmarks cannot convincingly prove additionality of a given activity, especially in heterogeneous sectors. Positive lists under Verra are less conservative than under the CDM. For forestry projects, a combination of an investment test with common practice and barrier analysis is undertaken which is robust (therefore partially sufficient).
American Carbon Registry	4.2	3.2	**Sufficient**: While CDM approved methodologies are accepted, ACR also develops its own methodologies, which are assessed through a peer review process involving public comments and dedicated reviewers. Documentation (see https://americancarbonregistry.org/carbon-accounting/standards-methodologies) is excellent. Performance standards for additionality assessments are regularly reviewed; other methodologies and tools are reviewed in case of "significant changes" in context, data availability or need for clarification
British Columbia Offset Program	4.2	3.2	**Insufficient**: Application document does not describe baseline methodology development procedure. Official information of the BC programme at https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/offset-projects does not specify the baseline methodology procedure applied. Baseline methodology for fuel switch (only methodology approved to date, https://www2.gov.bc.ca/assets/gov/environment/climate-change/ind/protocol/bc_fuel_switch_protocol_2019.pdf) is purely based on barrier analysis for baseline scenario selection. The submission also does not address the questions on baseline revision and baseline over-estimation.

China GHG Voluntary Emission Reduction Program	4.2	3.2	**Partially insufficient:** Applies approved CDM methodologies, and further methodologies which have been approved through a domestic procedure. Baseline review process is in place, but as methodologies and procedure are purely available in Chinese language, the conservativeness of the methodologies could not be checked. In order to be eligible, the program would have to translate both methodologies and procedures in English and make these translations publicly available.
Climate Action Reserve	4.2	3.2	**Sufficient**: Develops its own, detailed methodologies through a well-documented process, including peer review and public comments (https://www.climateactionreserve.org/how/protocols/) Baselines are reviewed at the end of the crediting period.
Clean Development Mechanism	4.2	3.2	**Sufficient**: Highly regulated baseline and monitoring methodology development process overseen by Meth Panel / Small Scale Panel. Over 200 technology-specific methodologies have been approved, and many of them have been significantly improved over the years as experience with their use has accumulated. The conservativeness of methodologies has generally increased through this regulatory process. Transparency is high.
Global Carbon Trust	4.2	3.2	**Insufficient**: Refers to Climate Action Reserve, CDM, Gold Standard and Verified Carbon Standard baseline methodologies all being eligible. Baseline revision is required. No baseline methodology development process has been clearly defined, so it is not possible to evaluate this. The baseline guidance document (https://gct.qa/Admin/Content/Baseline-and-Monitoring-Methodologies25112018893.pdf) is superficial and does not guarantee conservativeness.

Gold Standard	4.2	3.2	**Partially insufficient**: A detailed and transparent peer review process is undertaken and baseline revisions are addressed. However, methodologies from "credible" standards go through a simplified "fast track procedure". These credible standards are not properly defined, but cited are CDM, Verra, CAR, ACR and others. This means that any comments given here on one of these standards re baseline methodologies applies here as well. . More recent methodologies for unconventional project types tend to be less conservative than the "older" ones. For example, Gold Standard cookstove methodologies allow to gain about twice as many credits than if one would use the respective CDM methodology. Gold Standard forestry methodologies lack an uncertainty assessment.
Nori	4.2	3.2	**Insufficient**: The croplands sequestration methodology refers mainly to a third-party model and does not address the critical questions of conservativeness. The methodology development and peer review process is not clear.
Thailand Greenhouse Gas Management Organization	4.2	3.2	**Grossly Insufficient**: Baseline methodologies are extremely short and not available in English (http://ghgreduction.tgo.or.th/tver-method/tver-methodology-for-voluntary-greenhouse-gas-reduction/ee.html). No evidence is provided in response to the questions on baselines in the submission. The baseline methodology development process is unclear. There are also insufficient requirements for baseline revision. In order to assess the methodologies, they as well as the process documents need to be available in English.
State Forests of the Republic of Poland	4.2	3.2	**Grossly insufficient**: No proper baseline methodology is applied; the baseline is administratively set from politically determined forest management plans.

Verra/VCS	4.2	3.2	**Partially insufficient**: VCS accepts CDM and CAR methodologies but also develops new methodologies involving public consultations and two reviews by external validation/verification bodies. Baseline revision is addressed for both normal projects and REDD projects. Methodology scope is very broad and some of the more recent methodologies for unusual project types have been subject of public criticism for not being conservative, e.g. the tidal wetland and seagrass methodology (Johannessen S C, Macdonald RW (2016): Geoengineering with seagrasses: is credit due where credit is given? Environ Res.Lett. 11 113001). A positive feature of VCS methodologies is that they consistently account for uncertainties.
American Carbon Registry	4.8	3.8	**Partially insufficient**: No net harm principle anchored in procedures, albeit no specific procedure for MRV of non-GHG impacts/safeguards of activities. While project proponents must identify community and environmental impacts of their projects and describe safeguards put in place, ACR does not require a particular process or tool if basic requirements are addressed. However, project proponents must publicly disclose any comments received from stakeholders during development, construction, operation and/or maintenance of the project and prove that these issues were addressed.
British Columbia Offset Program	4.8	3.8	**Insufficient**: No specific “no net harm” procedure; section 14 of GGECR is generic and does not relate to MRV of non-GHG impacts/safeguards of activities.
China GHG Voluntary Emission Reduction Program	4.8	3.8	**Grossly insufficient**: No specific “no net harm” procedure; only reference to general EIA, as well as no MRV of safeguards or “no net harm” .
Climate Action Reserve	4.8	3.8	**Sufficient**: Detailed “no net harm” guidance and MRV of actual “no net harm” and safeguards, resulting in cancellation of credits if harm has occurred during a certain period.
Clean Development Mechanism	4.8	3.8	**Grossly insufficient**: No specific “no net harm” procedure and no procedure for MRV of safeguards or “no net harm”.

Global Carbon Trust	4.8	3.8	**Partially insufficient**: No net harm principle anchored in procedures. For the projects supplying CORSIA the voluntary environment and social safeguards standard with risk assessment and monitoring of impacts will be made mandatory.
Gold Standard	4.8	3.8	**Sufficient**: While strong stakeholder consultation procedures make it likely that harm can be avoided, there is no specific “no net harm” rule applied by the Gold Standard. However, the approach employed by the Gold Standard is consistent with the TAB definition on no net harm. Environmental or social risks must be assessed, safeguards put in place where necessary and monitored and reported.
Nori	4.8	3.8	**Grossly insufficient**: No specific “no net harm” procedure and no procedure for MRV of non-GHG impacts of activities. Only general reference to compliance with all legal requirements
Thailand Greenhouse Gas Management Organization	4.8	3.8	**Grossly insufficient**: No specific “no net harm” procedure; only reference to general EIA.
State Forests of the Republic of Poland	4.8	3.8	**Grossly insufficient**: No specific “no net harm” procedure
Verra/VCS	4.8	3.8	**Partially insufficient**: Verra enshrines the principle of no net harm and requires identification and mitigation of potential risks. However, continued monitoring of non-GHG impacts are only mandatory under the additional CCBS and the standard SDVISta and not under the VCS. Currently, Verra is proposing to update VCS rules to strengthen stakeholder consultation requirements. This would inter alia include a risk, cost and benefit analysis for local stakeholders and the development of a grievance and redress process.

TAB Public Comment Template Form

The public is invited to submit comments on the responses to the call for applications, including regarding their alignment with the emissions units criteria (EUC).

The public is requested to use this form to provide structured comments on the responses to the call for applications that were submitted for assessment by the TAB. Public comments regarding the information submitted may be published online, along with the commenter name and organization.

Commenter Name: Lambert Schneider (Oeko-Institut), Anne Simons (Oeko-Institut), Derik Broekhoff (Stockholm Environment Institute)

Commenter Organization: Oeko-Institut / Stockholm Environment Institute

Note: The following abbreviations are used for programs:

- American Carbon Registry (ACR)
- British Columbia Offset Program (BCOP)
- China GHG Voluntary Emission Reduction Program (CCER)
- Clean Development Mechanism (CDM)
- Climate Action Reserve (CAR)
- Forest Carbon Partnership Facility (FCPF)
- Global Carbon Trust (GCT)
- Gold Standard (GS)
- myclimate (myclimate)
- Nori (Nori)
- REDD.plus (REDD.plus)
- Thailand Greenhouse Gas Management Organization (TGO)
- The State Forests of the Republic of Poland (SFP)
- VCS Program managed by Verra (VCS)

Some comments provided below apply equally to several programs. In this case, the relevant programs are listed in the first column of the table. For simplicity, in such cases no separate comments are provided on each program.

The comments provided in this document are partially based on the Guidelines on Avoiding Double Counting for CORSIA which were developed by a multi-stakeholder working group (www.adc-wg.org), consisting of carbon-offsetting programs, non-governmental organizations and the International Emissions Trading Association (IETA). The Guidelines aim to help carbon-offsetting programs in implementing standards and procedures to avoid double counting for CORSIA. All four working group members (ACR, CAR, GS and VCS) have also applied to become CORSIA eligible programs. Three out of these four programs (ACR, CAR, GS) explicitly refer to these Guidelines; the VCS does not refer to them but informed the authors that it intends to apply the Guidelines as well. In their applications, not all of the programs are clear whether they intend to apply the Guidelines in its entirety. It would be helpful if this is clarified, and we therefore provide a comment in this regard. In commenting below, however, we assume that all four programs (ACR, CAR, GS and VCS) will implement and incorporate the Guidelines in their standards and procedures in their entirety.

Please also note that our evaluation of the programs raised some broader governance questions in relation to CORSIA. We understand that the main purpose of this public consultation is seeking feedback on the program applications. However, it is difficult to evaluate the programs if some broader governance questions have not been clarified. We therefore also provide a few broader comments in the first section of the document that do not relate to specific programs, but the process of program evaluation and approval.

Finally, please note that two of the individuals providing comments here have affiliations with some of the programs under consideration. Lambert Schneider (Oeko-Institute) is as a member of the CDM Executive Board and also serves on the VCS Program Advisory Group (part of Verra). Derik Broekhoff (SEI) was formerly the Vice President for Policy at the Climate Action Reserve (CAR). Within this document, SEI takes sole responsibility for comments specifically referencing the CDM and VCS/Verra, while Oeko-Institute is solely responsible for comments specifically referencing CAR.

Programme Name	Reference in Programme Application Form	Emissions Unit Criteria reference*	Comment
Cross-cutting comments on the application process (not specific to any program)			
Cross-cutting issue (not specific to any program)	Cross-cutting issue / All section	Cross-cutting issue / All aspects	**Timing of approving programs as CORSIA eligible.** None of the programs have standards and procedures in place that address all EUCs. This holds in particular for the avoidance of double counting in the new context of CORSIA and the Paris Agreement. This is clear given the timing of the adoption of the EUCs by the ICAO Council, just

			recently in February 2019, and the new context of CORSIA and the Paris Agreement. Many programs specify that they will address these issues in the future. However, the applications are not always clear how these issues will be addressed. Moreover, we believe that "plans" should not be the basis for an ultimate approval of a program by ICAO. For example, if a program announced in its application that it will incorporate in its procedures a requirement to obtain a host country attestation, but later – after approval by ICAO – does not include such a requirement, the use of offset credits from the program could seriously undermine the integrity of CORSIA. Plans may also change, for very good reasons, as often new issues are identified when developing the actual revisions of relevant program documents. For these reasons, we believe it is essential that programs are only approved by the ICAO Council as CORSIA eligible after they have adopted all necessary amendments to their standards, procedures, guidelines, forms and program operations, and only after these amendments have been assessed by the TAB. We recognize that this raises some timing issues, as amendments to standards and procedures that specifically target CORSIA should only become effective once the program is CORSIA eligible. A possible approach to address this issue could be that programs adopt any necessary amendments to their standards and procedures before the final assessment by the TAB and approval by the ICAO Council, but confirm the date of their effectiveness or entry into force only following a final decision by the ICAO Council on the eligibility of the program. It is common practice with carbon offsetting programs that revisions to program documents only enter into force at a future date.

Cross-cutting issue (not specific to any program)	Cross-cutting issue / All section	Cross-cutting issue / All aspects	**Duration of approval and treatment of future revisions of program documents.** There is no information available for how long programs will be approved as CORSIA eligible and how any future revisions to program requirements will be handled. For example, after initial approval, a program could adopt revisions to its requirements and may, due to these revisions, no longer satisfy the EUCs. To address these challenges, we recommend that programs are approved for a limited duration and are re-assessed by the TAB and re-approved by the ICAO Council prior to the end of the first eligibility period. Furthermore, we recommend establishing a procedure to address future revisions to program requirements. This procedure needs to be simple - as programs frequently amend their requirements - but at the same time sufficient to address the risk that revisions do not undermine the ability of the program to fulfil the EUCs. Possibly, programs could be required to annually notify the TAB about changes implemented in the last year and how these ensure that the EUCs are still met. The TAB could take note of this, or seek further information, or if it concludes that the program no longer meets the EUCs, request the program to implement changes, or otherwise suspend or terminate the eligibility of the program. We recommend that the TAB develops a clear and transparent procedure for the initial establishment of program eligibility, the subsequent continuous surveillance of the program in relation to its performance against the EUCs, as well as procedures for suspension or termination of program eligibility. This procedure should be publicly available and public comments should be invited to the procedures prior to its final adoption.
Cross-cutting issue (not specific	Cross-cutting issue / All section	Cross-cutting issue / All aspects	**Lack of sufficient information to inform public comments.** For some programs, it is not clear how they plan to fulfil the EUCs, in particular

to any program)			with regard to avoiding double counting. Some programs do not include any substantive information on how they plan to meet a criterion, other programs include some information, but with the available information it is not possible to assess whether the criterion will be satisfied. It seems obvious that further information needs to be provided by the programs. We call on the TAB to make publicly available any further information provided by the applicants in the course of the application process. Given that for many programs the current information is not sufficient to provide substantive comments, we also recommend that a second call for public comments be launched. It may be most effective to schedule this second call for public inputs for each applicant separately, and to launch the call once the program has prepared a draft amendment to its standards and procedures in order to satisfy the EUCs. This would constitute a meaningful basis for providing public comments.
Cross-cutting issue (not specific to any program)	Cross-cutting issue / All section	Cross-cutting issue / All aspects	**Lack of guidance on values for global warming potentials (GWPs).** ICAO has not established a requirement regarding which GWP values programs should use to convert non-CO_2 emission reductions/removals into CO_2 equivalents. The CORSIA State Letter refers to GWPs only in the context of life cycle assessments for sustainable fuels. In this context, the 100-year values from the 5th IPCC assessment report should be used, but there is no clear guidance whether the same values should be used by carbon-offsetting programs. If different programs use different sets of GWP values under CORSIA, this could have at least two adverse impacts. First, this could create a risk that project owners pick the program which results in higher CO_2 equivalents of emission reductions, depending on which gases are

			abated. In aggregate, this could lead to higher emission reduction claims compared to a situation where all programs use the same GWP values. Second, as the same emission reduction would have a different value under different programs, this could distort the market. The Guidelines on Avoiding Double Counting for CORSIA therefore recommend that all CORSIA eligible programs use the same GWP values, taking into account relevant decisions under the UNFCCC. We recommend that the ICAO clarifies which GWP values programs should use for which relevant time periods (up to 31 December 2020 and as of 1 January 2021). Following relevant decisions under the Kyoto Protocol and the Paris Agreement, as well as the Guidelines on Avoiding Double Counting for CORSIA, we recommend that the following GWP values be used by all programs that intend to become CORSIA eligible: 1. The 100-year time-horizon values from the 4th assessment report of the Intergovernmental Panel on Climate Change (IPCC) for emission reductions or removals that occur before 1 January 2021 (if such emission reductions are deemed eligible in accordance with relevant decisions on vintage and timeframe); 2. The 100-year time-horizon values from the 5th assessment report of the IPCC for emission reductions or removals that occur on or after 1 January 2021 or, if applicable, any other common GWP values adopted for future periods in relevant decisions by the CMA.
General comments to program applications (applicable to all sections of the application form)			
myclimate	All sections	All paragraphs	**Myclimate is a project developer rather than a carbon-offsetting program.** We note that myclimate is an entity that develops climate mitigation projects and draws upon other programs for registering projects and issuing offset credits. Myclimate does not have its own

			procedures and standards for registering projects and issuing offset credits. The application mainly refers to relevant programs that myclimate uses. As such, we do not deem myclimate to be a program that is eligible for application and do not further comment on this application. Please also note that not all programs referred to by myclimate have applied to become eligible programs in this first call by the TAB.
REDD.plus	All sections	All paragraphs	**REDD.plus seems to be a registry and trading platform rather than a carbon-offsetting program.** We similarly note that REDD.plus appears to maintain a registry (operated by IHS Markit) in conjunction with a trading platform intended to facilitate trading of UN-certified REDD+ credits (which, however, do not yet exist). It does not have its own procedures and standards for registering projects (or jurisdictional REDD+ programmes) and issuing offset credits. The application mainly refers to sections of international agreements providing guidelines and safeguards related to REDD+ efforts, which currently do *not* address offsetting or emissions trading requirements (e.g., as would be applied under Article 6 of the Paris Agreement). We therefore do not deem REDD.plus to be a carbon offsetting program eligible for application, and do not further comment on this application. We also not that the website of REDD.plus only includes one link to "contact" information and further information about this entity is lacking. The website also provides wrong information about the Warsaw Framework by referring to "UN approved, REDD+ carbon credits". Such credits do not exist.
SFP	All sections	All paragraphs	**The State Forests of the Republic of Poland (SFP) does not seem to be a carbon-offsetting program.** We similarly note that SFP also does not have any procedures and standards for registering activities and

			issuance of offset credits and does not operate a registry. We therefore deem that this initiative is also not a carbon-offsetting program and do not further comment on this application, except in specific circumstances that only apply to SFP.
BC, CCER, CDM, FCPF, GCT, Nori, TGO	All sections	All aspects	**Lack of a procedure to qualify offset credits for use under CORSIA.** Offset credits issued by the programs are often used for multiple purposes. In some instances, these different uses may involve different requirements. Not all offset credits issued by a program may satisfy all CORSIA requirements (e.g. because meeting such requirements is not necessary for their use outside of CORSIA). Some programs also applied with a limited scope and exclude certain activities. Some programs have already issued offset credits that do not satisfy CORSIA requirements. Some programs are not fully clear in their application whether they intend to issue offset credits that do not satisfy CORSIA requirements. In all these cases, offset credits for which all CORSIA requirements have been met should be clearly identified as such. All programs listed here do not explain how they will distinguish units that satisfy all CORSIA requirements from those that do not satisfy CORSIA requirements. Some other programs have explicit procedures for this. The GS, for example, explains in its application that it will introduce a procedure "to allow interested project owners or offset credit holders to make a formal request to Gold Standard to request that offset credits be qualified for meeting offsetting requirements under the CORSIA". To address this issue, we recommend that programs that intend to issue, or have already issued, offset credits for which not all EUCs and other relevant decisions under ICAO (such as on the eligible vintage and timeframe of offset credits) are initially satisfied establish a

			procedure under which project owners or offset credit holders can request that offset credits be qualified for meeting offsetting requirements under the CORSIA. This procedure should clearly specify which substantive requirements must be satisfied for offset credits to be qualified. Programs could establish certain minimum requirements that all projects have to satisfy in order to be issued offset credits, and additional requirements that must be satisfied in order for offset credits to be qualified by the program for use under CORSIA. The requirements arising from the CORSIA Eligible Emissions Unit Criteria could partially belong to the minimum requirements applicable to all offsets issued by the program and partially to the specific additional requirements needed to qualify an offset credit for use under CORSIA. The procedure should ensure that offset credits are not qualified by a program for use under CORSIA unless all CORSIA-related program requirements have been satisfied. The fulfilment of program requirements should be demonstrated through appropriate supporting documentation that is made publicly available. See further guidance in section II.8 of the Guidelines on Avoiding Double Counting for CORSIA.
Comments relating to addressing non-permanence			
ACR, BC, CAR, FCPF, GS, Nori, VCS	Section 4.5	All paragraphs	**Use of buffer reserves to address permanence.** Because offset credits will be used to compensate for emissions that will effectively raise atmospheric concentrations of CO_2 for many thousands of years, they should be associated with emission *reductions* that are similarly permanent. If an emission reduction or removal is "reversed" (e.g., subsequently emitted so that no net reduction occurs), then it can no longer function as an offset. The CORSIA EUCs imply that offsetting emission reductions must be truly permanent: *"Carbon offset credits must represent emissions reductions, avoidance, or carbon sequestration that are permanent."*

			Several of the programs that submitted applications use different versions of a pooled "buffer reserve" approach to address the risk of reversals. Under this approach, offset credits are set aside from individual projects into a common buffer reserve, which can be drawn upon to cover reversals from any project. Programs adopting this approach include ACR, BC, CAR, FCPF, GS, and VCS. Nori applies a limited form of project-specific buffering. The CDM addresses permanence through temporary (expiring) credits (though it does not detail this approach in its application). The remaining applicants do not indicate any specific requirements or provisions related to maintaining permanence. Although buffer reserves are a common mechanism for addressing permanence, they have some potential shortcomings: 1. They only guarantee permanence for a limited time period 2. They are not sufficient to address the risk of intentional, human-caused reversals 3. They must be sufficiently "capitalized" to cover reversal risks over time Each of these points is addressed in more detailed comments below, indicating specific programs for which these issues may be a particular concern.
ACR, FCPF, GS, Nori, VCS	Section 4.5	All paragraphs	**Insufficient length of permanence guarantees.** No risk can be insured against in perpetuity, including reversal risks (over the very long run, the chance of reversal for any given project approaches 100%). Programs adopting buffer reserves are therefore implicitly or explicitly transferring an obligation to maintain carbon storage (or compensate for reversals) to future decisionmakers (Murray et al. 2012). From a policy standpoint, the question is what sort of

			minimum guarantee is sufficient to deem an emission reduction "permanent." As a convention, international policymakers have adopted 100 years as a standard benchmark for evaluating the climate impacts of mitigation actions (Fearnside 2002). This is the basis, for example, for using 100-year global warming potentials (GWPs) to convert quantities of non-CO_2 emissions into CO_2-equivalent emissions. The same benchmark should be used for evaluating the "permanence" of carbon offsets used by the aviation industry. However, only two of the programs that submitted applications – BC and CAR – provide a minimum guarantee of compensating for reversals for 100 years or more. Other programs guarantee permanence for shorter periods of time (sometimes far shorter), have shorter monitoring periods, and/or are vague about their guarantees. Specifically: · ACR ensures compensation for reversals only through the end of a project's lifetime, which may be as low as 40 years (the "Minimum Project Term"). For geologic sequestration projects, a "Risk Mitigation Covenant" helps ensure against post-project reversals. However, there does not appear to be a similar covenant required for AFOLU projects. · The FCPF implements buffer reserves specific to each of the jurisdictional REDD+ programs it funds, as well as a pooled buffer to cover catastrophic reversals risks. The terms of FCPF emission-reduction purchase agreements (ERPAs), however, provide for compensation of reversals only during a REDD+ program's first crediting period. These are typically 4+ years, but in no case will go beyond the lifetime of the FCPF Carbon Fund (currently expected to be through 2025). Funded REDD+ programs are required to have a "robust Reversal management mechanism" in place that addresses "the risk of Reversals after the term of the

			ERPA." However, the FCFP offers few details on what such mechanisms could or should look like. This presents significant uncertainties about how permanence will be maintained after 2025, including – for example - whether the FCPF's program-specific and pooled buffer reserves will be maintained. · As noted above, Nori only compensates for reversals (in a limited fashion) for a period of 10 years after a project's last crediting period. · The Gold Standard does not indicate for how long monitoring and compensation for reversals must be carried out. According to program documentation, A/R projects have a minimum crediting period of 30 years and a maximum of 50 years. Although buffer reserve credits are not returned to projects at the end of a project, the Gold Standard provides no estimate of how long permanence can be ensured past the end of a project's crediting period. Unlike the BC Offset Program and CAR, there do not appear to be requirements for ongoing (post-crediting period) monitoring and compensation. · The VCS requires active monitoring and compensation for reversals only through the end of a project's final crediting period; AFOLU projects may have lifetimes as short as 20 years. Although VCS buffer reserves may offer some insurance against reversals after a project terminates, no evidence is provided for how long this compensation could last, or how it would operate without ongoing monitoring. **We recommend that programs are only approved as CORSIA-eligible if their procedures and standards ensure permanence for 100 years or more. This includes that monitoring of any reversals should continue throughout this period and that appropriate mechanisms are in place to compensate for potential reversal if monitoring is no**

			longer conducted.
Nori, VCS	Section 4.5	Paragraph 3.5.5	**Failure to sufficiently address risk of intentional reversals.** Buffer reserves can be effective at compensating for reversals due to natural disturbance risks, such as fire, disease, or drought affecting forests and soils. They can present a "moral hazard" problem, however, if used to compensate for human-caused reversals, such as intentional harvesting. If a landowner faces no penalty for harvesting trees for their timber value, for example – because any reversals caused by harvesting would be compensated out of a buffer reserve – then the landowner could face a strong incentive to harvest. Such perverse incentives can make a buffer reserve approach unviable, unless programs use alternative mechanisms or penalties to cover "intentional" or "avoidable" reversals. At least two of the applying programs – Nori and VCS – either do not explicitly address this distinction, or apply approaches that are insufficient to address the "moral hazard" problem: · Nori fails to apply any direct liability for reversals and therefore creates a moral hazard for suppliers. In theory, a supplier could decide to receive credits for a period of time, then allow their land to be developed in a way that releases all credited carbon. The supplier would face no penalty for this. Although Nori maintains an "insurance reserve pool" of tokens with which it could compensate for such intentional reversals (noted in its online materials), it fails to address the moral hazard created by not imposing any liability on suppliers or buyers. · The VCS covers "non-catastrophic" reversals (e.g., due to poor management or over-harvesting) out of its buffer reserve, but will not issue further offset credits to a project until the reversal is remedied. This is similar to Nori's approach, and provides some

			disincentive against intentional reversals. However, by not imposing any immediate liability, project developers may still abandon projects without further consequence. If project monitoring ceases, the VCS commits to compensating for all VCUs issued to a project from its buffer reserve – in principle allowing intentional reversals to be fully covered.* If early cessation of projects becomes widespread, however, this commitment could lead to failure of the VCS buffer reserve. **We recommend that programs are only approved as CORSIA eligible if they have procedures in place to address the "moral hazard" risk, as otherwise there is a significant risk that buffer reserves may not be sufficient to compensate for non-permanence.** * VCS AFOLU projects are also required to "put in place management systems to ensure the carbon against which VCUs are issued is not lost during a final cut with no subsequent replanting or regeneration."
ACR, BC , CAR, FCPF, GS, Nori, VCS	Section 4.5	Paragraph 3.5.7	**Uncertain sufficiency of buffer reserves.** As with any kind of insurance, buffer reserves can only be effective at guaranteeing permanence if they are sufficiently "capitalized" to cover reversal risks over time. Only two of the applicants – ACR and GS – provide explicit quantitative information indicating that their buffer reserves are sufficiently large to cover possible reversal events, including catastrophic losses across multiple projects. Given the potential volume of demand for carbon offsets that may arise under CORSIA, it will be important to ensure that the buffer reserves of approved programs are robust. **We recommend that rigorous stress testing of the applicants' buffer reserves be conducted prior to approval by ICAO, and that such**

			stress testing be conducted on a regular basis as CORSIA progresses. Stress testing should demonstrate that buffer reserves are sufficient to cover potential catastrophic events, taking into account the geographical locations of projects.
GCT, SFP	Section 4.5	All paragraphs	**Lack of provisions to address permanence.** These two programs include activities with non-permanence risks in their application scope but do not appear to have provisions in place to address permanence or reversal risk. · GCT refers only to permanence-related "applicability conditions" in "planned" methodologies for afforestation/reforestation (A/R) projects, and has not yet decided how reversal risk will be addressed for CCS projects. GCT indicates that it will follow CDM methodologies for permanence in A/R projects, but with shorter crediting periods; however, the CDM applies a "temporary crediting" approach to permanence that does not seem to be acknowledged here. Finally, GCT suggests that it has not yet registered any projects with reversal risks, so lack of clear policies should not (yet) be an issue. We recommend that for GCT to be approved, it should explicitly remove from its scope of eligible activities project activities that are subject to reversal risk. · SFP's application seems to imply that because forests in Poland are a net sink for carbon, reversal risks do not apply. This is incorrect. Nevertheless, the applications refers to a "reserve" that could be used to compensate for reversals, but provides no details. The program does not seem to meet minimum criteria for fulfilling this EUC.
Nori	Section 4.5	All paragraphs	**Approach does not ensure permanence.** Nori describes a unique approach to addressing permanence that, while innovative, does not appear to meet minimum requirements for meeting this EUC.

			In essence, Nori describes a forward-crediting approach, where total credits are gradually disbursed to projects ("suppliers") over time and total disbursements are trued-up based on an audit at 10 years, and then based on regular reporting (not audited) for 10 years thereafter. In principle, this monitoring and true-up process reduces the risk of over-crediting, including over-crediting as a result of reversals, but: · Monitoring and true-up only extends for 10 years past the end of a project's final crediting period. This is far less than the 100-year guarantee provided by other programs, which should be the benchmark for claiming "permanence." · Nori notes that suppliers can extend the duration of carbon storage by re-enrolling their projects and adopting a new baseline. However, there is no requirement for projects to re-enroll, and there appears to be no enforcement of the new baseline (the application states explicitly that new baselines are a "theoretical assumption" and will be published "for general information purposes only.") · As a result, there is no requirement for either suppliers or buyers to replace already-issued credits for which there are reversals (which could happen, for example, if carbon stocks fall *below* baseline levels). Liability is therefore not assigned (Paragraph 3.5.5 (a)) – and the checkbox for this requirement is left unchecked. Although Nori maintains an "insurance reserve pool" of tokens with which it could compensate for such reversals (noted above), it fails to address the moral hazard created by not imposing any liability on suppliers or buyers – nor is it clear that the "virtual" supply of tokens in Nori's reserve pool could be used to secure a sufficient number of CRCs, which would depend on market availability.
CDM	Section 4.5	All paragraphs	**Use of temporary crediting.** Although not detailed in its application,

			it should be noted that, for afforestation/reforestation (A/R) projects, the CDM's approach to ensuring permanence differs markedly from other offset programs. Specifically, the CDM applies a "temporary crediting" approach, where offset credits expire after a predefined period and must be replaced with other units issued under the Kyoto Protocol (this holds for both tCERs and lCERs). In clearly defined instances – the end of a commitment period under the Kyoto Protocol for tCERs, or a non-permanence event or non-submission of a monitoring report for lCERs, the credits must be replaced. tCERs may be reissued for subsequent commitment periods.. At the end of a project's final crediting period, however, no more credits may be issued and all credits must be replaced with permanent Kyoto units, regardless of whether a reversal occurred or not. This approach ostensibly guarantees permanence by ensuring that all offset credits associated with potentially non-permanent reductions or removals are replaced with units representing permanent reductions – even if no reversals occur during a project's crediting period. This is arguably a stronger guarantee than that provided by buffer reserves. There are several challenges with the CDM's approach, however. First, it was developed in the context of the Kyoto Protocol, and specific requirements are linked to elements of the Kyoto regime. For a certain subset of temporary credits, for example, expiry is linked to the end of the next Kyoto Protocol commitment period, which has yet to be defined (and likely will not be defined, as countries to the UNFCCC do not intend to adopt a third commitment period under the Kyoto Protocol). Moreover, in the absence of a third commitment period, permanent Kyoto units will no longer exist after the end of the true-up period of the second commitment period after 2023. After the end of that period, no units can be transacted within the Kyoto registry system. It may thus be technically impossible to

			compensate for any reversals after 2023. Furthermore, the requirements to replace units legally apply only to Annex B Parties to the Kyoto Protocol; it is unclear how the requirement to replace expiring credits would be enforced in the context of CORSIA. Note that the CDM applies a different approach to ensuring the permanence of CCS projects, involving buffers for each project (i.e., CCS buffers are not "pooled"), combined with a state liability either by the acquiring country or the host country. Although this appears to be a conservative approach in general, it faces the same issues with regard to the operational ending of the Kyoto Protocol. In summary, while the CDM's approaches to addressing non-permanence for AR and CCS project activities are in principle conservative and appropriate, they are functionally insufficient due to a lack of subsequent commitment periods under the Kyoto Protocol. Effectively, permanence for these activities is no longer ensured. We therefore recommend that these project types be excluded from scope should the CDM be approved as an eligible program.
ACR, GS	Section 4.5	Paragraph 3.5.6	**Using a mix of credits in buffer reserves.** Both ACR and the Gold Standard in principle allow a project to contribute to pooled buffer reserves using credits that were issued to *other* projects, including projects not subject to reversal risks. This can bolster the effectiveness of buffer reserves, because at least some of the buffer will not be subject to reversal (as it could be if only AFOLU-project credits are used). On the hand, this could create the risk that credits that are not eligible under CORSIA could be used to compensate for the reversal of credits that *are* CORSIA-eligible. Both ACR and the Gold Standard indicate that they are able to prevent this from happening. If both these programs are approved, then their approval

			should be conditional on having procedures in place to ensure that ineligible credits are not used to compensate for reversals of CORSIA-eligible credits. (It could also be noted that allowing different types of credits to compensate for reversals could create arbitrage opportunities for project developers. As a worst-case example, a developer could sell credits from an AFOLU project, terminate the project, and cover any liability using cheaper credits from other project types. While this presents no direct environmental integrity risks - as long as projects that are not CORSIA-eligible have the same quality as CORSIA-eligible projects - it could create issues for buyers who paid a higher price assuming they were also supporting the co-benefits of an AFOLU project.)
Comments relating to avoiding double counting			
ACR, CAR, GS, VCS	Section 4.7	All paragraphs	**Incorporation of the Guidelines on Avoiding Double Counting for CORSIA**. These Guidelines were developed by a multi-stakeholder group and aim to help carbon offsetting programs in implementing standards and procedures to avoid double counting for CORSIA. The Guidelines provide practical examples and guidance on how programs can address the EUCs related to double counting. They include guidance to address nearly all of the elements included in the TAB's "Guidelines for Criteria Implementation", with the exception of the "Reconciliation of double-claimed mitigation" (3.7.13). The four programs listed here have participated in the multi-stakeholder group that developed the Guidelines on Avoiding Double Counting for CORSIA. The ACR, CAR and GS refer in their application to the Guidelines; the VCS does not mention the Guidelines. From the language used in the applications of these four programs, it is however not fully clear whether the programs intend to incorporate

			the Guidelines in their entirety in their program standards and procedures: · The ACR standard, version 6.0, chapter 10, incorporates by reference the "procedures to avoid double counting as detailed in the Guidelines on Avoiding Double Counting for CORSIA". Section 10.B.2 also incorporates some elements of the Guidelines into the standard, such as the requirement to obtain attestation letters from relevant countries. Given the short time available after publication of the Guidelines and the application window for the TAB, the incorporation by reference seems a good and straight-forward solution for those elements of the Guidelines that can be implemented directly by project owners. However, some elements of the Guidelines target the standards, procedures and operations of the carbon-offsetting programs. For example, the Guidelines include several options for how programs could satisfy CORSIA requirements; a reference to the Guidelines does not provide clarity about which of these elements are required for project owners and which not. There are also elements of the Guidelines which may require modifications to the operations of the program, such as the information and registry systems of the program. These can also not be addressed by a reference to the Guidelines. · The CAR highlights that several changes to relevant program documentation will be implemented to incorporate the Guidelines. This should be completed by the end of 2019. · The GS highlights that for addressing double claiming procedures will be developed in line with the Guidelines. The GS also explicitly refers to a new procedure that will be developed to qualify offset credits for use under CORSIA. These elements are planned to be finalized by the end of 2019, whereas other

			elements are only planned to be finalized around 2023-2024. · The VCS does not refer to the Guidelines. We recommend that these four programs further clarify which elements of the Guidelines they intend to apply, or whether they will apply the Guidelines in their entirety. We also recommend that programs further clarify which program documents and operations will be changed to implement the Guidelines. In commenting below, we assume that all four programs apply the Guidelines in their entirety, including the VCS. However, we flag specific issues that may arise for programs on some aspects. If our assumption that the Guidelines will be applied in their entirety is not correct, some of the comments provided to other programs may also apply to ACR, CAR, GS and the VCS.
BC	Section 4.7	Double issuance (paragraph 3.7.5)	**Lack of procedures to avoid double issuance due to double registration of the same project within the same program.** BC does not explain how they intend to avoid double registration of the same project within the same program. The application form only refers to registry functionalities, but this issue cannot be addressed through registry functionalities. To address this issue, the program should have standards and procedures in place that ensure that the same project is not simultaneously registered more than once within a single program.
FCPF	Section 4.7	Double issuance (paragraph 3.7.5)	**Lack of procedures to avoid double issuance due to nested activities within a jurisdictional program.** FCPF does not explain what procedures are in place to avoid double issuance with activities nested within the jurisdiction where FCPF is implemented. To address this issue, the programs could establish standards and procedures for accounting of nested activities.
BC, CDM, FCPF, Nori, TGO	Section 4.7	Double issuance (paragraph 3.7.5)	**Lack of procedures to avoid double issuance due to double registration of the same project with other programs.** The programs

			listed here do not explain how they avoid double registration of the same project under two different programs. Other programs have procedures in place to avoid double issuance between two projects registered under two programs. To avoid double registration of the same project under different programs, programs should undertake checks, e.g. by reviewing project databases of other programs to verify that registered projects have not been issued offset credits in any other program for emission reductions. For that purpose, offset credit registries need to make information on offset credits available to users and the public. Programs should administer a publicly accessible, transparent and easily searchable project database for that purpose which may operate as a separately functioning system or be incorporated as part of the program's offset credit registry system. If a project is registered with more than one program, offset credits need to be cancelled by one program before offset credits are issued by another program for the same emission reductions and removals. The cancellations should be clearly designated for the purpose of allowing the reissuance of offset credits for the same emission reductions or removals under another program. For that purpose, legal attestations from project owners should also be obtained which confirm that they have not and will not request issuance of offset credits for emission reductions or removals from more than one program, unless such offset credits are canceled under one program prior to reissuance. By that means, the risk of double registration can be reduced by making project owners liable in case of not adhering to the obligations they have signed on to.
GCT	Section 4.7	Double issuance (paragraph 3.7.5)	**Lack of clarity how double issuance with other programs is avoided.** GCT states that, in order to avoid such double issuance, the GPS coordinates of the project will be checked before issuing offset

			credits. However, there is no reference to relevant standards and procedures which clearly establish requirements that double registration is not allowed or not avoided. It is also questionable whether GPS checks are sufficient to avoid this form of double issuance. Most other programs require legal attestations from project owners that they will not register the project elsewhere, or similar means.
ACR, BC, CCER, CDM, FCPF, GCT, GS, Nori, TGO, VCS	Section 4.7	Double issuance (paragraph 3.7.5)	**Double issuance of offset credits from different projects which indirectly address the same mitigation activity under the same or different programs.** Double issuance can also occur indirectly, through overlapping claims by different entities involved in carbon offset projects. This can, for example, occur when different entities involved in the production and/or consumption of the same good or service are allowed to claim offset credits for the same emission reductions or removals. The programs listed here are not clear how they avoid such double issuance, in particular in relation to such overlap with other programs (e.g. if one program credits the production of biofuels, whereas another program credits the use of biofuels). The CAR addresses this issue by avoiding the development and adoption of protocols that are likely to present a risk of ownership issues. Some CDM methodologies also address this issue, inter alia, by requesting that project owners seek written attestations from other potential owners of the emission reductions that they will not claim the emission reductions. For some activities, CDM methodologies also only allow that one possible user can claim emission reductions. More indirect overlaps are also addressed, for example, by using emission factors that consider other CDM projects with potentially overlapping claims. However, the CDM addresses this form of double issuance only with regard to other CDM projects but

			does not avoid it with regard to projects registered under other programs. We recommend that programs listed here clarify how they address this form of double issuance. To avoid this form of double issuance, programs could establish quantification standards and project eligibility criteria that ensure that overlapping emission reduction or removal claims are avoided so that different projects cannot be issued credits for the same emission reductions or removals. To prevent overlapping claims, procedures and methodologies for the accounting of emission reductions or removals need to be defined. For that purpose, the boundaries for different project types need to be defined so that overlap does not occur. The Guidelines on Avoiding Double Counting for CORSIA provide further information that may be useful in implementing such standards and procedures.
BC, CCER, CDM, FCPF, GCT, Nori, TGO	Section 4.7	Double use (paragraph 3.7.6)	**Lack of CORSIA compatible cancellation procedures to avoid double use of the same offset credits.** Double use of offset credits could occur not only if the same offset credit is cancelled twice, but also if one cancellation is applied to more than one emission reduction claim. This could occur, for example, if the purpose of a cancellation is ambiguous, such that more than one entity could assert a claim to it. The programs listed here are not clear how they would ensure that, for CORSIA compliance, the cancellation purpose is clearly indicated such that only one party (e.g., an aeroplane operator) can credibly claim the use of an offset credit. To address this issue, programs need to incorporate cancellation procedures that ensure that a cancellation is clearly indicated, irreversible and unambiguously designated for a specific purpose. Accordingly, cancelled offset credits should be clearly linked to a specific offsetting requirement of a particular aeroplane operator.

			The registry functionalities of the program should require the registry user, in order to conduct a CORSIA-related cancellation, to specify the aeroplane operator for which the offset credits were cancelled and the calendar year for which an offsetting requirement is fulfilled through the cancellation (e.g. "XYZ Airlines, 2024 offsetting requirement, covering the 2021-2023 offsetting compliance period under CORSIA").
BC, CCER, CDM, FCPF, GCT, Nori, TGO	Section 4.7	Host country attestation to the avoidance of double-claiming (paragraph 3.7.8)	**Content of host country attestations.** The programs listed here are not clear what information in host country attestations would be regarded as sufficient for the program to qualify offset credits as being CORSIA eligible. To address this issue, we recommend that programs establish procedures that require that attestation letters must, as a minimum, include the following information in order for the program to qualify offset credits from a project as being CORSIA eligible: · Identify the project; · Acknowledge that the project may reduce emissions (or enhance removals) in the country; · Acknowledge that the program to which the letter is provided has issued, or intends to issue, offset credits for the emission reductions or removals that occur within the country; · Authorize the use of the project's emission reductions or removals, issued as offset credits, by aeroplane operators in order to meet offsetting requirements under CORSIA; · Declare that the country will not use the project's emission reductions or removals to track progress towards, or for demonstrating achievement of, its NDC (or other relevant international mitigation targets, as applicable) and will account for their use by aeroplane operators under CORSIA by applying

			relevant adjustments (or for other relevant international mitigation targets by taken appropriating other means such as the cancellation of assigned amount units under the Kyoto Protocol). It may also be helpful if programs encourage that letters: · Provide a stipulation regarding the maximum number of the project's emission reductions or removals, issued as offset credits, that the country authorizes for use, including any limits on the time period over which the country provides such authorization; · Include a request to the program to provide information to the country on the use of the offset credits; · Declare that the country will report on the authorization and use of the project's emission reductions or removals by other countries or entities in a transparent manner in its biennial transparency report submitted under Article 13 of the Paris Agreement. Programs may also include example letters in any best practice guidelines. Further relevant information, including example letters, can be found in the Guidelines on Avoiding Double Counting for CORSIA.
Cross-cutting issue / All programs	Section 4.7	Host country attestation to the avoidance of double-claiming (paragraph 3.7.8)	**Mitigation outcomes outside the scope of NDCs.** There is ongoing debate in international negotiations under the Paris Agreement whether emission reductions that are not covered by NDCs are eligible for international transfer and, if yes, whether corresponding adjustments or other safeguards are necessary. While technically double claiming does not occur if the emission reductions or removals are not covered by an NDC, the use of such offset credits could create a number of environmental integrity concerns. It could,

			in particular, create perverse incentives for countries not to broaden the scope of their NDCs. This could undermine the objective in Article 4.4 of the Paris Agreement that all countries should move over time towards economy-wide targets. If the emission reductions are covered by NDCs, countries may also have greater incentives to ensure that they only authorize projects that are additional and do not over-estimate emission reductions. A further practical difficulty of not requiring adjustments for emission reductions or removals that are not covered by NDCs is that the scope of current NDCs is often not clear, and it may be practically difficult to differentiate whether an emission reduction is covered or not covered by an NDC. This could potentially result in inconsistent treatment by different programs, even in the same country with the same activities. While this matter cannot be resolved by carbon-offsetting programs and should ideally be addressed by the Parties to the Paris Agreement, including for offset credits used under CORSIA, in the absence of such clear international rules under the Paris Agreement this issue is a relevant matter for the process of approval of programs by ICAO. Effectively, by approving programs, ICAO would either approve the use of such emission reductions (if the program's procedures allow them to be qualified for use under CORSIA) or not approve them (if the program's procedures do not allow them to be qualified). None of the programs provide information in their applications whether and under which conditions they would qualify offset credits for use under CORSIA if the associated emission reductions are not covered by NDCs and no rules on this matter have been adopted under the Paris Agreement. In particular, it is unclear how they would handle a situation where the letter from the relevant country would

			NOT confirm that the country intends to apply adjustments for emission reductions not covered by the NDC and used under CORSIA. If this matter is not resolved at COP25 in Santiago, including for offset credits used under CORSIA, we recommend that programs and ICAO adopt a cautious approach, in order to avoid that offset credits are qualified for use under CORSIA that may not satisfy future rules under the Paris Agreement. To implement such a cautious approach, we recommend that programs only qualify offset credits for use under CORSIA: 1) if the offset credit's associated emission reductions are covered by NDCs; or 2) if the attestation letter by the relevant country specifies that **all** emission reductions - irrespective of whether they are covered or not covered by an NDC (or other relevant international mitigation target) - will be accounted for by the country through the application of adjustments. If this matter is clarified at COP25 in Santiago, the approach adopted would need to be incorporated in relevant program standards and procedures, to ensure consistency with relevant international rules.
ACR, BC, CAR, CCER, CDM, FCPF, GCT, GS, Nori, TGO, VCS	Section 4.7	Host country attestation to the avoidance of double-claiming (paragraph 3.7.8)	**Possibility of host country attestations from countries that do not participate in the Paris Agreement.** The EUC on double claiming specifies that host countries of emissions reduction activities should agree to "account for any offset units issued" as a result of those activities such that double claiming does not occur between the airline and the host country of the emissions reduction activity." The Guidelines for interpretation further specify that this should occur on the basis of an attestation which should describe the steps taken to

			prevent double claiming. However, none of the programs listed here provide information whether they would qualify offset credits for use under CORSIA if the relevant country does not participate in the Paris Agreement, or has not communicated an NDC for the applicable implementation period, but would nevertheless issue a letter authorizing the use of the emission reductions under CORSIA. We recommend that all programs clarify as part of their procedures that offset credits issued for emission reductions after 2020 can only be qualified by a program as CORSIA eligible if the relevant country participates in the Paris Agreement and has communicated an NDC for the applicable NDC implementation period. As part of the program approval process, ICAO will need to clarify, and programs will need to implement respective provisions, whether emission reductions from countries that do not participate in the Paris Agreement, or that have not communicated an NDC for an applicable NDC implementation period, should be eligible for use under CORSIA. In our view, this is not only essential to satisfy the EUCs with regard to the requirement to account for offset credits, but also to avoid that CORSIA creates a perverse incentive for countries to withdraw from the Paris Agreement. Such perverse incentives could undermine global mitigation ambition beyond CORSIA. Lastly, qualifying offset credits from countries that currently do not participate in the Paris Agreement could also lead to double claiming if a country would later join the agreement again.
BC, CCER, CDM,	Section 4.7	Double claiming	**Lack of procedures to identify overlap with a country's NDC.** A key

FCPF, GCT, Nori, TGO		procedures (paragraph 3.7.9)	prerequisite for avoiding double claiming is that any overlap with a country's NDC under the Paris Agreement is identified. A systematic identification of whether a project involves activities or emission reductions or removals that are covered by NDC targets is necessary in order to provide transparency on potential effects of a project on a country's progress towards achieving its NDC targets. Such transparency helps countries to plan the achievement of their NDC targets and understand how the implementation of projects might affect their progress towards NDC targets. Also, this information may be needed for countries to apply adjustments in cases of overlap. The programs listed here do not specify how they intend to implement procedures to identify overlap with NDCs. To address this issue, programs should adopt a procedure to identify overlap with NDC targets. The results of the assessment of overlap with a country's NDC would need to be documented, such as through a publicly accessible database where relevant information on each offset credit is accessible (e.g. whether it overlaps with relevant NDC targets, whether adjustments are necessary, and whether the relevant adjustments have been applied). The Guidelines on Avoiding Double Counting for CORSIA provide useful further information how this could be implemented.
BC, CCER, CDM, FCPF, GCT, Nori, TGO	Section 4.7	Double claiming procedures (paragraph 3.7.9)	**Lack of procedures to ensure gathering and public provision of information on the country where the emission reductions or removals occurred.** To prevent double claiming and seek attestation letters (see comment further below), it is necessary to identify in which countries the offset credits' emission reductions or removals occurred. In most instances, a project is implemented only in one country and the emission reductions or removals occur in the same country. In some instances, however, the emission reductions or removals could occur in several countries or in a different country

			than where the project is being implemented. Examples include programmatic approaches that often implement activities in several countries; multinational electricity systems in which the generation or saving of electricity in one country can affect the emissions from power plants in other countries; and projects avoiding upstream or downstream emissions that occur in other countries, such as from the production of fossil fuels. The programs listed here do not include information in their applications on how they identify the countries where the emission reductions occur. To address this issue, programs need to adopt standards and procedures to identify the relevant countries and allocate the emission reductions respectively to the relevant countries. For that purpose, the Guidelines on Avoiding Double Counting for CORSIA recommend that programs require project owners and/or program staff to · Identify the countries in which the project is implemented, I.e. where the mitigation action is undertaken, · Identify the country, or group of countries, where the project's calculated emission reductions or removals occur, · Determine the proportion of emission reductions or removals that occurred within each identified country, ensuring that o The allocation is proportional to where the emission reduction or removals occurred o A project cannot claim emission reductions in one country while ignoring increases of emissions in another country due to the project o The total number of offset credits issued does not exceed

			the net emission reductions or removals of the project in all countries · Assign an attribute to each offset credit indicating the country where the emission reductions or removals occurred, ensuring that only one country is assigned to each offset credit.
BC, CCER, CDM, FCPF, GCT, Nori, TGO	Section 4.7	Double claiming procedures (paragraph 3.7.9)	**Lack of specification of approach to identify the calendar years in which the emission reductions or removals occurred.** The programs listed here do not explain how they plan to identify the calendar years in which the offset credits' emission reductions or removals occurred. This is necessary in order to effectively avoid double claiming, as it is necessary to assess whether an offset credit's emission reductions or removal fall within a period that is covered by a relevant mitigation target. It also necessary for enabling robust accounting for the use of offset credits over time, in particular in the context of single-year mitigation targets. The programs do not provide information how they plan to address this. The CDM includes such approaches, but only for identifying the relevant commitment period, not individual calendar years. In the post-2020 context, however, with many countries having single year targets, it is necessary to identify the calendar year in which the emission reductions occurred. To address this issue, the programs should establish standards and procedures to identify for each offset credit the calendar year in which the associated emission reductions or removals occurred, and to assign to each issued offset credit an attribute indicating the calendar year. Offset credits should be allocated proportionally to calendar years. For that purpose, the Guidelines on Avoiding Double Counting for CORSIA recommend two different approaches:

			· Direct measurement: the emission reductions are measured continuously, or relevant meters are read at the end of a calendar year; · Allocation based on plausible assumptions: the emission reductions are allocated to the calendar years using plausible assumptions on when they likely occurred. The allocation of offset credits to calendar years should be transparently documented. Clear allocation of credits to calendar years allows assessing whether an offset credit's emission reduction or removal falls within a period that is covered by an NDC.
BC, CCER, CDM, FCPF, GCT, Nori, TGO	Section 4.7	Double claiming procedures (paragraph 3.7.9)	**Lack of procedure to provide countries information necessary to apply adjustments in the GWP values that they use to account for their NDCs.** In some instances, countries may account for their mitigation targets in different GWP values than the values that the program uses to issue offset credits for use under CORSIA. Under the Paris Agreement, for example, it is envisaged that countries account for emissions and removals in accordance with "common metrics" assessed by the IPCC (decision 1/CP.21, paragraph 31, sub-paragraph a). At COP24 in Katowice, Parties agreed that each Party shall use in their national inventory reports the 100-year time-horizon GWP values from the 5th IPCC assessment report, or 100-year time-horizon GWP values from a subsequent IPCC assessment report as agreed upon by the CMA, to report aggregate emissions and removals of GHGs, expressed in CO2eq. Each Party may in addition also use other metrics (e.g. global temperature potential) to report supplemental information on aggregate emissions and removals of GHGs, expressed in CO2eq (see paragraph 37 of the decision 18/CMA.1 on "Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement"). Furthermore, Parties adopted guidance

			on accounting for Parties' nationally determined contributions, which establishes that Parties account for anthropogenic emissions and removals in accordance with these metrics (paragraph 1, sub-paragraph a, of Annex II to decision 4/CMA.1 on "Further guidance in relation to the mitigation section of decision 1/CP.21"). This accounting guidance is, however, only mandatory for second and subsequent NDCs (paragraph 32 of decision 1/CP.21 and paragraph 14 of decision 4/CMA.1). In their first NDCs, countries communicated that they intend to use various GWP values, including values from the 2nd, 4th, and 5th IPCC assessment reports. It is thus possible that some countries use, for the first NDC, values other than those from the 5th IPCC assessment report to account for their NDC. This brings challenges for the consistency of GWP values used by programs to issue offset credits, and the amounts that need to be accounted for by countries in their own GWP metrics. To address this issue and enable robust accounting by countries for the use of offset credits under CORSIA, it is thus necessary that programs establish procedures that inform countries about the amount of adjustments that are necessary to effectively avoid double claiming based on the GWP values applied by the countries. The Guidelines on Avoiding Double Counting for CORSIA provide further information on how such information could be reported. None of the programs listed explain in their applications how they intend to address this issue.
ACR, BC, CAR, CCER, CDM, FCPF, GCT, GS, Nori, TGO, VCS	Section 4.7	Double claiming procedures (paragraph 3.7.9)	**Procedures to avoid double counting with international mitigation targets in the period up to 2020.** Through 2020, countries have agreed to or communicated international climate change mitigation targets in the context of the UNFCCC, the Kyoto Protocol and its Doha Amendment. In response to the fifteenth and sixteenth Conferences of the Parties (COP) to the UNFCCC, held respectively in Copenhagen and Cancun, countries put forward voluntary pledges and nationally-

			appropriate mitigation actions for the year 2020 (hereinafter referred to collectively as "Cancun targets"). The targets of developed countries that participate in the Kyoto Protocol's second commitment period were later translated into quantified emission limitation and reduction objectives for the period 2013 to 2020 and included in Annex B under the Doha Amendment, while the targets of other countries remain under the UNFCCC. The programs take diverse approaches to avoid double counting in the context of these mitigation targets. Some programs avoid double counting with Kyoto Protocol targets (e.g. by requiring cancellation of AAUs if offset credits are issued). Some programs also avoid double counting with Cancun targets communicated by Annex I countries (mostly by not allowing projects in these countries), while others ignore these targets. Some programs are not entirely clear. We recommend that all programs provide clear information with which type of international mitigation targets they intend to avoid double claiming. In our view, double claiming should be avoided with both Kyoto and Cancun targets. In the negotiations following the adoption of the Cancun targets, Parties agreed that "various approaches, including opportunities for using markets … must meet standards that … avoid double counting of effort" (decision 2/ CP.17, paragraph 79). Decision 1/CP.21, adopting the Paris Agreement, also refers to avoiding double counting in the context of action prior to 2020, urging "host and purchasing Parties to report transparently on internationally transferred mitigation outcomes, including outcomes used to meet international pledges, and emissions units issued under the Kyoto Protocol with a view to promoting environmental integrity and avoiding double counting." International decisions under UNFCCC

			thus point to the need to avoid double counting. Moreover, the EUCs are clearly not limited to NDCs but cover mitigation efforts and obligations more broadly. Lastly, in our view, allowing double counting with internationally communicated mitigation targets in the period up to 2020 could undermine the integrity and ambition of CORSIA.
BC, CCER, CDM, FCPF, GCT, Nori, SFP, TGO	Section 4.7	Double-claiming procedures (paragraph 3.7.9)	**Lack of procedures to avoid double claiming with mandatory domestic climate change mitigation targets.** The programs listed here do not explain how double claiming with mandatory domestic climate mitigation targets can be avoided. Mitigation activities that are used under CORSIA might overlap with domestic mandatory climate targets. For example, renewable power plants could also reduce emissions in regional or national emissions trading system (ETS). Some programs explicitly have procedures in place to avoid such double counting or plan to implement them. For example, several programs avoid double counting with ETSs and have procedures that emission reductions covered by an ETS can either not be issued as offset credits or that a respective amount of ETS allowances be cancelled if offset credits are issued. The programs listed here do not explain whether they avoid such double counting. SFP, for example, proposes to qualify emission reductions for use under CORSIA that can also be used to achieve mandatory EU legislation (LULUCF Regulation, Regulation (EU) 2018/841). Under the EU's LULUCF regulation, countries can use the same emission reductions to achieve their LULUCF target and partially to compensate for emissions in other sectors. The EU legislation does not include means to account for the use of these emission reductions under CORSIA. EU legislation would thus need to be amended to avoid double counting for CORSIA.

			To address this issue, programs should have procedures in place to identify relevant mandatory domestic mitigation targets and a project's overlap with such targets in order to avoid double claiming. Any potential overlap should be addressed through · Requiring that activities or emission reductions/removals that are associated with offset credits are not counted towards the achievement of relevant domestic mitigation targets · Not issuing offset credits for activities or emission reductions or removals that are covered by these targets · Not qualifying offset credits for use under CORSIA if the associated activities or emission reductions or removals are covered by these targets.
ACR, GCT, GS, VCS	Section 4.7	Double claiming procedures (paragraph 3.7.9)	**Clarification of ineligibility of emission reductions from international bunker fuel sectors.** The programs listed here are not fully clear in their applications whether emission reductions from decreasing the use of international bunker fuels are ineligible. If such emission reductions were eligible, this could lead to double claiming within CORSIA (as the airlines would claim the same emission reductions through lower reported emissions and through the use of these offset credits) or with mitigation efforts and targets under the International Maritime Organization (IMO).
ACR, CAR, CDM, GCT, VCS	Section 4.7	Double-claiming procedures (paragraph 3.7.9)	**Potential double claiming with targets under the Montreal Protocol and its amendments.** The Montreal Protocol and its amendments establish binding targets for countries to reduce the consumption and production of ozone depleting substances (ODS) as well as HFCs (in the recent Kigali amendment). The programs listed here include the reduction of ODSs or HFCs within their scope, or are not entirely clear whether these activities are included within their scope requested to be eligible for CORSIA. It is not clear how the programs ensure that credited emission reductions from these gases are not

			used to achieve both CORSIA offsetting obligations and the targets under the Montreal Protocol and its amendments.
Cross-cutting issue / All programs	Section 4.7	Double-claiming procedures (paragraph 3.7.9)	**Potential double claiming of emission reductions in relation to NDC targets expressed in non-GHG metrics.** If an NDC target is expressed in non-GHG metrics, double claiming can occur if emission reductions that are used as offset credits under CORSIA result from activities that also contribute to achieving non-GHG targets in a country's NDC (e.g. energy efficiency targets, increasing renewable energy or forest cover). In international negotiations under the Paris Agreement, it is not yet clear how any targets in non-GHG metrics will be considered. One option considered is expressing such NDCs in GHG emissions terms for accounting purposes, another option is considering non-GHG metrics. Depending on the outcome, programs will need to have procedures in place to identify any overlap between project activities and non-GHG targets. So far, a decision on accounting of such mitigation outcomes and potential adjustments has not been taken. If the CMA provides guidance in this respect in the future, this should be implemented as requirements for programs operating under CORSIA as well.
BC, FCPF, Nori, TGO	Section 4.7	Double claiming procedures (paragraph 3.7.9)	**Lack of procedures for ensuring that offset credits are issued only after final program approval of verification reports.** The programs listed here do not explain how they ensure that offset credits are issued only after emission reductions have occurred and been verified. If offset credits were issued ex-ante, this could lead to double counting (e.g. if an NDC is updated to include sources for which credits were already issued in advance).
BC, CCER, CDM, FCPF, GCT, Nori, TGO	Section 4.7	Double-claiming procedures (paragraph	**Lack of procedures to obtain evidence of appropriate accounting by host countries.** The programs listed here are not clear how they plan to obtain evidence of appropriate accounting by host countries. In

		3.7.9.2) and comparing unit use against national reporting (3.7.11)	order to avoid double claiming, programs need to establish procedures to check whether countries have appropriately accounted for any emission reductions that were used as offsets under CORSIA when claiming the achievement of their mitigation targets. To address this issue, programs should adopt standards and procedures to obtain such evidence. The procedure should address all relevant types of mitigation targets (domestic, international) and mandatory schemes (such as emissions trading systems). In the context of emissions trading systems, for example, the procedures should ensure that a respective amount of allowances are cancelled for any emission reductions achieved within the scope of the emissions trading system. In the context of NDCs under the Paris Agreement, programs should verify that the relevant country has established and is operating an accounting system for recording adjustments; that the adjustment was recorded appropriately in the accounting system and reported in the structured summary referred in paragraph 77d of the Annex to decision 18/CMA.1 and paragraph 17 of decision 4/CMA.1; and that all necessary adjustments were appropriately applied, consistent with relevant international rules. Evidence for the application of adjustments could, for example, be provided in the form of a letter or certificate (physical or electronic) from the relevant country indicating that the required adjustments have been applied within the relevant accounting system. Any evidence should clearly reference the offset credits for which the country has applied the adjustments. A program's standards and procedures should also clarify when the program should take action to obtain evidence of appropriate

			accounting by the host country.
BC, CCER, CDM, FCPF, GCT, Nori, SFP, TGO	Section 4.7	Reconciliation of double-claimed mitigation (paragraph 3.7.13)	**Public reporting.** The programs listed here do not provide information on their procedures for public reporting. The regular publication of reports with aggregated information can facilitate the avoidance of all forms of double counting. The countries where the emission reductions or removals occur require information on the issuance and use of offset credits for the purpose of applying adjustments. Aggregated information on the issuance and use of offset credits is also required to reconcile and compare the use of offset credits under CORSIA with the adjustments applied by countries. To address this issue, we recommend that programs regularly publish reports that provide aggregated information related to the issuance and cancellation of offset credits. Such reports should be published at least annually within six months after the end of a calendar year and include at a minimum · Total issued offset credits by country, calendar year, and the need for application of adjustments, · Total cancelled offset credits by aeroplane operators, · The maximum number of emission reductions or removals from projects registered with the program, authorized by countries for use by other countries or entities, by country and calendar year. The Guidelines on Avoiding Double Counting for CORSIA provide further information reporting elements.
ACR, BC, CAR, CDM, CCER, FCPF, GCT, GS, Nori, SFP, TGO, VCS	Section 4.7	Reconciliation of double-claimed mitigation (paragraph 3.7.13)	**Lack of procedures to reconcile credits once double-claimed.** The programs listed here do not provide information on how they deal with double counting once it has occurred. Procedures are necessary to ensure that any double-claimed mitigation associated with units

			used under CORSIA are compensated for, replaced or otherwise reconciled. Most programs do not provide any information on how to deal with this issue or vaguely state that they will put in place or would be willing to consider introducing a mechanism to compensate for instances of double claiming, as required by ICAO (e.g. ACR, VCS). Nori mentions in its application and supporting documents that all purchases of credits under CORSIA are insured to be made whole by the Nori insurance reserve. However, according to the program documentation by Nori (section 2.5), this insurance does not cover double counting (e.g. a situation where the country does not apply necessary adjustments). It is also unclear whether this insurance will be able to adequately address the underlying risk.

* Please refer to Programme Application Form, Appendix A - Supplementary Information for Assessment of Emissions Unit Programs

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Securing Climate Benefit: A Guide to Using Carbon Offsets

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Title image credit: reforestation and restoration of degraded mangrove lands, sustainable livelihood and community development project in Myanmar.

HOW TO USE THIS GUIDE

You should use this guide in combination with www.OffsetGuide.org, which provides more detail on the topics covered in this guide. For example, the website expands on the following topics:

- Global warming potential and CO_2 equivalent
- Comparing offset credits with green power and other environmental instruments and investments
- Common types of offset projects
- What carbon offset programs do
- How to acquire carbon offset credits
- Achieving carbon neutrality
- Air Travel & Climate
- Concerns about carbon offset quality
- Additionality
- Avoiding social and environmental harms
- How carbon offset programs address social and environmental harms
- Domestic or Foreign Projects
- Conducting project due diligence when vetting offset projects

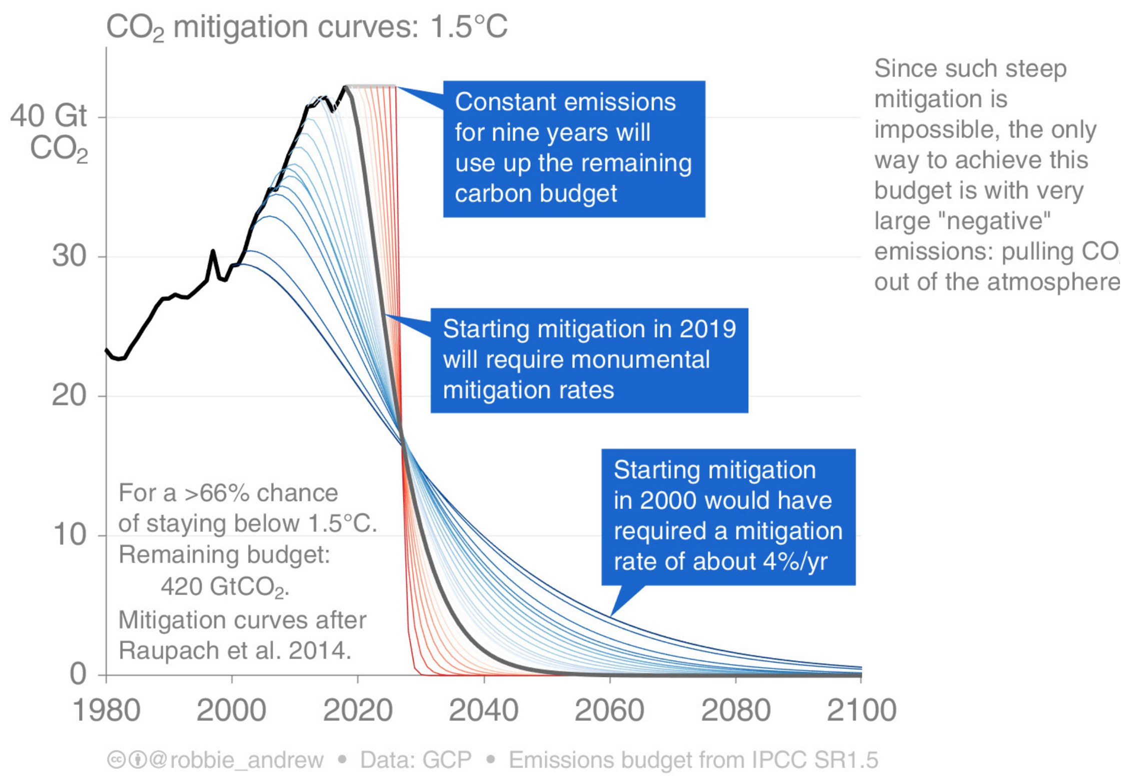
Internet links are provided throughout this PDF guide to access expanded and updated information. Links are presented as a clickable button ( ) at the end of each related section.

1. INTRODUCTION

According to the Intergovernmental Panel on Climate Change (IPCC), the world has until 2030 to cut human-caused carbon dioxide (CO_2) emissions in half (and cut other greenhouse gas emissions considerably) to maintain a 50% chance of avoiding the worst effects of climate change.[1] By 2050, CO_2 emissions will need to reach "net zero" – where emissions are in balance with removals[2] – to sustain this chance. Such reductions will require worldwide action by national and local governments, along with businesses and civil society (Figure 1).

The urgency is clear: incremental steps to address greenhouse gas (GHG) emissions will not be enough. Companies and organizations will need to use every tool at their disposal to achieve emission reduction goals. "Carbon offsets" are one such tool that – if used responsibly – can accelerate action to avert dangerous climate change.

Figure 1. Required emission reduction rates for limiting global warming to 1.5°C



This guide is for companies and organizations seeking to understand carbon offsets and how to use them in voluntary GHG reduction strategies. It may also be useful for individuals interested in using carbon offsets to compensate for their personal emissions.

We begin, in Section 2, with an explanation of the basics of carbon offsets, how to acquire them, and how they can (or should) be used in carbon management strategies. Section 3 addresses common criticisms of carbon offsets. Section 4 clarifies the essential elements of carbon offset quality, explains how carbon offset certifiers try to ensure that quality, and includes basic questions prospective buyers can ask about quality. Section 5 describes strategies buyers can use to avoid lower quality offset credits. This guide ends with Section 6, which provides links to further resources.

Fig. 1 source: Robbie Andrew (CICERO), http://folk.uio.no/roberan/t/global_mitigation_curves.shtml

2. UNDERSTANDING CARBON OFFSETS

The term "carbon offset" is shorthand for GHG emission reductions or removals that compensate for CO_2 emissions. In this section, we define carbon offsets, as well as explain the difference between offset credits, projects, and programs; detail how buyers can obtain offset credits; and describe how offset credits can (or should) be used in an organization's GHG management strategies.

2.1 WHAT IS A CARBON OFFSET?

The terms carbon offset and carbon offset credit (or simply "offset credit") are used interchangeably, though they can mean slightly different things. A carbon offset broadly refers to a reduction in GHG emissions – or an increase in carbon storage (e.g., through land restoration or the planting of trees) – that is used to compensate for emissions that occur elsewhere. A carbon offset credit is a transferable instrument certified by governments or independent certification bodies to represent an emission reduction of one metric tonne of CO_2, or an equivalent amount of other GHGs (see Box 1). The purchaser of an offset credit can "retire" it to claim the underlying reduction towards their own GHG reduction goals.

Box 1. Establishing a common denomination for different greenhouse gases

CO_2 is the most abundant GHG produced by human activities, and the most important pollutant to address for limiting dangerous climate change. However, human beings create and emit numerous other GHGs, most of which have a far greater heat-trapping effect, pound for pound, than CO_2. The most prevalent of these gases are methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), nitrogen trifluoride (NF_3), and sulfur hexafluoride (SF_6). Fully addressing climate change will require reducing emissions of all GHGs. Scientists and policymakers have established "global warming potentials" (GWPs) to express the heat-trapping effects of all GHGs in terms of CO_2-equivalents (annotated as "CO_2e"). This makes is easier to compare the effects of different GHGs and to denominate carbon offset credits in units of CO_2-equivalent emission reductions.

Learn more about GWP

The key concept is that offset credits are used to convey a net climate benefit from one entity to another. Because GHGs mix globally in the atmosphere, it does not matter where exactly they are reduced. From a climate change perspective, the effects are the same if an organization: (a) ceases an emission-causing activity; or (b) enables an equivalent emission-reducing activity somewhere else in the world. Carbon offsets are intended to make it easier and more cost-effective for organizations to pursue the second option.

As explained later in this guide, offset claims are only defensible under a set of rigorous conditions. Although organizations sometimes use other kinds of investments to make GHG reduction claims – such as the purchases of "renewable energy credits" – these other instruments usually do not meet the criteria for effective carbon offset claims.

How do I compare offset credits with green power and other environmental instruments and investments?

2.2 CARBON OFFSET PROJECTS

Carbon offset credits can be produced by a variety of activities that reduce GHG emissions or increase carbon sequestration. In most cases, these activities are undertaken as discrete "projects." A carbon offset project, for example, may involve:

- Renewable energy development (displacing fossil-fuel emissions from conventional power plants);
- The capture and destruction of high-potency GHGs like methane, N_2O, or HFCs; or
- Avoided deforestation (which can both avoid the emission of the carbon stored in trees, as well as absorb additional carbon as trees grow).

Projects can range in scale from very small (e.g., reducing a few hundred tonnes of CO_2e per year) to very large (e.g., millions of tonnes reduced per year). Carbon offset credits are also sometimes produced by large-scale "programs of activities,"[3] which aggregate together many similar small projects or coordinated efforts across entire jurisdictions (such as in the case of avoided deforestation).[4]

What other types of offset projects are common?

In many cases, carbon offset projects produce social and environmental benefits beyond just GHG reductions. Depending on the project type, these "co-benefits" can include: improvements to community employment opportunities; enhanced air or water quality; biodiversity and habitat conservation; improved energy access; and better access to community health and education services. Many offset credit buyers seek projects that yield a broad range of benefits. Carbon offsets can thus be part of a comprehensive strategy for corporate social responsibility, combining efforts to address climate change with contributions to other public goods.

One challenge is that the types of projects that make for higher-quality carbon offsets tend to be those with the fewest co-benefits – and vice versa (see Section 5.2).

2.3 CARBON OFFSET PROGRAMS

Carbon offset credits are not a simple commodity. As with many products whose quality is difficult for casual buyers to assess, standard-setting organizations have been established to provide quality assurance for carbon offsets. These carbon offset programs[5] range from international or governmental regulatory bodies – such as the United Nation's Clean Development Mechanism (CDM) Executive Board, which oversees carbon offsets under the Kyoto Protocol – to independent non-governmental organizations (NGOs). Historically, governmental bodies certified offset credits for regulatory purposes ("compliance programs"), while NGOs primarily served voluntary buyers ("voluntary programs"); more recently, both types of programs have begun to serve both types of markets (Table 1). Each carbon offset program issues its own labelled "brand" of credit.

Offset programs perform three basic functions: (1) they develop and approve standards that set criteria for the quality of carbon offset credits; (2) they review offset projects against these standards (generally with the help of third-party verifiers); and (3) they operate registry systems that issue, transfer, and retire offset credits.

More detail on how carbon offset programs seek to ensure the quality of offset credits (along with some of their limitations) can be found in Section 4 of this guide.

This man trains two women in the use of small-scale anaerobic digesters that capture and destroy methane as a fuel source for cooking. Image credit: Sichuan Rural Poor-Household Biogas Development Programme

Learn more about what carbon offset programs do

Table 1. Examples of major carbon offset programs

"Compliance" carbon offset programs (run by governmental bodies)	Geographic Coverage	Label used for offset credits
Clean Development Mechanism (CDM)[6]	Developing countries	Certified Emission Reduction (CER)
California Compliance Offset Program	United States	Air Resources Board Offset Credit (ARBOC)
Joint Implementation (JI)[7]	Developing countries	Emission Reduction Unit (ERU)
Regional Greenhouse Gas Initiative (RGGI)	Northeast United States	RGGI CO_2 Offset Allowance (ROA)
Alberta Emission Offset Program (AEOP)	Alberta, Canada	Alberta Emissios Offset Credit (AEOC)

"Voluntary" carbon offset programs (run by NGOs)	Geographic Coverage	Label used for offset credits
American Carbon Registry	United States, some international	Emission Reduction Tonne (ERT)
Climate Action Reserve (CAR)	United States, Mexico	Climate Reserve Tonne (CRT)
The Gold Standard	International	Verified Emission Reduction (VER)
Plan Vivo	International	Plan Vivo Certificate (PVC)
The Verified Carbon Standard	International	Verified Carbon Unit (VCU)

2.4 HOW TO ACQUIRE CARBON OFFSET CREDITS

Although there are some trading exchanges that facilitate offset credit transactions, most transactions occur "off-exchange", making price discovery difficult. The price of an offset credit can range from under US$1 to well over US$35. Prices tend to vary mostly by project type, generally with small differences between offset credit labels.[8]

Although offset credit buyers do not need to be familiar with every carbon offset program rule and procedure, they should have a basic understanding of how carbon offset credits are generated, transferred, and used. Purchasing options can depend on where in this "lifecycle" a buyer gets involved. In general, the earlier in the lifecycle, the better the nominal price and terms will be – but the greater the delivery risk and the longer it may take to actually receive offset credits.

The basic lifecycle for carbon offset credits looks like the following:

1. Methodology development. Before any GHG reductions can be certified for use as carbon offsets, they must be shown to meet carbon offset quality criteria. This process requires a methodology or protocol that is specific to the type of offset project generating the reductions. Most carbon offset programs have a library of approved methodologies covering a wide range of project types. However, project developers may also propose new methodologies for program approval and adoption.

Purchasing options: In rare cases, a prospective offset credit buyer may sponsor the development of a methodology for a new project type that is not already eligible in existing offset programs. This effort can be a resource-intensive – and risky – but could make sense for organizations with a strong interest in a new type of project activity.

2. Project development, validation, and registration. An offset project is designed by project developers, financed by investors, validated by an independent verifier, and registered with a carbon offset program. Official "registration" indicates that the project has been approved by the program and is eligible to start generating carbon offset credits after it begins operation (next step).

Purchasing options: Some offset credit buyers directly invest in an offset project in return for rights to (some portion of) the credits the project is able to generate. This approach can allow for deeper engagement and a fuller understanding of a project's strengths and weaknesses.

Alternatively, a commonly used purchasing option is to contract directly with a project developer for delivery of carbon offset credits as they are issued. Such contracts generally take the form of "Emission Reduction Purchase Agreements" (ERPAs). An ERPA provides project developers with confidence that they will be able to sell a reliable volume of offset credits. For buyers, the advantage is being able to lock in a price for offset credits that is typically lower than market prices (in exchange for some delivery risk). ERPAs can be structured in numerous ways, including as option contracts

3. Project implementation, verification, and offset credit issuance. An offset project is implemented, then monitored and periodically verified to determine the quantity of emission reductions it has generated. The length of time between verifications can vary, but is typically one year. A carbon offset program approves verification reports, and then issues a number of carbon offset credits equal to the quantity of verified CO_2-equivalent GHG reductions. Offset credits are generally deposited into the project developer's account in a registry system administered by the offset program.

Purchasing options: In some cases, project developers may have unsold offset credits for which they are seeking buyers. Purchasing directly from a project developer can avoid some transaction costs. However, projects with unsold credits (e.g., not contracted through an ERPA) may sometimes raise quality concerns (see Section 4.1.2).

4. Offset credit transfer. After they are issued, carbon offset credits can be transferred into different accounts in an offset program's registry. Transfers are usually undertaken as a result of a purchase or trade (so, after a purchase, the offset credits will be transferred from the project developer's account into an account owned by the purchasers). Offset credit buyers may then use the offset credits by retiring them (see next step), hold them, or transfer them to other accounts. Offset credits may change hands multiple times (getting transferred among multiple accounts) before they are ultimately retired and used.

Purchasing options: As with other commodities, numerous firms act as brokers for carbon offset credits. Brokers procure offset credits and then transfer (or retire) them on clients' behalf. Brokers can make it easier to identify a mix of offset credits from different project types, and facilitate large or small transactions. Some brokers sell offset credits from projects they have invested in, in addition to projects developed by others. This practice may provide efficiencies in pricing, but it can affect the ability of the broker to be impartial about the credits they sell.

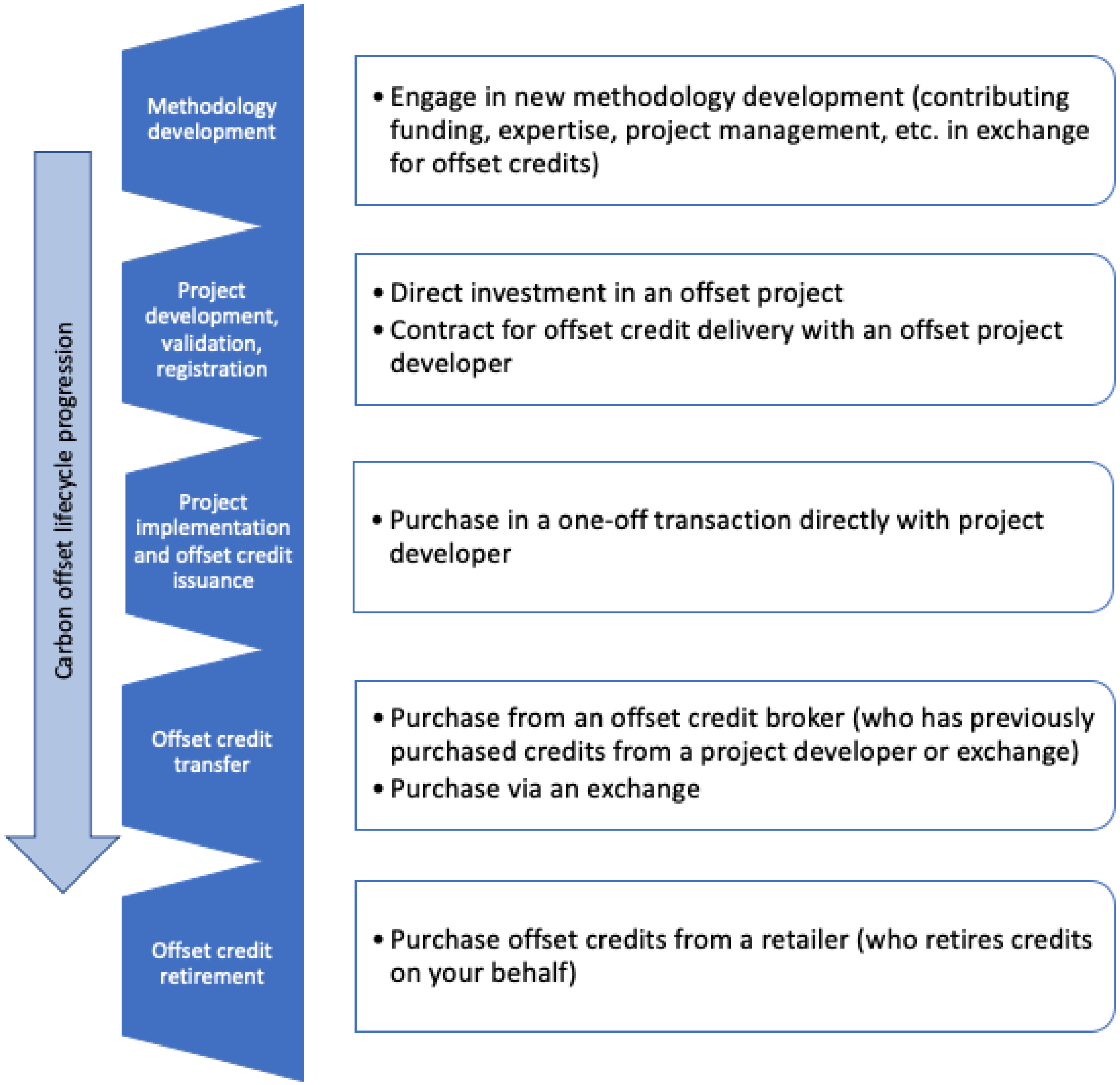
Another option is to purchase offset credits on an exchange. There are a number of environmental commodity exchanges – mostly in North America and Europe – that list carbon offset credits for sale and work with registries to enable transfers. Purchasing offset credits on an exchange can be relatively quick and easy, but it can be harder to obtain the information needed to evaluate the quality of these credits.

5. Offset credit retirement. Offset credit holders must "retire" carbon offset credits in order to use them and claim their associated GHG reductions towards a GHG reduction goal. Retirement occurs according to a process specified by each carbon offset program's registry. Once an offset credit is retired, it cannot be transferred or used (meaning it is effectively taken out of circulation).

Purchasing options: For buyers looking to acquire only a small number of offset credits (such as small companies or individuals), the most feasible option is to go through a retailer. Retailers can provide access to offset credits from a range of different projects, and will provide at least basic information about those projects. In most cases, the retailer will maintain accounts on carbon offset program registries, and will retire offset credits directly on a buyer's behalf.

Learn more about how to acquire carbon offsest credits

Figure 2. Carbon offset credit lifecycle and buyer purchase options at each stage



2.5 THE ROLE OF OFFSETS IN CARBON MANAGEMENT STRATEGIES

In principle, carbon offset credits offer a convenient and cost-effective way to reduce GHG emissions. Often, this means offset credits are used to compensate for (or "offset") an organization's GHG emissions, in lieu of reducing those emissions directly. For example, since most organizations find it impractical to completely eliminate their carbon footprint using only internal measures, carbon offsets offer the only practical way to claim "carbon neutrality." If your organization pursues carbon neutrality, however, it should still seek to use carbon offsets sparingly (Section 2.5.1).

In the future, international policy efforts could make it more difficult for organizations to establish valid voluntary offset claims (see Section 2.5.2). This could change how most buyers approach the use of offset credits. Instead of offsetting GHG emissions, for example, credits may be used to indicate an organization's charitable contribution to external climate change mitigation efforts. One indication of this shift in thinking is the increasing use of the term "carbon credit" rather than "offset credit" to refer to the commodity being purchased. In this guide, we continue to use the term "offset credit" since the underlying principles involved remain the same.

2.5.1 ACHIEVING CARBON NEUTRALITY

Carbon neutrality refers to achieving a net carbon footprint of zero.[9] The term is often applied to an entire organization (or committed individual), but can also be applied to a product or activity (such as air travel). Since it is not possible for most organizations or individuals to completely eliminate all GHG emissions associated with their activities and products, carbon neutrality is typically premised on the idea of using external GHG reductions to balance emissions that cannot readily be eliminated. Carbon offset credits are the primary tool for achieving such reductions.

Carbon neutrality goals are growing in popularity, and on their face are highly ambitious. Achieving "net zero" emissions by 2050, for example, is increasingly seen as the benchmark for a "science-based" GHG reduction target.[10] One risk, however, is that carbon neutrality can mask what is ultimately required to avert climate change. Given their ease of use, it can be tempting to rely on carbon offsets as a primary means for meeting a carbon neutrality goal. In fact, as originally conceived, carbon offset credits were seen primarily as a way to lower the cost of meeting a particular GHG target, including carbon neutrality.

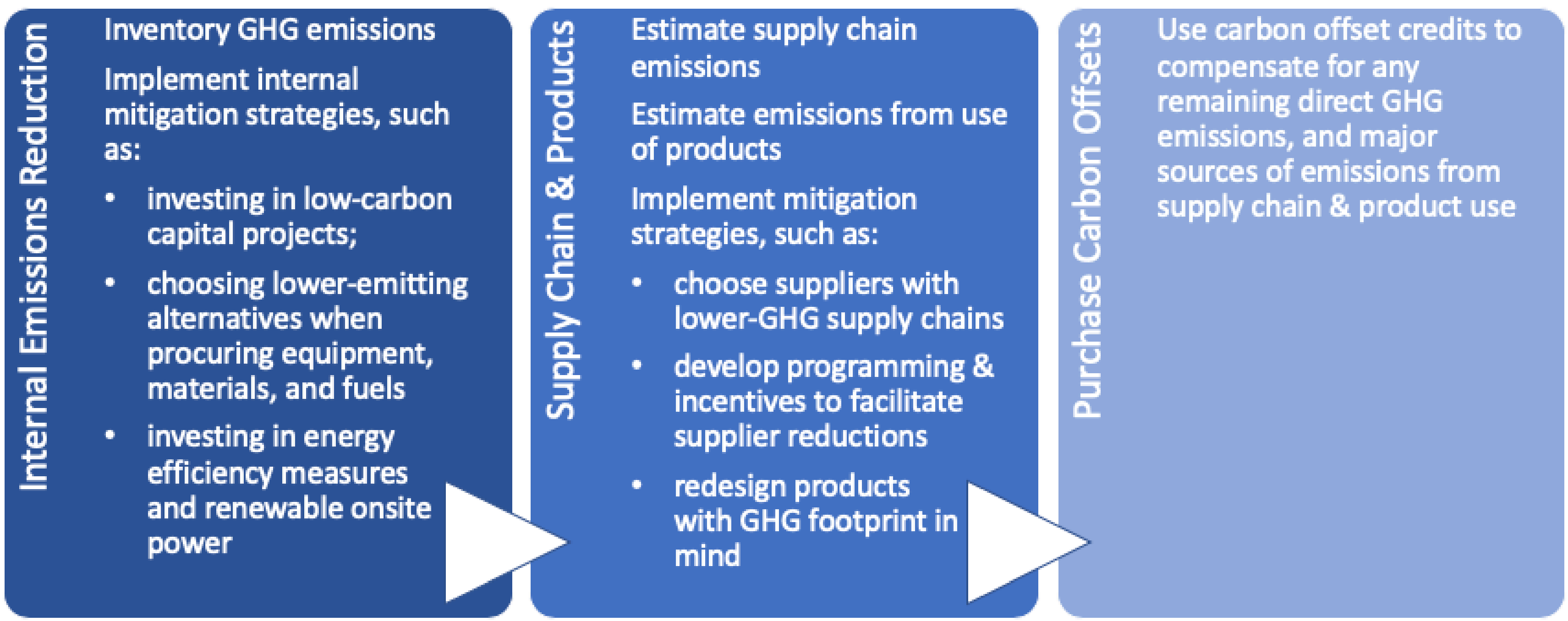
Under current circumstances, this approach to using carbon offsets would be a mistake. Collectively, all CO_2 emissions from burning fossil fuels must cease altogether well before the end of the century: there will be little room for anyone to "net out" their emissions using someone else's GHG reductions. Thus, although the idea of achieving zero net emissions is compelling and even necessary, the focus should be on reducing GHG emissions directly (and dramatically) in line with global mitigation goals. Arguably, organizations should only use carbon offsets on top of efforts to reduce their own emissions to near-zero by 2050.

A basic strategy would look like the following (Figure 3):

- Inventory your company's GHG emissions.[11]
- Implement internal mitigation strategies in line with global goals (for example, halving CO_2 emissions by 2030, and achieving net-zero emissions by 2050).
- Reduce supply chain emissions, such as by selecting suppliers with lower-GHG supply chains, and emissions from the use of consumer products, such as by designing energy-efficient products.
- Use carbon offset credits to cover any remaining GHG emissions from sources your organization owns or controls, and if possible, from your supply chain and product use.

Achieving carbon neutrality

Figure 3. Steps to achieving carbon neutrality



2.5.2 CARBON OFFSETS AFTER 2020: THE WORLD UNDER PARIS

The practice of carbon offsetting has arisen in a world where far too little is being done to address climate change. At a global level, relatively few organizations have taken meaningful action to reduce GHG emissions. As a result, for companies committed to taking action, it has not been hard to find low-cost carbon offsets. The potential supply of GHG reductions is huge, because there are so many sources of GHG emissions that face no legal or economic incentives to reduce.

The 2015 Paris Agreement could change this. For the first time, nearly every country in the world has identified explicit actions (i.e., "contributions") they agree to make to reduce GHG emissions and adapt to climate change. This approach is a major change from the Kyoto Protocol, where only industrialized countries committed to reduce emissions. Under Kyoto, offsetting was an explicit and prominent strategy: industrialized countries could fund offset projects in developing countries, providing them with needed investment and promoting sustainable development. In exchange, industrialized countries could more cheaply meet their obligations, by claiming the reductions achieved by these projects. Developing countries benefited from such an exchange, because they faced no obligations themselves and therefore gave nothing up in allowing emission reductions to be "transferred."

The Paris Agreement complicates this older picture considerably. The fact that every country has agreed to reduce emissions means there will be fewer opportunities for additional reductions – i.e., reductions that go beyond what countries have pledged (and would otherwise not happen in the absence of a carbon offset market - see Section 4.1). This does not mean the end of carbon offsetting. In fact, Article 6 of the Paris Agreement explicitly recognizes the possibility for international cooperation through the transfer of emission reductions. However, if a country allows an emission reduction to be claimed by another party (either another country or some other entity), it should no longer be able to count the reduction towards its own GHG target. The Paris Agreement has language expressly prohibiting such "double counting" among countries.

Currently, it is envisioned that double counting will be avoided through "robust" accounting methods (the language used in Article 6). Specifically, if a country transfers an emission reduction, it will adjust its GHG balance sheets so that the reduction is not counted toward its pledged "contribution," while a country receiving the transfer can apply the reduction to its own GHG balance sheet.[12] Similar accounting will likely be done for emission reductions funded by the international aviation industry, which has pledged to offset any increase in its GHG emissions after 2020.[13] In principle, the same methods could be applied to backstop claims for carbon offset credits purchased by private voluntary buyers.

Players in the voluntary carbon offset market are still sorting out what this will all mean. [14] Whatever happens, the criteria for what makes a quality credit will not change. In the remainder of this guide, we highlight some common concerns about carbon offset credits, explain the essential criteria for a "high quality" offset credit, and indicate what buyers can do to avoid lower-quality credits.

Air travel and climate

3. COMMON CRITICISMS OF CARBON OFFSETS

Carbon offsets are frequently criticized by the press and some environmental advocates. Some observers object to "market-based" approaches for solving environmental problems, and oppose carbon offsets on that basis. Even those who are open to such approaches, however, often have reservations about carbon offsets. Their concerns fall into two categories:

- How carbon offset credits are used
- The quality of carbon offset credits

Some criticisms are more valid than others, but many have at least some validity and are important for buyers of carbon offset credits to keep in mind.

3.1 CONCERNS ABOUT HOW OFFSET CREDITS ARE USED

Examples of criticisms:

- "Carbon offsets allow polluters to go on polluting" (i.e., they are a form of "greenwashing")
- "Carbon offsets are not a long-term solution and can 'lock in' high-carbon infrastructure"
- "Carbon offsets create an incentive to avoid regulating certain sectors and industries"

These kinds of criticisms are not so much about whether carbon offsets are a valid form of climate change mitigation, but rather whether they create "perverse" incentives. Carbon offsets were conceived as a way to facilitate investment in cost-effective mitigation options that organizations would otherwise not be able to access. The temptation, however, can be for organizations to use carbon offset credits to achieve all (or large parts) of their GHG reduction goals, rather than make the investments needed to significantly reduce their own carbon footprint. The counterproductive result can be that they continue to pursue high-emitting activities – and invest in high-emitting equipment and facilities – effectively "locking in" higher emissions over the long run. This concern is the primary reason that many observers advocate for treating carbon offsets as a complement to aggressive internal climate action, not a primary means of mitigation.

Another possible perverse incentive created by carbon offsets is to discourage needed regulation.[15] Regulations that require GHG reductions could deprive project developers of revenue from selling offset credits, because the reductions would no longer be "additional" (see Section 4.1). Project developers would likely resist such regulatory changes. From a climate policy perspective, therefore, carbon offsets have been viewed as an interim solution — a way to accelerate action in the near term, but one that must ultimately (and explicitly) be replaced by more comprehensive policy action in the future.

3.2 CONCERNS ABOUT CARBON OFFSET QUALITY

Examples of criticisms:

- "Carbon offset credits do not represent valid GHG mitigation; if they are used as a substitute for real climate action, they only make climate change worse."
- "Carbon offset projects have adverse impacts on local communities and may make other environmental problems worse."

These criticisms are probably the most immediate concern for most offset credit buyers. Carbon offset credits are of little use in mitigating climate change if they are not a valid substitute for an organization's own internal GHG reductions. Unfortunately, despite the efforts of carbon offset programs, a number of independent studies have identified serious problems with some carbon offset credits. For example, studies of the world's two largest offset programs – the Clean Development Mechanism (CDM) and Joint Implementation (JI), both administered by the United Nations under the Kyoto Protocol – suggest that up to 60-70% of their offset credits may not represent valid GHG reductions.[16] Other critiques have highlighted instances of carbon offset projects that harmed local communities or resulted in broader environmental damage.[17] An official report commissioned by the United Nations in 2012 catalogued many of the CDM's shortcomings and identified areas of potential improvement.[18]

These critiques are troubling and should give pause to prospective buyers of offset credits. Major carbon offset programs, however, have responded to at least some of the concerns raised by these studies.[19] These responses include amending quantification methodologies to prevent over-estimation of GHG reductions,[20] as well as reconsidering the eligibility of certain project types.[21] Nevertheless, it is still wise to approach the carbon offset market with healthy scepticism.

Some species, such as bamboo, may rapidly sequester carbon, but planting non-native or invasive species of plants can lead to damaging outcomes. Photo source: Misha FroLove/Bigstockphoto.com

Buyers can employ a number of strategies to improve their likelihood of acquiring higher-quality offset credits. In the next section, we explain the essential elements of a "high-quality" carbon offset credit and indicate some basic questions buyers can use to vet potential purchases. In Section 5, we provide some general strategies for avoiding "low-quality" offset credits.

Concerns about carbon offset quality

4. WHAT MAKES A HIGH-QUALITY CARBON OFFSET?

The central idea behind a carbon offset is that it can substitute for GHG emission reductions that an organization would have made on its own. For this to be true, the world must be at least as well off when you use a carbon offset credit as it would have been if you had reduced your own carbon footprint.[22] **When people talk about the "quality" of a carbon offset credit, they are referring to the level of confidence one can have that the use of the credit will fulfil this basic principle.**

This concept- **frequently referred to as preserving "environmental integrity"**- sounds straightforward, but it is challenging to guarantee in practice. Quality has two main components. First and foremost, a quality offset credit must represent at least one metric tonne of additional, permanent, and otherwise unclaimed CO_2 emission reductions or removals. Second, a quality offset credit should come from activities that do not significantly contribute to social or environmental harms.

A variety of terms are frequently used to define quality criteria for carbon offsets, including that associated GHG reductions must be "real," "quantifiable," and "verifiable." Most of these terms have their origin in regulatory criteria established for air pollutant credits under the U.S. Clean Air Act (going back to 1977). However, these terms have distinct regulatory meanings under U.S. law that do not always translate meaningfully to carbon offsets. The term "real," for example, has no commonly agreed definition across carbon offset programs and standards, and is often used as a vague catch-all. [23]

For this guide, therefore, we have distilled the essential elements of carbon offset quality down to five criteria. In short, quality carbon offset credits must be associated with GHG reductions or removals that are:

- Additional
- Not overestimated
- Permanent
- Not claimed by another entity
- Not associated with significant social or environmental harms

Carbon offset programs were created with the intention of ensuring the quality of carbon offset credits (Section 2.3). In the remainder of this section, we describe the approaches carbon offset programs use to address the quality criteria listed above. As indicated in Section 3, however, many observers believe that carbon offset programs have a mixed track record. Part of the challenge is that offset quality is not black and white. The multiple criteria involved – plus the fact that critical criteria like "additionality" are a matter of confidence rather than absolute truth (see below) – means that quality exists along a continuum. Carbon offset programs, by contrast, are forced to make a binary decision: do they issue an offset credit or not? Most carbon offset programs will say that every credit they issue is equally valid, but buyers should feel justified in questioning this assertion. Think of scoring the quality of an offset on a 100-point scale. A carbon offset program may decide to issue credits for every GHG reduction that exceeds a score of 50. But as a buyer, is a score of 51 really "good enough"?[24]

Astute buyers will understand this difficulty and actively seek out higher quality offset credits. For each offset quality criterion below, we highlight some questions that buyers can ask about specific offset projects to better ascertain their relative quality. Even for sophisticated buyers, however, getting detailed answers to these questions may be difficult. Thus, in Section 5, we identify a range of strategies buyers can use to steer clear of lower quality offset credits and improve the chances of acquiring higher-quality credits.

Tree planting carbon offset projects can provide many co-benefits to local communities. Image credit: The international small group and tree planting program.

4.1 ADDITIONALITY

GHG reductions are additional if they would not have occurred in the absence of a market for offset credits. If the reductions would have happened anyway – i.e., without any prospect for project owners to sell carbon offset credits – then they are not additional. Additionality is essential for the quality of carbon offset credits – if their associated GHG reductions are not additional, then purchasing offset credits in lieu of reducing your own emissions will make climate change worse.

Evaluating whether GHG reductions are additional can be deceptively difficult. The challenge is that GHG-reducing activities occur all the time.[25] Sometimes this is because the activities are required by law. Landfill operators in California, for example, are required to install equipment that captures and destroys methane. In other cases, investments that reduce emissions are made simply because they are profitable, without any consideration of carbon offset credits. An investment in energy-saving lighting, for example, can pay for itself through avoided energy costs. Similarly, renewable energy technologies, like wind and solar, are increasingly cost competitive with fossil fuels, without revenue from carbon offset sales. For an activity or project to be additional, the possibility to sell carbon offset credits must play a decisive ("make or break") role in the decision to implement it.

Additionality is a topic about which there is frequent misunderstanding. One commonly heard claim, for example, is that a project can be considered additional if GHG emissions are lower than they would have been "in the absence of the project." This is incorrect. If a project would have been pursued without the sale of carbon offset credits, it is not additional, even if it reduces emissions below what they would have been in the project's absence. It is also common to hear discussion of different "kinds" of additionality, using terms like "financial additionality" or "regulatory additionality," as if these are distinct concepts. In fact, the only definition of additionality relevant to offset quality is the one presented here. Legal and financial considerations come into play when making determinations about additionality, but are not separate benchmarks for what it means for GHG reductions to be "additional."

Furthermore, while additionality is the most essential ingredient of carbon offset quality, its determination is subjective. Additionality is frequently talked about in binary terms: a GHG reduction is either additional or it is not. In practice, however, determining whether an activity is additional requires comparing it to a scenario without revenue from the sale of carbon offsets. Such a scenario is inherently unknowable, and must be determined using educated predictions (such as about future fuel, timber, or electricity prices). The determination can also fall prey to "information asymmetry": only a project developer can say whether the prospect of selling carbon offset credits was truly decisive, but regardless of the truth, every project developer has an incentive to argue that it was. **In light of these uncertainties, it best to think of additionality in terms of risk: how likely is a project to be additional?**

Additionality

4.1.1 HOW CARBON OFFSET PROGRAMS ADDRESS ADDITIONALITY

Carbon offset programs have developed two main approaches to determining the additionality of a project: "project-specific" and "standardized." Each of these approaches has strengths and weaknesses.

Renewable energy carbon offset projects like this wind farm, must be highly scrutinized for their additionality and the role of potential offset revenue incentivizing the project to occur. Image credit: Los Santos Wind Power Project.

Project-specific approaches rely on an analysis of an individual project's characteristics and circumstances to determine whether it is additional. For example, they may involve:

- A demonstration that the proposed project activity is not legally required (or that non-enforcement of the legal requirements is wide-spread); and
- An "investment analysis" of whether the project is financially attractive in the absence of offset credit revenues; and/or
- A "barriers analysis" demonstrating that at least one alternative to the project would not be prevented by (non-financial) implementation barriers (e.g., social, institutional, or technical barriers); and
- A "common practice analysis" demonstrating that the proposed project is not common practice, or is distinct from similar types of activities that are common practice.

Project-specific approaches can be effective when applied rigorously, but can also be time consuming. Moreover, they often require subjective judgments (such as in the evaluation of financial parameters or the identification of barriers) and strongly hinge on uncertain assumptions about the future (such as fuel prices). It is often challenging for offset program staff and verifiers to judge whether project developers are biasing these assumptions in their favor. All voluntary carbon offset programs rely heavily on project-specific approaches, except for the Climate Action Reserve (CAR).

"Standardized" approaches to determining additionality were developed in response to the perceived shortcomings of project-specific approaches. A standardized approach evaluates projects against a set of pre-determined eligibility criteria (e.g., performance benchmarks that—in principle—distinguish additional from non-additional projects). Standardized approaches require upfront analysis to establish these eligibility criteria. Their main advantages are that they can reduce the administrative burdens of making additionality determinations, and they reduce elements of subjectivity in assessing projects. Their main drawback is that they may be imprecise in distinguishing additional and non-additional projects. Of the major voluntary carbon offset programs, the CAR has been the primary adopter of standardized approaches,[26] although other programs (e.g. VCS) apply them to some project types.

For many project types, it can be difficult to define objective criteria that reliably screen out non-additional projects, while not mistakenly excluding truly additional projects. Consequently, standardized approaches are available for a smaller set of project types. For example, CAR, which uses a standardized approach, has adopted less than 20 protocols, in contrast to the VCS and Gold Standard, which incorporate over 200 project-specific methodologies/protocols.

4.1.2 QUESTIONS FOR BUYERS TO ASK ABOUT ADDITIONALITY

None of the program-administered screens for additionality are perfect. Some key questions to avoid lower quality projects include the following:

- Did the project secure a buyer for offset credits before implementation? Given the risks and uncertainties of the carbon market, it is rare for a project that truly needs offset credit revenue to go forward without first securing buyers for some or all of the credits it expects to produce. Forward contracts generally take the form of "emission reduction purchase agreements" (ERPAs). Although there are exceptions, if a project began implementation without an ERPA, its claims to additionality should be further examined.
- How large is the project's offset credit revenue stream compared to other revenue streams or cost savings achieved by the project? Claims of additionality are often tenuous if carbon offset revenues constitute a small portion of a project's total revenues. For example, if 95% of the total revenues for a renewable energy project derive from electricity sales and only 5% are from offset credit revenue, the project's additionality should be questioned.
- Would the project cease reducing emissions if it did not continue to receive carbon offset revenues? Even if a project's offset credit revenue is comparable to (or greater than) other revenue streams, those other revenues may be sufficient to cover costs – meaning that the project may continue reducing emissions even if it stopped selling carbon offset credits. While such projects are not necessarily non-additional -- the decision to implement the project, for example, may still have been based on the prospect of carbon offset sales – they may pose a higher risk of being non-additional.

Sometimes GHG reduction activities are required by law. Landfill operators in California, for instance, are required to install equipment that captures and destroys methane. Photo source: Panaramka/ Bigstockphoto.com

- If the project is not (currently) legally required, is there reason to believe that it is being undertaken in anticipation of future legal requirements (or to avoid triggering such requirements in the future)? Programs may differ in the extent to which they examine prospective legal requirements. For example, a landfill gas flaring project may not be currently required by law, but landfill owners may seek to implement such a project anyway if they anticipate being mandated to control landfill emissions in the future (e.g., as the landfill grows to where it exceeds a regulatory size threshold). Thus, they could claim that the project is additional today, even though it would be implemented anyway in the (near) future.

4.2 AVOIDING OVERESTIMATION

Suppose that, for every 50 additional tonnes of CO_2 that are reduced by an offset project, the project developer reports reducing 100 tonnes, and 100 offset credits are then issued to the project. Half of these credits would have no effect in mitigating climate change, and using them in lieu of reducing your own emissions would make climate change worse. Overestimation of GHG reductions can occur in several ways:

- Overestimating baseline emissions. The first – and most subtle – way GHG reductions can be overestimated is if a project's baseline emissions are overestimated. Baseline emissions are the reference against which GHG reductions are calculated, and are closely tied to additionality: they are the emissions that would have occurred in the absence of demand for offset credits.[27] Baselines are easier to determine for some types of projects than others. For a project that captures methane from a landfill and destroys it, the amount of methane that would have been emitted is generally equal to the amount that is captured and destroyed.[28] In contrast, there can be much greater uncertainty when estimating how many GHG emissions will be displaced on an electricity grid by a solar power project – leading to greater risk of overestimation if methods are not appropriately conservative.
- Underestimating actual emissions. Many kinds of carbon offset projects reduce, but do not eliminate, GHG emissions. A project's GHG reductions are quantified by comparing the actual emissions that occur after the project is implemented to its predicted baseline emissions. In the same way that baseline emissions can be overestimated, actual emissions can be underestimated – with both contributing to an overestimation of GHG reductions. One way actual emissions can end up underestimated is through measurement error. For example, determining the increase in the amount of carbon stored in trees in any given year is subject to measurement uncertainty, and sampling errors can lead to overestimating carbon sequestration (the equivalent of underestimating GHG emissions).
- Failing to account for the indirect effects of a project on GHG emissions (aka "leakage"). To quantify GHG reductions, actual and baseline emissions are determined for sources (or sinks) affected by a project. Often, however, a project will have both intended and unintended effects on GHG emissions. If quantification methods fail to account for GHG emission increases caused by the project at some sources (even indirectly), then the total net GHG reductions will be overestimated. Unintended increases in GHG emissions caused by a project outside of its boundaries are referred to as "leakage." The classic example is a forest preservation project that avoids the emissions caused by clearing one parcel of forest, but ends up shifting the production of timber through deforestation to other areas.
- Forward crediting. Although rare, offset credits may be issued for GHG reductions that a project developer expects to achieve in the future. Such "forward crediting" is usually problematic, because it can lead to an over-issuance of offset credits if a project fails to perform as expected.[29] It can also pose issues if future events (e.g., regulatory changes) lead to additionality or emission reduction ownership concerns.

Finally, to control for all these possible causes of overestimation, it is important to monitor and verify a project's performance.[30] It is important for measurement and data collection procedures – and for any calculations or estimates derived from these data – to be scientifically sound and methodologically robust. Furthermore, it is important for project monitoring data to be rigorously verified. Verification entails assessing the veracity of data provided by project developers, often through an audit of selected data samples. Carbon offset project developers have an incentive to report data that maximize the number of carbon offset credits they can sell. Verification helps to assure that reported data are accurate and do not overstate GHG emission reductions.

Forestry-based offset projects have the potential to shift deforestation from the project location to unprotected areas causing project leakage to occur. Image credit: Biofilica Resex Rio Preto – Jacundá REDD+.

4.2.1 HOW CARBON OFFSET PROGRAMS ADDRESS OVERESTIMATION

Carbon offset programs try to ensure that GHG reductions are not overestimated by requiring the use of detailed quantification methods specific to individual project types. In general, these methods prescribe:

- GHG accounting boundaries that define the GHG sources and sinks that must be considered in quantifying a project's baseline and actual GHG emissions. [31]
- Baseline emission estimation methods that prescribe how a project's baseline scenario is defined, including acceptable assumptions regarding baseline technologies and practices.
- Monitoring requirements that prescribe the data to be collected for predicting baseline emissions and quantifying a project's actual emissions. These methods also specify how to conduct measurements, what kinds of estimates are acceptable, and what calculation formulas must be used. [32]

Importantly, carbon offset programs require verification by independent, third-party verifiers, who check that projects have properly applied prescribed quantification methods (see Box 2). In most cases, offset credits are only issued after GHG reductions or removals have already occurred and been verified.

Finally, offset programs also limit the crediting periods during which projects can generate creditable GHG reductions. Crediting periods are typically from 7 to 10 years, which is often shorter than the operational lifetime of a project's equipment. Programs generally allow crediting periods to be renewed (usually one or two times, depending on project type), as long as a project remains eligible under its standard. [33]

Box 2. What do carbon offset project verifiers do?

Third-party verifiers have two main responsibilities in the context of a carbon offset program. First, they perform project validation, which entails confirming that a proposed project meets a program's eligibility criteria. Second, verifiers conduct project verification, which entails confirming that project monitoring data was collected in accordance with a program's requirements, as well as reviewing calculations to confirm that the project's GHG reductions were estimated according to the approved methodology/protocol.[34] The verification process usually involves a site visit combined with auditing (or sampling) of monitoring data to confirm with "reasonable assurance" that the data are accurate.

Verifiers are generally paid by project developers, which creates a conflict of interest. To reduce the risk of bias, most carbon offset programs review verification arrangements, require verifiers to legally certify that they are free of conflicts, and limit the number of times that the same verifier can verify a project. Programs also regularly audit the work of verifiers to ensure their objectivity.

4.2.2 QUESTIONS FOR BUYERS TO ASK ABOUT OVERESTIMATION

Examining in detail how a project's GHG reductions were quantified can be difficult and time-consuming. However, two relatively straightforward questions can point to areas of potential risk:

- Does the project apply any deviations from the protocol/methodology and appropriately justify these deviations? Several carbon offset programs allow projects to deviate from a protocol's requirements if the project developer can justify an alternative approach to program staff. Deviations are often temporary, and typically involve situations where a project is not able to produce monitoring data according to prescribed methods, but is able to estimate them using alternative methods. Programs will generally try to ensure that alternative methods are more conservative than what a protocol prescribes. Offset credit buyers may nevertheless wish to review cases where a deviation was applied for and approved.
- Are there any gaps or other discrepancies in project monitoring data, and have these discrepancies been properly explained and addressed? Major carbon offset programs have rules and procedures to address gaps or discrepancies in project monitoring data (for example, if a flow meter temporarily breaks down and fails to collect data for a period of time). Such instances should be transparently reported, along with methods to address them. If monitoring reports and relevant data are not available and easily accessible (usually online), this lack of transparency should raise concerns about overestimation.

4.3 PERMANENCE

One challenge with using carbon offsets to compensate for CO_2 emissions is that the effects of CO_2 emissions are very long-lived. Most of the carbon in a tonne of CO_2 emitted today will – eventually – be removed from the atmosphere. However, around 25% remains in the atmosphere for hundreds to thousands of years.[35] To compensate for this, offset credits must be associated with GHG reductions that are similarly permanent. If a GHG reduction or removal is "reversed" (i.e., GHGs are subsequently emitted so that no net reduction occurs),[36] then it no longer serves a compensatory function.

For most kinds of carbon offset projects, reversals are either physically impossible or extremely unlikely.[37] The greatest risk occurs with projects that store carbon in "leaky" reservoirs. The classic example is a forestry project that keeps carbon in trees and soils (and adds to those carbon stores over time, as the forest grows). Such a project will reduce CO_2 emissions – and increase removals – if the trees would have been cut down otherwise. But, if a fire later burns down the project's trees, some or all of the carbon may be (re)emitted, leading to a reversal.

One common misunderstanding is that – for carbon offsets – "permanent" means something less than hundreds or thousands of years. A standard convention, for example, is that carbon only needs to be kept out of the atmosphere for 100 years (or less, in some cases) to be considered "permanent." Such compromises are frequently made in the context of carbon offset programs seeking to balance technical requirements with the practical constraints of insuring against reversals. But, scientifically, anything less than a full guarantee against reversals into the indefinite future is not "permanent."

4.3.1 HOW CARBON OFFSET PROGRAMS ADDRESS PERMANENCE

Most carbon offset programs have established "buffer reserves" to address the risk of GHG reductions being reversed. [38] Under this approach, offset credits from individual projects are set aside into a common buffer reserve (or "pool"), which functions as an insurance mechanism. Reserved credits can be drawn upon to compensate for reversals from any project. If a reversal occurs, credits are retired or cancelled from the buffer reserve on behalf of the project's buyers. The number of credits a project must contribute to the buffer reserve is usually based on an assessment of the project's risk for reversals. Over finite time periods, this approach can fully cover catastrophic losses affecting individual projects, as long as the buffer reserve is sufficiently stocked with credits from projects across an entire program.

Carbon offset programs also encourage – or require – projects to reduce the risk of reversals. Some programs, for example, allow lower buffer reserve contributions if project developers implement risk mitigation measures (such as fuel treatments, and the use of conservation easements or other legally binding restrictions on land use). Other programs make reversal risk mitigation a requirement for eligibility.

Buffer reserves can effectively compensate for reversals due to natural disturbance risks—such as fire, disease, or drought affecting forests and soils. However, they present a "moral hazard" problem if used to compensate for human-caused reversals, such as intentional timber harvesting. [39] If a landowner faces no penalty for harvesting trees for their timber value, for example – because any reversals caused by harvesting would be compensated out of a buffer reserve – then the landowner could face a strong incentive to harvest. Offset programs approach this issue in different ways. Some programs use buffer reserves only to compensate for natural disturbances, and impose contractual obligations on landowners to compensate for any “avoidable” reversals (including reversals due to negligence or willful intent). Others will cover such reversals using buffer reserves, but will not issue further offset credits to a project until the reversal is remedied.

4.3.2 QUESTIONS FOR BUYERS TO ASK ABOUT PERMANENCE

No reversal risk can be insured against in perpetuity. Over the very long run, the chance of reversal for projects that store carbon in trees and soils approaches 100%. Buyers should keep this in mind when considering offset credits from these kinds of projects. As a rule of thumb, if your goal is strictly to offset GHG emissions, avoiding reversible GHG reductions altogether is the safest approach. However, addressing emissions from agriculture, forestry, and land use is critically important for mitigating climate change globally – and these kinds of projects often have desirable co-benefits. If your primary goal is to contribute to mitigation efforts (not offset per se), then purchasing credits representing additional GHG reductions from these projects can be a great choice.

Assuming some risk of reversibility is acceptable, questions for buyers to consider include:

- Does the project have a formal plan for managing and reducing reversal risks, and is this plan being followed? Higher quality carbon sequestration projects will have management plans in place to lower the risk of reversals. These plans may cover physical measures like thinning or other treatments to reduce the risks of fire and disease in forests; financial management practices to reduce risk of project failure or bankruptcy; and/or easements, legal restrictions, or other measures to guard against over-harvesting or land conversion. Projects with strong plans, along with implementation and enforcement provisions, are likely to have higher quality offset credits.
- How long is “permanence” guaranteed by the offset program that issued the credits? Offset programs differ significantly in terms of the length of time that they will guarantee compensation for reversals. The majority do so only through the end of a project’s lifetime, which under some programs may be as short as 10 years. Other programs offer a minimum guarantee of 100 years from the time a credit is issued. Offset programs are not always transparent about what their minimum guarantee is, so it is worth inquiring either with project proponents or directly with program staff. The longer the guarantee, the higher the relative quality of the offset credits.

4.4 EXCLUSIVE CLAIM TO GHG REDUCTIONS

Carbon offset credits must convey an exclusive claim to GHG reductions. Imagine if two different companies laid claim to the same 100 tonnes worth of CO_2 reductions. Together they would claim a total of 200 tonnes of reductions, but the actual reduction would only be 100 tonnes. Again, climate change would be made worse, compared to a situation where both companies simply reduced 100 tonnes of their own emissions. This type of "double counting" can happen in three ways:[40]

- **Double issuance** occurs if more than one offset credit is issued for the same GHG reduction. For example, a carbon offset program can mistakenly issue two credits to the same project for one tonne of CO_2-equivalent reductions. More likely, however, is that a program issues credits to two different projects, each of which claims the same reduction. An example would be if both the producer and consumer of biofuels claim GHG reductions associated with using the same liters of fuel – and a program issues offset credits to both of them without realizing the overlap. Established carbon offset programs are generally good at avoiding this error within their system, but a somewhat greater risk is that two different programs issue offset credits for these kinds of overlapping claims (not realizing that another program has recognized the same reductions).
- **Double use** occurs if two different parties count the same offset credit towards their GHG reduction claims. Again, most carbon offset programs have procedures to prevent this from happening. The most likely way for it to occur is for an unscrupulous seller to represent to multiple buyers that the credit was retired on their behalf. To avoid such fraud, it is essential for carbon offset programs to require that the purpose of any offset credit retirement is clearly recorded in their registry systems – including on whose behalf the retirement was made.
- **Double claiming** can happen if offset credits are issued to a project, but another entity (e.g., a government or private company) then counts the same GHG reductions towards its own GHG reduction goal. For example, double claiming would occur if an energy efficiency project obtains offset credits for reducing emissions at a power plant covered by a (regulatory or voluntary) emission reduction target. In this case, both the project and the power plant would claim the same reduction: the project through offset credits, and the power plant, through a reduction of emissions relative to its target. Such overlapping claims must be carefully avoided. As described in Section 2.5.2, a potentially significant double claiming issue could arise under the Paris Agreement. Specifically, unless governments agree not to count an offset project's GHG reductions towards their national mitigation targets, the reductions will effectively be double claimed.

4.4.1 HOW CARBON OFFSET PROGRAMS ADDRESS EXCLUSIVE CLAIMS

Carbon offset programs apply a number of methods to ensure that offset credits convey an exclusive claim to GHG reductions.

Double issuance is avoided primarily by:

- Ensuring that offset credits are only issued after program approval of emission reduction verification reports and other supporting documentation;
- Checking that the accounting boundaries used to quantify GHG reductions for different projects do not overlap
- Actively monitoring project registrations – including at other programs—to check that a project is not issued credits by more than one program for the same emission reductions[41]

Double use is avoided primarily through registry systems that assign unique serial numbers to individual offset credits, track their transfer and ownership, and record the purpose of their use and retirement.[42]

Double claiming is avoided though:

- Restricting the eligibility of project types (e.g., excluding those are known to be subject to GHG reduction mandates or competing claims); and/or
- Requiring project developers to sign legal attestations asserting exclusive claims to any credited emission reductions, and agreeing to legally convey such claims to the buyers of offset credits.

Offset programs are still deliberating on how to reconcile competing claims for GHG reductions that are covered by countries' climate action pledges under the Paris Agreement (see Section 2.5.2).

4.4.2 QUESTIONS FOR BUYERS TO ASK ABOUT OWNERSHIP CLAIMS

Although carbon offset programs generally have effective measures in place to assure that the emission reductions are not double counted, there are still some steps that credit buyers should take to make sure they have an exclusive claim to emission reductions. Key questions to ask include:

- When offset credits are retired, is the purpose of the retirement clearly indicated in a carbon offset program registry? Buyers should ask to see proof of offset credit retirement on the relevant registry – including certificate numbers or a transaction ID that match the quantity purchased – along with a clearly identified purpose and the beneficiary of the retirement.
- Were the offset credits issued for indirect emission reductions? Ownership claims are harder to police where they involve indirect emission reductions (i.e., reductions that occur at sources not owned or controlled by the project owners). Claims to these emission reductions are inherently riskier because there is always a chance that the entities who do own or control the sources may claim the reductions as well. Major carbon offset programs generally try to prevent conflicting claims by having project owners legally attest to having an exclusive claim to credited reductions. However, it can be difficult (if not impossible) to determine exactly where indirect reductions occur, making the truth of such attestations difficult to verify. Where risks of double claiming seem significant (for example, if GHG reductions occur in sectors with significant voluntary commitments or regulatory obligations), buyers should avoid offset credits associated with indirect reductions (e.g., from projects that displace fossil fuel emissions on an electricity grid).

4.5 AVOIDING SOCIAL AND ENVIRONMENTAL HARMS

Finally, for a project to produce high quality offset credits, it should not significantly contribute to social and environmental harms. For example, a project should demonstrate it complies with all legal requirements in the jurisdiction where it is located. Depending on the type of project and the jurisdiction where it is located, however, additional reviews and safeguards may be necessary to guard against negative outcomes unrelated to GHG emissions.

Avoiding social and environmental harms

4.5.1 HOW CARBON OFFSET PROGRAMS ADDRESS SOCIAL AND ENVIRONMENTAL HARM

Carbon offset programs generally have environmental and social safeguard policies designed to reduce the risk of any detrimental effects from registered projects. Nearly all require (and verify) that projects are in compliance with applicable legal requirements. Most offset programs also require local stakeholder consultations as part of the project approval process, and have established grievance mechanisms to address complaints about projects after implementation. Finally, some programs actively require that projects demonstrate social and environmental co-benefits (and not just avoid harms), as well as monitor and report on these benefits.

There are a number of "add-on" certification schemes focused on the social and environmental impacts of carbon offset projects. Organizations like the Climate, Community & Biodiversity Alliance (CCBA) and SOCIALCARBON, for example, certify the added co-benefits achieved by offset projects (but do not otherwise address offset quality).

How carbon offset programs address social and environmental harms

4.5.2 QUESTIONS FOR BUYERS TO ASK ABOUT SOCIAL AND ENVIRONMENTAL HARMS

Asking the following questions can help reduce the risk of purchasing offset credits from harmful projects:

- Prior to implementation, did the project developers engage and consult with local stakeholders potentially affected by the project? Stakeholder consultation can be particularly important in developing countries, where there are often fewer regulatory safeguards. If stakeholder outreach was not undertaken, this failure should raise concerns, though the seriousness may depend on the type of project involved and where it is located. Some types of projects pose fewer risks to local communities than others.
- Has the project received any program or third-party certifications affirming its environmental or social co-benefits? Generally, such certifications (e.g., from the CCBA; SOCIALCARBON; or offset programs themselves) can provide added assurance that a project will not cause harm and ensure that project developers have taken into account the concerns

of local stakeholders. Projects that have not received any co-benefit certification do not necessarily pose a high risk of harms, but it may be useful to inquire with project developers about why they did not seek certification, if it was an option.

- What has the project done to minimize risks and reduce potential harm? Annex 1 (also available at offsetguide.org) contains a list of general project types and identifies those for which the risk of social or environmental harms may be significant. Where there is significant risk, it is crucially important to understand a project's specific circumstances, how it has addressed potential risks and the concerns of local stakeholders, and what mechanisms it has in place to both avoid harms and compensate for them if they occur. The CCBS, for example, requires ongoing community impact monitoring associated with forestry projects.

Domestic or foreign projects

Agriculture-based carbon offset projects can create job opportunities through increased management intensity. Image credit: The international small group and tree planting program.

5. STRATEGIES FOR AVOIDING LOWER-QUALITY OFFSET CREDITS

As the prior sections make clear, carbon offset credits are not a typical commodity. Although carbon offset programs provide some assurance, purchasing high quality offset credits is not as simple as buying any "certified" credit issued by an offset program. It is common to tell credit buyers to "do their homework," and indeed such advice is appropriate for organizations with the time and resources to do so. In this section, we describe both thorough and simpler strategies for steering clear of lower-quality offset credits.

5.1 VETTING OFFSET PROJECTS

As indicated in the prior section, buyers can ask basic questions about offset projects that may help screen out lower quality options. In most cases, project developers and offset credit owners should be forthcoming with answers to such questions (if they are not, it is a red flag). For more sophisticated buyers or those with more resources, a fuller list of offset project "due diligence" questions can be applied.

How do I conduct more rigorous project due diligence?

One option is to engage the services of consultants or trusted retailers to examine projects, navigate different options, and put together a portfolio of offset credits that meet a buyer's goals (with respect to location, project type, offset quality, and co-benefits, for example). It is often a good idea to work with someone who has a detailed understanding of the sectors or project types being considered, which in some cases could involve enlisting multiple experts.

5.2 STICKING TO LOWER-RISK PROJECT TYPES

Although many kinds of projects can deliver GHG reductions, some types of projects have a harder time meeting essential carbon offset criteria than others. It is generally easy to show that industrial gas destruction projects are additional, for example: as long as they are not required by law, there are few if any reasons to undertake them aside from generating carbon credits.[43] For many renewable energy projects, on the other hand, careful scrutiny is required to determine whether the prospect of carbon credit sales played a decisive role in their implementation (and even with such scrutiny, it can be hard to be certain – they are often on the margin of viability with energy sales revenue alone).

Perhaps the easiest way to reduce the risk of buying low-quality offset credits is to restrict purchases to credits that come from lower-risk project types. Annex 1 (also available at offsetguide.org) provides an overview of the relative offset quality risks associated with common types of carbon offset projects.

There are two potential drawbacks to this approach. First, as Annex 1 indicates, there are only a handful of project types that have low environmental integrity risks as a class. Second, the kinds of projects that can most easily meet environmental integrity requirements tend to be projects that offer the least in terms of environmental and social co-benefits – and vice versa. Often, a buyer must choose between a project type with lower quality risks and one with greater co-benefits. A project that avoids N_2O emissions at a nitric acid plant, for example, will generally be highly additional, easy to quantify, will pose no ownership or permanence concerns, and will not cause social or environmental harms – but it will do little to enhance people's livelihoods or otherwise improve the environment. An agroforestry project that sequesters carbon in trees across many small farms, on the other hand, may yield a multitude of local benefits – but its GHG impact will be harder to quantify, and the carbon stored in trees may not be permanent. These kinds of trade-offs can be observed in Annex 1, which also identifies project types that offer the greatest potential for social and environmental co-benefits.

5.3 "DISCOUNTING" OFFSET PURCHASES

One strategy to address quality risks is to simply retire extra offset credits. For example, to compensate for 100 tonnes of CO_2 emissions, a buyer could purchase and retire 200 offset credits from a range of different projects. This approach is commonly referred to as "discounting."[44]

Although this strategy does not address quality directly, it hedges against the risk that some offset credits may be associated with GHG reductions that are non-additional, over-estimated, non-permanent, or claimed by others. It can also help buyers focus on reducing their own emissions, since it effectively increases the cost of offsetting.

While discounting can be part of a responsible strategy for using carbon offsets, it should not be done in the absence of other methods to check for offset quality. Doubling the purchase of non-additional GHG reductions still contributes nothing to climate change mitigation!

Clean cookstoves reduce CO_2 through more efficient fuel usage while reducing indoor air pollution and providing financial savings to residents. Image (left) credit: Proyecto Mirador Enhanced Distribution of Improved Cookstoves in Latin America.

5.4 WEAKER METHODS: RELYING ON PRICE OR VINTAGE

In many markets, "cheap" is often synonymous with "low quality." Very cheap offset credits can indeed be a sign of low quality, especially for newer projects. If a project is selling offset credits for a price below US$1-2 per tonne (i.e., close to the transaction cost of getting a project developed, registered, and verified) then the case for additionality is probably weak; it can be hard to argue that the project truly depended on offset credit revenue for its implementation. However, some offset project types with high environmental integrity can produce GHG reductions at relatively low cost (e.g., industrial N_2O destruction or avoidance projects).

The inverse argument – that higher prices correlate with higher quality – is not reliably true either. Truly additional offset projects will have a higher intrinsic cost for generating GHG reductions, and will therefore need to charge a higher price for offset credits to be financially viable. However, there is nothing to prevent non-additional projects from also charging high prices, assuming they can find a gullible buyer. These projects may end up crowding out projects with higher actual costs. Looking only for higher-priced offset credits (without looking at other variables) is therefore not a wise strategy.

The "vintage" of an offset credit can refer either to the year in which it was issued, or the year in which its associated GHG reduction occurred (for some kinds of offset projects, there can be a significant lag between the latter and the former, because of longer verification cycles, e.g., with forestry projects). The vintage of an offset credit does not necessarily indicate anything about its quality.

However, older *issuance* vintages may present a quality concern where the following conditions are true:

- The offset credits under consideration have remained unsold for a long time; and/or
- The offset credits are being sold directly by the project developer, where the developer:
    - Did not contract with a dedicated offset credit buyer upfront (e.g., under an ERPA); and/or
    - Has carried forward a significant number of unsold offset credits; and
    - Has continued to operate the offset project for several years despite the lack of offset credit sales.

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You may email GHGMI at info@ghginstitute.org

ANNEX 1: OFFSET PROJECT TYPES AND RELATIVE QUALITY RISKS

Some types of carbon offset projects have an easier time meeting essential carbon offset criteria than others. In the following tables, we distinguish between "lower risk" project types, where individual projects will frequently meet all offset quality criteria, and other project types, where more caution may often be necessary. For each project type, we indicate in the tables whether meeting a particular criterion could be relatively difficult and may therefore be of particular concern when considering an offset credit purchase. In Tables 3-5, if a cell is left blank, then the criterion is not a major concern for that project type.

Table 2. Relative offset quality risk for different project types

Lower risk	Medium risk	Higher risk
• CO_2 usage • Methane destruction (w/o utilization) • N_2O avoidance from nitric acid production • N_2O – adipic acid* • Ozone-depleting substance (ODS) destruction	• Methane capture and utilization • Methane avoidance • Energy distribution • Energy efficiency, household demand side • PFCs & SF_6 avoidance/ reuse • Renewable energy, small scale	• Agriculture • Biomass energy • Cement production • Energy efficiency, industrial demand side • Energy efficiency -- supply side • Forestry & land use • Fossil fuel switching • Fugitive gas capture or avoidance • Low-carbon transportation measures • Renewable energy, large scale

* Studies have found potential concerns with N2O avoidance projects at adipic acid plants. In principle, however, these could be lower risk projects if appropriate methodologies are applied.

Table 3. Lower risk project types

Project Type	Sub-Types Included	Additionality	Quantification & Leakage	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
CO_2 usage	Use of CO_2 from biomass or industrial tail gases to replace fossil or mineral CO2 in industrial applications				
Methane destruction	Coalmine ventilation air methane (VAM) destruction				Harms: Could be seen as supporting coal industry and therefore not a project type consistent with long-term climate goals.
	Landfill gas flaring	Varies by location. Projects are likely additional in most parts of the developing world. In developed countries, including the United States, some projects are pursued to avoid triggering regulatory requirements.	Some potential for baseline uncertainties (e.g., how much methane would have been generated in the absence of a project), but most are addressed through program quantification & eligibility rules.		Benefit: May reduce odor issues for communities near landfills.

Project Type	Sub-Types Included	Additionality	Quantification & Leakage	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
N_2O avoidance from nitric acid production	Various process improvements in nitric acid production		The baseline can be overestimated, as N_2O measurement is technically complex.		Harms: Could be seen as supporting the manufacture of synthetic fertilizer and therefore not consistent with long-term climate goals
N_2O destruction in adipic acid production	Destruction or reuse/ recycling of N_2O by-product from adipic acid production		Studies have found evidence of plants increasing their acid production to generate more N_2O to destroy for carbon offset credits. Current methodologies may correct for this tendency.		
Destruction of ozone depleting substances (ODS)	Collection and destruction of ODS used in insulating foams and refrigeration equipment		Some uncertainties may exist regarding baseline emission rates (e.g., how quickly ODS would leak if reused in old equipment). The high GWP for ODS gases can amplify quantification errors.		Benefit: Destruction of ODS helps to accelerate recovery of stratospheric ozone.

Table 4. Medium risk project types

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits / harms
Methane capture and utilization for energy	Coal mine methane, coal bed methane	Carbon offset revenue can make up a large portion of return on capital investment; however, technical hurdles for these projects are no longer substantial and there are significant levels of business-as-usual methane usage at mines in some countries	Some projects may incentivize increased drainage of methane, leading to more methane destroyed than would have been released in the baseline. Most protocols control for this, however. Where methane is utilized for energy generation, some uncertainties can arise regarding the baseline for displaced emissions.	Ownership: Projects that generate energy using captured methane may result in indirect emission reductions (e.g., at grid-connected power plants).	Benefits: May have air pollution benefits if captured methane is used to displace coal. Harms: Could be seen as supporting coal industry and therefore not a project type consistent with long-term climate goals.
	Livestock methane, manure management, biogas utilization	For some projects in some locations, it is important to evaluate whether other revenue streams and funding sources would enable implementation without carbon revenues.	Some potential for baseline uncertainties, but most can be addressed through quantification & eligibility rules. Where methane is utilized for energy generation, some uncertainties can arise regarding the baseline for displaced emissions.	Ownership: Projects that generate energy using captured methane may result in indirect emission reductions (e.g., at grid-connected power plants).	Benefits: Offset projects at industrial livestock operations may mitigate local environmental impacts. Similarly, biodigesters can provide energy families use for cooking, saving money on fuel and reducing the sanitary issues associated with burning of animal and human waste. A lower dependence on firewood due to biogas use reduces fuel wood use.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits / harms
Methane capture and utilization for energy (cont.)	Other (waste water, industrial solid waste methane capture & utilization)	Regulatory drivers should be examined for many of these projects. For some projects in some locations, it is important to evaluate whether other revenue streams and funding sources would enable implementation without carbon revenues.	Some potential for baseline uncertainties, but most can be addressed through quantification & eligibility rules. Where methane is utilized for energy generation, some uncertainties can arise regarding the baseline for displaced emissions.	Ownership: Projects that generate energy using captured methane may result in indirect emission reductions (e.g., at grid-connected power plants).	Benefit: May reduce odor issues for communities near facilities.
	Landfill gas utilization (for energy, electricity)	Varies by location. Projects are likely additional in most parts of the developing world. In developed countries, including the United States, some projects are pursued to avoid triggering regulatory requirements, and projects that generate energy can be economical without carbon revenue.	Some potential for baseline uncertainties (e.g., how much methane would have been generated in the absence of a project), but most are addressed through program quantification & eligibility rules. Where methane is utilized for energy generation, some uncertainties can arise regarding the baseline for displaced emissions.	Ownership: Projects that generate energy using captured methane may result in indirect emission reductions (e.g., at grid-connected power plants).	Benefit: May reduce odor issues for communities near landfills.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits / harms
Methane emission avoidance	Composting; aerobic treatment of waste or wastewater; palm oil waste management / utilization	For composting and aerobic waste treatment, regulatory drivers should be carefully examined. For some projects in some locations, it is important to evaluate whether other revenue streams and funding sources would enable implementation without carbon revenues.	Some potential for baseline uncertainties, but most can be addressed through quantification & eligibility rules. If palm oil (or other) waste is used for energy generation, uncertainties can arise regarding baseline for displaced emissions.	Ownership: Projects that generate energy (e.g., from palm oil waste) may result in indirect emission reductions (e.g., at grid-connected power plants).	Benefits: Composting projects help reduce food waste, promote the environmental and health benefits of organic farming and reduce fossil-based fertilizer demand.
Energy distribution	District heating, connection of isolated grids, microgrid development, other	Additionality may be unclear in many cases; projects may be capital intensive and it is not clear that carbon revenues would be decisive for investment decisions.	May be some uncertainty about avoided baseline emissions; quantification protocols will generally address this concern with sufficient conservativeness.	Ownership/double counting: Often results in indirect emission reductions. Where distribution displaces electricity applications (e.g., fewer space heaters used as a result of a district heating project), electricity generators could double count reductions.	Benefits: Can lead to significant air quality benefits where displacing inefficient distributed combustion (e.g., in home coal or peat stoves). Connecting isolated grids or microgrid development, provides more reliable energy access.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits / harms
Energy efficiency, household demand side	Improved cookstoves		Significant uncertainty and potential for over-crediting due to approaches used to estimate reduction in biomass fuel used with improved stoves, fraction of non-renewable biomass (i.e., emissions associated with land-use change impacts), emission factors for wood-fuel used in baseline, inclusion of "suppressed demand" for fossil fuels, and underestimation of stove abandonment or stove stacking.	Permanence: Where project includes accounting for avoided deforestation (i.e., increase in forest carbon stocks due to decreased use of biomass), carbon storage could be reversed.	Benefits: Can lead to significant air quality benefits where replacing inefficient distributed combustion (e.g., in home wood, coal, charcoal or peat stoves) and therefore significant health benefits for families using improved cookstoves. Can lead to creation of new employment through market for stoves. Can reduce time and expenditures on fuel by rural families.
	More efficient lighting, insulation, & appliances; HVAC systems; air conditioning; street lighting; water pumping and purification; etc.	For some projects, it may be hard to show that carbon revenues were a decisive factor, e.g. where energy cost savings exceed offset credit revenues. In many places, improved efficiency is already common practice with national and local support schemes.	Often there can be uncertainty about avoided baseline emissions, actual adoption rates for new equipment, and/or baseline usage patterns. Baselines are sometimes linked to estimates of "suppressed demand" for fossil fuels, which run the risk of overestimating baseline emissions.	Ownership/double counting: Energy efficiency measures will often lead to indirect emission reductions, meaning greater potential for double counting.	Benefits: Can lead to cost savings for end users, and meaningful public health improvements for communities and families in low income areas.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits / harms
PFC & SF_6 avoidance & reuse	PFC & SF_6 emission avoidance; SF_6 capture & re-use	Additionality depends on specific project activity and facilities involved. In some contexts, measures for reducing emissions may be cost-effective without carbon revenues. In addition, PFCs and SF_6 are increasingly being regulated by governments, and so some projects could be mandated in some jurisdictions. Some projects may be pursued in anticipation of these regulations, prior to them taking effect.			

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Renewable energy, small scale (under 15 MW)	Electricity generation from small-scale (run of river) hydropower plants	Can face greater investment hurdles than large hydro projects, but it is often not clear whether carbon revenues would materially affect investment decisions	May be some uncertainty about avoided baseline emissions; quantification protocols will generally (though not always) address this concern conservatively.	Ownership/double counting: If grid-connected or otherwise displacing fossil fuel energy, these projects will result in indirect emission reductions; electricity generators could double count reductions. If RECs or GoOs are also sold from project then another entity may functionally double count reduction.	Benefits: Reduced air pollution where fossil generation is displaced. Rural electrification. Harms: Displaced ecosystem services and communities that relied on previous river resources (this is less of a concern for smaller projects).
	Electricity generation from solar, wind, geothermal, other renewable power sources	For many of these projects, it is not clear that carbon revenues can decisively influence investment decisions.	May be some uncertainty about avoided baseline emissions; quantification protocols will generally (though not always) address conservatively.	Ownership/double counting: If grid-connected or otherwise displacing fossil fuel energy, these projects will result in indirect emission reductions; electricity generators could double count reductions. If RECs or GoOs are also sold from project, then another entity may functionally double count reduction.	Benefits: Reduced air pollution where fossil generation is displaced. Rural electrification.
	Gasification and/or combustion of municipal solid waste	For many of these projects, it is not clear that carbon revenues can decisively influence investment decisions.	Potential uncertainties related to methane emissions avoided in baseline. Potential uncertainties related to displaced energy emissions (similar to other renewable energy projects)	Ownership/double counting: If grid-connected or otherwise displacing fossil fuel energy, these projects will result in indirect emission reductions; electricity generators could double count reductions. If RECs or GoOs are also sold from project then another entity may functionally double count reduction..	Benefits: Better local solid waste management. Harm: Air pollution, if advanced emission controls not part of project.

Table 5. Higher risk project types

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence	Co-benefits/ harms
Agriculture	Low-till/no-till soil carbon sequestration; use of biochar	Additionality is context-specific. In U.S., for example, low-till/ no-till is increasingly common practice. Frequently, for individual landowners, carbon revenues for these project types are too low to play a decisive role in changing practice. Programmatic approaches (where many landowners are aggregated together under a single project) are more likely to be additional.	Quantification of net GHG reductions in biological systems is inherently more uncertain than for many other project types; diverse and uncontrolled implementation environments make measurement, monitoring, and verification more difficult. Leakage risk can be a significant issue for tillage projects (to the extent crop yields are affected).	Permanence: Risk of reversal (i.e., non-permanent reductions) is a concern for all carbon storage projects.	Benefits: Both biochar and tillage projects can enhance soil productivity and reduce erosion, increasing farmers' yields and reducing impact on aquatic ecosystems.
	Rice cultivation methane avoidance, improved fertilizer management, etc.	Improved fertilizer management can often pay for itself (without carbon revenue), although barriers may prevent efficient investments in some cases. Conversely, carbon revenues for these project types (rice methane, nutrient management) are often too low to play a decisive role in changing practice. Programmatic approaches (where many landowners are aggregated together under a single project) are more likely to be additional.	Quantification of net GHG reductions in biological systems is inherently more uncertain than for many other project types; diverse and uncontrolled implementation environments make measurement, monitoring, and verification more difficult. Leakage risk can be a significant issue to the extent crop yields are affected (shifting production to lands where mitigation actions are not practiced).		Benefits: Improved fertilizer management can help reduce nutrient runoff. Harms: Effects of alternative rice cultivation methods may vary depending on context. (In California, for example, reduced flooding of fields may negatively impact waterfowl habitat.)

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Biomass energy	Industrial waste: Bagasse power, palm oil solid waste, black liquor, forest residues, sawmill waste, industrial waste, biodiesel from waste oil	Regulatory incentives frequently make biomass power competitive with fossil fuels, even without carbon revenues. Some studies have questioned the application of barrier and investment analyses to assess the additionality of these projects.	Some risk of exaggerated claims of avoided methane emissions associated with anaerobic decay of biomass.	Ownership/double counting: Often results in indirect emission reductions; other energy suppliers or electricity generators could double count reductions.	Benefits: Supports a beneficial use of waste from agricultural industries, diverting waste from landfills and providing revenue in return for environmental benefit. A source of renewable and environmentally-improved energy by generating electricity from waste. Accordingly, creates more sustainable patterns of production.
	Agricultural farm residue, forest residue, and dedicated energy crop	Regulatory incentives frequently make biomass power competitive with fossil fuels, even without carbon revenues. Some studies have questioned the application of barrier and investment analyses to assess the additionality of these projects.	Significant risks of over-crediting concern due to lack of assessment of land use, as well as direct and indirect land use change from collection of biomass feedstocks (leakage risk). Some protocols may better address these concerns than others.	Ownership/double counting: Often results in indirect emission reductions; other energy suppliers or electricity generators could double count reductions.	Benefits: Promotes renewable energy development. If land-use risks are properly dealt with, creates more sustainable patterns of production. Harms: Risks competing with other land-uses, primarily agriculture for food and reforestation/ afforestation.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Cement production	Use of blended cements, process and efficiency improvements	Choice of cement blends is often determined by institutional purchasing or regulatory requirements over which carbon revenues have little influence; higher-blend cements are also often cheaper than standard blends. Additionality for these projects may therefore hinge upon non-financial factors that are more difficult to prove.			
Energy efficiency, industrial demand side	Various forms of Industrial energy use efficiency	Many industrial efficiency projects pay for themselves and are common practice. Carbon revenues are often small relative to energy cost savings, so are seldom a decisive factor in pursuing a project.		Ownership/double counting: Energy efficiency measures will often lead to indirect emission reductions, meaning greater potential for double counting.	Benefits: Increasing industrial energy efficiency decreases the lifecycle emissions – and environmental impact – of products. These projects contribute to private sector participation in decarbonization.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Energy efficiency – supply side	Waste heat/ gas recovery; combined heat and power projects; improving energy conversion efficiency at boilers, power plants, etc.	Carbon revenues are often small relative to energy cost savings, so are seldom a decisive factor in pursuing a project. Projects are also common practice in many (though not all) countries and sectors. Some studies have questioned the application of barrier and investment analyses to assess the additionality of these projects.	Baseline determination can be complicated and site-specific. In existing facilities, it can be difficult to assess the actual use of waste heat in the baseline. In new projects, there are high uncertainties in modelling baseline waste heat production. Baselines under some protocols for supply-side efficiency projects have been set too high, resulting in over-crediting.	Ownership/double counting: Projects that displace emissions at other sources (e.g., on electricity grid) will lead to indirect emission reductions, meaning greater potential for double counting.	Harms: Financially supporting energy efficiency improvements in fossil burning energy systems may slow the transition to low-carbon energy systems.
Forestry and land use	Afforestation & reforestation; avoided deforestation; improved forest management; agroforestry; avoided conversion of high-carbon soils	Frequent challenges in determining baseline activity, which may be highly site-specific. Since the baseline determines how much carbon storage is additional, this makes additionality uncertain. In addition, timber and land-use values often exceed carbon revenue value, making it difficult in some cases to determine whether carbon revenues were decisive in changing baseline activities.	There are frequently significant baseline uncertainties for these project types. In addition, diverse and uncontrolled implementation environments make measurement, monitoring, and verification more difficult for these projects. Significant leakage risk can occur from displacement of harvesting or land-use development (i.e., reduced harvest in one area can cause an increase elsewhere)	Permanence: Risk of reversal (i.e., non-permanent reductions) is a concern for all carbon storage projects.	Benefits: Forests provide a range of ecosystem services that forest sector offset projects can maintain and expand. These may include increased local livelihoods, maintaining ecosystems and biodiversity, local farm productivity (pollination and precipitation services), limiting runoff, and water filtration.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Forestry and land use (cont.)					Avoided conversion of grasslands can yield significant environmental benefits beyond carbon storage, such as preserving landscapes and biodiversity. Harms: Poorly-designed forestry projects that do not sufficiently engage local communities and indigenous peoples can have major negative impacts, including livelihood restrictions and even community displacement.
Fossil fuel switching	Switch from coal to natural gas in boilers or power generation; use of natural gas as a transportation fuel	Carbon revenues are often a small component of total project revenues, so are seldom a decisive factor in pursuing a project. Studies have identified significant uncertainties in assessment of investment barriers to fuel switching, and point to new natural gas projects becoming increasingly common practice and non-additional.	Failure to account for upstream emissions from fossil fuel extraction & transport (e.g., methane leaks at well-head or in transmission & distribution) can lead to over-crediting.		Harms: Supporting adoption or continued use of fossil fuels may slow the transition to low-carbon energy systems. Widespread use of natural gas is incompatible with the temperature goals of the Paris Agreement.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Fugitive gases	Waste gas recovery from oil & gas production or other industrial operations; leak prevention in natural gas transmission & distribution systems; other fugitive gas prevention and recovery	Many fugitive emission reduction activities are cost-effective without carbon revenues; the financial value of preventing fugitive emissions (e.g., in terms of reduced fuel losses) often exceeds the carbon revenue value, so carbon revenues are seldom a decisive factor in pursuing a project.	Where waste gas quantities are directly measured, quantification concerns are low. Fugitive emissions, however, can be hard to detect and quantify, creating uncertainties about the effects of leak prevention activities.		Harms: Supporting adoption or continued use of fossil fuels may slow the transition to low-carbon energy systems. Widespread use of natural gas is incompatible with the temperature goals of the Paris Agreement.
Renewable energy, large scale	Geothermal; solar; mixed renewables; tidal energy; other	Unconventional renewables face greater financial hurdles than other technologies, and thus are more likely to be additional. However, carbon revenues are often a small component of total project revenues, so are seldom a decisive factor in pursuing a project.	May be some uncertainty about avoided baseline emissions; quantification protocols will generally (though not always) address conservatively.	Ownership/double counting: Projects that displace emissions at other sources (e.g., on electricity grid) will lead to indirect emission reductions, meaning greater potential for double counting.	Benefits: Reduced air pollution where fossil generation is displaced.

Project type	Sub-types included	Additionality	Quantification	Other (Ownership/ Double Counting, Permanence)	Co-benefits/ harms
Renewable energy, large scale (cont.)	Hydropower and wind projects	Common practice in many countries Carbon revenues are often a small component of total project revenues, so are seldom a decisive factor in pursuing a project. Studies have found documented concerns related to additionality assessment in large-scale hydro and wind projects.	May be some uncertainty about avoided baseline emissions; quantification protocols will generally (though not always) address conservatively. Some studies have identified issues with quantification methodologies for hydro projects, particularly when methane emissions (from plant material that is buried in the dam reservoir) are omitted, leading to over-crediting .	Ownership/double counting: Projects that displace emissions at other sources (e.g., on electricity grid) will lead to indirect emission reductions, meaning greater potential for double counting.	Harms: Some large-scale hydropower projects have well-documented negative social and environmental impacts. These projects can displace local communities and indigenous peoples, degrade forests, harm biodiversity and affect aquatic life and existing food sources for populations.
Low-carbon transportation measures	Public transportation improvements, mode shifting, vehicular fuel efficiency improvements, vehicle scrapping or retirement	In general, the mitigation cost of transportation projects ($/ tonne CO2 reduced) is well above current and historical prices for carbon offsets, calling into question whether carbon revenues can be a decisive factor in incentivizing these projects. For transport efficiency projects, fuel cost savings often (substantially) exceed carbon revenues from avoided emissions, raising similar questions about additionality.	High levels of uncertainty in quantifying avoided emissions from public transportation, mode shifting, and vehicle scrapping/ retirement projects. Reasonable quantification certainty for efficiency upgrades (notwithstanding baseline/additionality concerns).		Benefits: Transportation emissions reduction projects can improve air quality and the health of those living nearby as well as increase urban liveability.

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ENDNOTES

1 Under the Paris Agreement, the international community has established a goal of limiting global warming to "well below 2°C" by the 2100, and to pursue efforts to limit warming to 1.5°C. In a 2018 report, the IPCC summarized current modeling of what will be required to achieve the latter goal, noting that very substantial CO_2 reductions will be required by 2030. See: IPCC (2018).

2 CO_2 can be removed from the atmosphere through natural sequestration (e.g., in trees, soils, or the ocean) or through artificial means (e.g., using direct-air capture technologies, which are still in their infancy).

3 Such "programs" were pioneered under the Kyoto Protocol's Clean Development Mechanism; see here.

4 See, for example, Verra's framework for Jurisdictional and Nested REDD+ programs. (REDD stands for "reduced emissions from deforestation and forest degradation".)

5 The terms "standard" or "registry" are sometimes used when referring to offset programs. However, a comprehensive carbon offset program will consist of more than just a standard and a registry.

6 Although the CDM has functioned primarily as a regulatory program under the Kyoto Protocol, it now also caters to voluntary purchasers.

7 Like the CDM, "Joint Implementation" is a separate offset program established under the Kyoto Protocol; the CDM applies only to developing countries, while JI is used in developed countries.

8 In general, price discrepancies among programs arise only when one program serves a captive market with strong demand that other programs may not serve, such as the regulatory cap-and-trade market in California.

9 Similar terms, like "climate neutral" or "net zero" are largely synonymous.

10 See, for example, https://sciencebasedtargets.org/step-by-step-guide/

11 Scope 2 emissions for your corporate inventory should be estimated using grid average emission factors (e.g., kg CO2/kWh), also referred to as the location based method. Application of a zero emission factor, based on green power purchasing claims (i.e., the market based method), generally lacks environmental integrity and is inconsistent with good practice in environmental accounting. For further information see https://scope2openletter.wordpress.com/

12 This kind of "double-entry bookkeeping" is referred to in international negotiations as "corresponding adjustments." Detailed rules for how corresponding adjustments will be implemented are still being negotiated – see Schneider et al. (2019).

13 The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), established in 2016, is expected to demand anywhere from 1.6 to 3.7 billion offset credits between 2021 and 2035 – see Warnecke et al. (2019). On the subject of avoiding double counting, see Schneider, Broekhoff, et al. (2019).

14 See, for example, Kreibich and Obergassel (2019) as well as ICROA (2019) and Voluntary Carbon Market Working Group (2019).

15 See Wara and Victor (2008).

16 The primary concern is that a large number of offset credits come from energy sector projects that have significant sources of other revenue besides offset credits, suggesting that they would have happened anyway and do not represent additional mitigation. Other identified issues include concerns about over-estimation of emission reductions, e.g., for industrial gas destruction and other project types (Alexeew et al. 2010; Cames et al. 2016; Gillenwater and Seres 2011; Haya and Parekh 2011; Kollmuss et al. 2015; Kollmuss and Lazarus 2010; Lazarus et al. 2012; Ruthner et al. 2011; Schneider 2009; Schneider et al. 2010; Spalding-Fecher et al. 2012)

17 See, for example, Dufrasne (2018) as well as here.

18 See Spalding-Fecher et al. (2012).

19 Although most critical studies of carbon offsets have focused on the CDM and JI because of their high profile, many of the same issues are likely to arise in other programs as well. For some programs – like Verra (i.e., VCS) and the Gold Standard – this is because they incorporate CDM methodologies by reference, so there is substantial overlap in the kinds of projects they certify. In other cases, programs have used CDM methodologies as a starting point in developing their own standards. Although a number of programs have followed approaches that differ from the CDM, no program should be considered categorically free of all concerns about offset quality.

20 The CDM Executive Board, for example, adopted amendments and clarifications to its methodology for destruction of HFC-23 emissions to address demonstrated concerns about over-production of this gas purely for the purpose of producing more offset credits. Such projects are now disallowed. However, similar concerns for other project types – e.g., N_2O abatement at adipic acid plants – have not been fully addressed.

21 Verra and the Gold Standard, for example, have solicited public input on whether to exclude from eligibility clean energy projects in wealthy and middle-income countries, on the grounds that these projects have a low likelihood of being additional.

22 This condition applies to GHG emissions, as well as to other social and environmental impacts. If global GHG emissions would be no greater as a result of using a carbon offset credit instead of reducing your own emissions, then the credit is said to preserve "environmental integrity" (Schneider and La Hoz Theuer 2019). However, it is also important that offset projects do not cause significant social or (non-climate) environmental harms. Both are important for offset quality.

23 See Gillenwater (2012).

24 For an in depth discussion of these ideas, see Trexler (2019).

25 Again, see Trexler (2019).

26 Standardized additionality approaches can use "positive lists" (lists of defined technologies or practices that are deemed additional without further *evaluation) or a set of technical specifications and other criteria that a project must meet to be eligible (for example: landfill gas collection and destruction, occurring at a sanitary landfill that is below a certain size threshold, where gas collection is not required by law, etc.).*

27 Again, a common misconception is that the baseline for a project represents what would have happened "in the absence of the project." However, it is essential to evaluate whether a proposed project is itself the baseline (i.e., is not additional), and therefore will generate no emission reductions.

28 Assuming that the project is additional and that the project itself does not affect the rate of methane generation at the landfill – for example, by creating a "bioreactor" landfill.

29 See, for example, Offset Quality Initiative (2008).

30 This process may include collecting and verifying data needed to estimate a project's baseline emissions.

31 Some of these sources and sinks may be treated as "leakage" effects and addressed in supplemental calculations.

32 Most quantification methods prescribe a combination of project-specific data collection, along with the use of conservative defaults or estimates where data collection is impractical.

33 Renewal under some programs may also involve an updated

34 Carbon offset programs can differ in their approach to validation and verification. Some programs, like CAR, combine validation with the first verification of a project, and do not make a formal distinction between the two functions. Others require validation and verification as separate steps (and some, like the CDM, require separate verifiers for each to avoid conflicts of interest – since a positive validation could lead to a more lucrative verification contract).

35 Technically, the individual molecules of CO_2 emitted may cycle back and forth between the atmosphere and terrestrial reservoirs multiple times, but atmospheric concentrations of CO_2 will remain elevated by an amount equal to about 25% of the original mass emitted after 1,000 years (Joos et al. 2013).

36 Technically, a "reversal" occurs if – at any point in the future – the rate of GHG emissions accelerates so that it is higher than would have occurred if the project had never happened. For example, protecting a parcel of forest from deforestation prevents 100 tonnes of carbon from being released to the atmosphere (reducing emissions by 100 tonnes). Fifty years later, however, the parcel is burned down, emitting all the carbon. The rate of emissions in year 50 is accelerated, because without the project, the 100 tonnes of carbon would not have been present to be burned. Net GHG reductions over 50 years are zero, because the additional emissions cancel out the prior reductions.

37 Unless a project involves carbon storage of some kind (e.g., sequestering carbon in trees), a reversal of emission reductions is highly unlikely. In theory, however, reversals can occur in other circumstances. A hypothetical example would be where a solar panel and battery storage system is used to provide electricity to a building, allowing it to operate off the grid (and avoiding grid-based electricity emissions); however, the solar panel fails and a backup diesel generator is brought in to provide power instead, causing more emissions than would have occurred without the project. Such circumstances will be rare, but for *some project types, it may be worth evaluating whether these types of risks exist.*

38 The CDM is alone in issuing "temporary credits" for reversible GHG reductions. Under this approach, offset credits issued for these reductions expire after a predefined period (up to 30 years) and must be replaced with other emission reductions. This approach effectively guarantees permanence if it is enforced (whether the CDM's administrative structures will be maintained in the future is an open question). However, it has faced significant hurdles, not least because it puts the onus for ensuring permanence on offset credit buyers. As a result, buyers have been far less willing to pay for these credits, and the market for them has been largely non-existent.

39 See Murray et al. (2012).

40 See Schneider et al. (2015) for a fuller explanation of double counting issues with carbon offsets.

41 Procedures may include requiring project developers to sign legal attestations stipulating that they will not request issuance of offset credits for emission reductions from more than one program (unless they are effectively "transferring" credits from one program to another).

42 Some third-party programs, like Green-e Climate, provide checks on credit retirement steps for retail credit buyers. However, in most cases this adds little value beyond what carbon offset programs already make available to any buyer in terms of retirement certification.

43 While additionality is not usually a concern, some kinds of industrial gas projects do have issues with baseline estimation and overestimation of reductions.

44 Technically, "discounting" refers to issuing fewer credits to a project than the GHG reductions it achieved, but it is often used more broadly to refer to any approach that effectively uses more GHG reductions to offset fewer GHG emissions. It has also been proposed as an approach to be used in regulatory carbon markets; for example, see Warnecke et al. (2014).

Image (next page) courtesy of High Tide Foundation

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11 August 2021

PRIVATE AND CONFIDENTIAL

Dear Ms Kim

Gold Standard Inquiry - Potential Deep Coal Mine Development at Whitehaven, Cumbria, U.K. (the Development)

I write for and on behalf of Friends of the Earth England, Wales and Northern Ireland (FoE). We are contacting you to enquire into the Gold Standard Foundation's position regarding the potential use of the Gold Standard scheme to offset the climate impacts of the above Development. We would be grateful if you could respond to this letter as soon as possible and address the queries we raise in section C below.

A. The Development

The developer, West Cumbria Mining Limited (WCM) has applied for planning permission[1], and the matter is going to a four-week planning inquiry in September 2021. If granted, it would be the first new deep coal mine in the country in thirty years. It is estimated that the Development would last until 2050, and a total of 2.78 million tonnes of metallurgical coal per annum would be extracted. We have calculated that the total scope 3 emissions (i.e. from the ultimate use of the coal) will be 220 million tonnes of CO_2e over the lifetime of the mine.

FoE is a main party to the proceedings and will be participating in the upcoming inquiry. We are opposing the grant of planning permission on climate grounds, along with other arguments relating to visual and landscape impacts.

The Development has already received considerable media attention in the UK, including substantial criticism on the basis of its obvious carbon impacts. [2] In January 2021, the Chair of the

[1] Link to planning application documentation: https://planning.cumbria.gov.uk/Planning/Display/4/17/9007
[2] See for example: https://www.itv.com/news/border/2021-08-10/opponents-of-cumbria-coal-mine-

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Committee on Climate Change[3] wrote to the UK Government and stated that "*the opening of a new deep coking coal mine in Cumbria will increase global emissions and have an appreciable impact on the UK's legally binding carbon budgets*".[4]

However, WCM is seeking to argue that the Development will be carbon neutral. In making this claim, it is only including the operational carbon emissions in its assessment, and expressly excluding scope 3 emissions arising from the end-use of the coal. It claims that carbon neutrality will be achieved through a combination of carbon mitigation measures as a first priority, and for those impacts which it cannot mitigate against, carbon offsetting. It has stated that the latter will be achieved through purchasing carbon credits from the Gold Standard's scheme.

B. The Climate Emergency

Friends of the Earth does not consider that it is appropriate for promoters of fossil fuel developments to try to make use of the Gold Standard scheme (or any carbon offsetting scheme) in order to justify further extraction of fossil fuels. This is particularly so in the context of the worsening climate emergency.

We note in this respect that:

- The UN's Production Gap Report 2019 stated that countries' planned fossil fuel production by 2030 will lead to about 50% more emissions than would be consistent with a 2°C pathway, and 120% more than would be a consistent with a 1.5 °C pathway[5] (i.e. a Paris compliant pathway; this finding was repeated in the 2020 report as well);
- the UN Production Gap Report 2019 further concluded that there is a causal relationship between production limitation and emission reduction;[6]
- the UN Emissions Gap 2020 Report identified that the world is on track for warming of 3.2°C in this century[7];
- The International Energy Agency's 2021 report concluded that there is no need for investment in new fossil fuel supply in the Net Zero pathway and that there must be a huge decline in the use of fossil fuels in order to reach Net Zero[8]; and
- the IPCC's 2021 report published on 9 August 2021 has identified that unless there are immediate and large-scale *reductions* in greenhouse gas emissions, limiting warming to 1.5°C or even 2°C will not be possible.

C. The Gold Standard's Position on Fossil Fuel Developments

We would be grateful if you could confirm the Gold Standard Foundation's position in respect of the following points:

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welcome-prime-ministers-comments-on-coal; https://www.bbc.co.uk/news/science-environment-56223327

[3] The Committee on Climate Change is the independent body established under the Climate Change Act 2008 to advise the UK Government on climate policy in order to meet the legally binding carbon reduction targets in the Climate Change Act 2008.

[4] https://www.theccc.org.uk/publication/letter-deep-coal-mining-in-the-uk/

[5] UN Production Gap Report 2019 p10 https://www.unep.org/resources/report/production-gap-report-2019#:~:text=This%20new%20report%20finds%20that,goals%20much%20harder%20to%20reach.

[6] UN 2019 Production Report p50

[7] UN 2020 Emissions Gap Report p13 https://www.unep.org/emissions-gap-report-2020

[8] IEA Report p21 and p18 https://www.iea.org/reports/net-zero-by-2050

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1. Would the Gold Standard Foundation actually permit the purchase of carbon credits to offset the carbon impacts of a new coal mine? We understand that WWF International[9] was a founder of the Gold Standard Scheme in 2003 (along with some other NGOs), and furthermore, it is a supporter of the scheme. We note also, that WWF-UK (a member of the global WWF network which is coordinated by WWF International) has publicly stated that it is opposed to the Cumbria coal mine.[10]
2. If this is something that the Gold Standard Foundation might in theory authorise, are there any specific restrictions/ limits to this?
3. Does the Gold Standard Foundation have a view on whether a fossil fuel promoter can credibly claim that its development is carbon neutral, if it does not address the scope 3 emissions arising from the end-use of the fossil fuel extracted? We note, in this respect, that the Gold Standard's website refers to guidance on how scope 3 emissions can be assessed[11].
4. More generally, does the Gold Standard Foundation consider, in principle, that offsetting carbon impacts from a fossil fuel development is an appropriate use of the scheme, in the context of the global climate emergency? We note that the Gold Standard Offsetting Guide states that offsetting should be for "truly unavoidable emissions", not a means of making "*a poor choice..suddenly better*."[12]

Given the proximity of the planning inquiry in three weeks' time, it would be very helpful if you could reply to this letter as soon as possible, and ideally by 18 August 2021. Please send your response to Katie de Kauwe and Niall Toru ([redacted]). We would of course be very happy to arrange a meeting to discuss these points further, if that would be helpful.

Thank you in advance for your assistance.

Yours sincerely

Katie de Kauwe
Solicitor, Friends of the Earth

CC: Matt Thomas - matthew.thomas@goldstandard.org;
Charles Wilson – charles.wilson@goldstandard.org

[9] WWF International is the central secretariat for the WWF network https://wwf.panda.org/contact_us/ and https://wwf.panda.org/discover/about_wwf/how_were_run/
[10] https://www.in-cumbria.com/news/18540727.wwf-calls-halt-mining-plans/
[11] See for example: https://www.goldstandard.org/our-story/climate-leadership-guidance and https://www.goldstandard.org/our-story/valuechange-working-groups. The website also links to the GHG Protocol https://ghgprotocol.org/standards/scope-3-standard
[12] https://www.goldstandard.org/sites/default/files/documents/gold_standard_offsetting_guide.pdf :"*You still need to get to and from work. You need to heat your home and 100% renewable energy is not yet available in your area. The food you eat undoubtedly has at least some carbon footprint. If you're faced with making a carbon-intensive choice or not, **offsetting should not convince you that a poor choice is suddenly better.** Rather, offsetting **truly unavoidable emissions** empowers you to take responsibility for the emissions you can't reduce. If you must take a flight, for example, offsetting your flight is much better than doing nothing*." (emphasis added)

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RE: Gold Standard Inquiry - Potential Deep Coal Mine Development at Whitehaven, Cumbria, U.K. (the Development)

Dear Ms de Kauwe,

Thank you for your letter enquiring about the Gold Standard Foundation's position regarding the potential use of the Gold Standard scheme to offset the climate impacts of the development of a deep coal mine at Whitehaven, Cumbria, for metallurgical coal for use by the steel making industry. As you have highlighted, the development claims as part of its documentation that it will offset its direct emissions using Gold Standard carbon credits 'or equivalent.' It is further noted that indirect ('Scope 3') emissions from combustion of the coal, the majority of the project's climate impact, are not to be offset.

Gold Standard is strongly against the further exploration and extraction of fossil fuels, and our core Principles and Requirements prohibit the certification of any project type that supports, enhances, or prolongs energy generation from fossil fuels. In addition, Gold Standard supports the well-established 'mitigation hierarchy', under which the priority is: 1) to avoid emitting activities, 2) to reduce emissions from activities that already exist, and then 3) to take responsibility for unavoidable emissions through mechanisms such as carbon markets.

The latest scientific paper from the Intergovernmental Panel on Climate Change (IPCC) on 9 August gave a stark reminder of the pace at which the planet is warming and the unequivocal influence of human activity on this warming, in particular the extraction and use of fossil fuels. We note that achievement of the goals of the Paris Agreement would be rendered impossible by the already planned increase in fossil fuels (UN Production Gap Report, 2019), and that the International Energy Agency (2021) has clearly stated that further investment in fossil fuels is unnecessary, with achieving global net zero goals instead requiring a rapid reduction in their use.

It is clear to us, in light of this evidence and reflecting the principles of the mitigation hierarchy, that a new coal mine in 2021 is an activity that must be avoided in the context of the climate emergency.

Beyond ignoring climate science, undermining the Paris Agreement, and perverting the mitigation hierarchy, the absence of a Scope 3 commitment renders any claims to have offset emissions uncredible. The vast majority of the proposed coal mine's emissions would

be in the use of its product; hence compensating only for direct emissions cannot even justify a 'carbon neutral' claim, much less the extraction and use of additional fossil fuels.

Gold Standard remains a firm advocate for the role of the voluntary carbon market, enabling investment into projects that reduce emissions and promote development while providing a means to contribute to global climate action outside a company's value chain. We believe that the market continues to have an important role to play within the climate mitigation hierarchy, after action by organisations firstly to avoid, and secondly to reduce their emissions.

But in the context of an ever-shrinking global carbon budget, voluntary carbon offsetting should not be used to justify to new fossil fuel exploration or extraction activities.

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Whilst Gold Standard, like other programmes certifying activities and issuing credits, does not have the ability to forbid companies or other actors from purchasing its carbon credits and using these to make positive environmental claims, we reiterate our commitment to a proper, science-based climate mitigation hierarchy that uses the carbon market to take responsibility for unavoidable emissions. From a position of basic carbon accounting, we strongly disagree that the proposed coal development could fall into the category of truly "unavoidable emissions". It is a new development that does not yet exist, and given the latest scientific reports (referred to above), it cannot be said that it is an unavoidable development, or one that *must* happen. Even for truly unavoidable emissions, Gold Standard does not consider 'carbon neutrality' to be a legitimate claim if Scope 3 emissions are not accounted for.

Finally, we are wary about the reference to the purchase of carbon credits that are from Gold Standard 'or equivalent'. Without a clear definition of how equivalence will be judged, it seems quite possible that the developer could acquire carbon credits that are of lower quality than those issued under Gold Standard, recognising that these may be available at a lower price. In such a case, we would consider that the Gold Standard brand has been used in a misleading way.

We strongly oppose this proposed development and reject the notion that carbon offsetting could be used as a basis to justify its approval. We are happy for this letter to be shared with the Planning Inspectorate and remain available for further comment as needed. You can find further public information on Gold Standard's positions on our website, including Corporate Climate Stewardship guidelines co-authored with the World Wide Fund for Nature (WWF), and can find answers to your four questions at Annex A.

Sincerely,

Margaret Kim

CEO of the Gold Standard Foundation

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Annex A: Responses to Friends of the Earth questions

1. **Would the Gold Standard Foundation actually permit the purchase of carbon credits to offset the carbon impacts of a new coal mine?**

As described above, Gold Standard – like other programmes certifying activities and issuing carbon credits – does not have the ability to prevent the purchase of carbon credits by particular organisations or individuals and does not have the capacity to 'police' all environmental claims made by organisations or individuals using these carbon credits. This is a feature of the structure of the voluntary carbon market.

However as described in the main body of the letter, we do not consider the use of carbon credits to justify the development of a new coal mine to be an appropriate use of the voluntary carbon market. We believe that this is an issue that merits more consideration across the carbon market as it takes steps to strengthen its integrity and to scale in support of the goals of the Paris Agreement. This could, for instance, be one of the issues taken up by the Voluntary Carbon Market Integrity (VCMI) Initiative supported and funded by the UK Government.

2. **If this is something that the Gold Standard Foundation might in theory authorise, are there any specific restrictions/ limits to this?**

As described in response to the first question, Gold Standard does not have the ability to prevent the purchase of carbon credits by particular organisations or individuals. However Gold Standard does have Claims Guidelines which outline the claims that organisations or individuals are authorised to make with respect to Gold Standard products. We are in the process of revising these Claims Guidelines with a view to publishing a new version by the end of 2021, which we anticipate will include advice on claims made with respect to new fossil fuel exploration or extraction activities.

3. **Does the Gold Standard Foundation have a view on whether a fossil fuel promoter can credibly claim that its development is carbon neutral, if it does not address the scope 3 emissions arising from the end-use of the fossil fuel extracted?**

Please see the main body of the letter for Gold Standard's views on this question. In short, Gold Standard does not believe that a carbon neutrality claim can be credibly made if Scope 3 emissions are not addressed.

4. **More generally, does the Gold Standard Foundation consider, in principle, that offsetting carbon impacts from a fossil fuel development is an appropriate use of the scheme, in the context of the global climate emergency?**

Please see the main body of the letter and the answer to the first question for Gold Standard's views on this question.