UNIVERSITY OF OXFORD

The Oxford Principles for Net Zero Aligned Carbon Offsetting

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Executive Summary

As part of their climate strategies, many companies, organisations, cities, regions and financial institutions are relying on voluntary carbon offsetting—payment to receive credit for a certified unit of emission reduction or removal carried out by another actor. Current best practice helps to reduce some of the well-known risks associated with existing offsets (e.g. improper carbon accounting, re-release of stored carbon, negative unintended impacts on humans or ecosystems, etc.), but is unlikely to deliver the types of offsetting needed to ultimately reach net zero emissions. The Oxford Principles for Net Zero Aligned Carbon Offsetting (the "Oxford Offsetting Principles") presented here outline how offsetting needs to be approached to ensure it helps achieve a net zero society.

1. **Cut emissions, use high quality offsets, and regularly revise offsetting strategy as best practice evolves**

A host of carbon offsetting best practices have been developed over the past decades. Adherents to these principles must first observe these best practices, which can be grouped as:

- *Prioritise reducing your own emissions* - Minimise the need for offsets in the first place.
- *Ensure environmental integrity* - Use offsets that are verifiable and correctly accounted for and have a low risk of non-additionality, reversal, and creating negative unintended consequences for people and the environment.
- *Maintain transparency* - Disclose current emissions, accounting practices, targets to reach net zero, and the type of offsets you employ.

2. **Shift to carbon removal offsetting**

Most offsets available today are **emission reductions**, which are necessary but not sufficient to achieve net zero in the long run. **Carbon removals** scrub carbon directly from the atmosphere. Users of offsets should increase the portion of their offsets that come from carbon removals, rather than from emission reductions, ultimately reaching 100% carbon removals by mid-century to ensure compatibility with the Paris Agreement goals. Creating demand for carbon removal offsets today will send the necessary market signal to increase supply.

3. **Shift to long-lived storage**

The transition from emission reductions to carbon removals as outlined in Principle 2 above is critical for achieving net zero, but doesn't address the question of how carbon is stored. Short-lived storage involves methods that have a higher risk of being reversed over decades. Long-lived storage refers to methods of storing carbon that have a low risk of reversal over centuries to millennia, such as storing CO_2 in geological reservoirs or mineralising carbon into stable forms. Short-lived storage offsets help buy time to reduce emissions and invest in long-lived

storage, but they are not a long-term solution for achieving balance between sinks and sources. It is therefore critical that investment in scaling and improving the technologies that enable long-lived storage begins now. Creating demand for long-lived offsets today sends a signal to the market to grow the supply of such offsets.

4. Support the development of net zero aligned offsetting

The market for the high-quality offsets needed to meet Principles 2 and 3 is immature and in need of early-adopters to support its evolution. Users of these principles can develop the market for net zero aligned offsetting by:

- *Using long-term agreements* - give the certainty required by offset project developers to create net zero offsets.
- *Forming sector-specific alliances* - work collaboratively with peers to develop the market for net zero aligned offsets.
- *Supporting the restoration and protection of a wide range of natural and semi-natural ecosystems in their own right* - not only will this secure the ecosystem goods and services on which humans depend, including resilience to the impacts of climate change, but will contribute to carbon storage over the long term. While carbon offsetting can help to fund some of this work, such efforts should fundamentally be supported for the benefits and values they create, not purely for the purpose of carbon offsetting.
- *Adopting and publicising these Principles, and incorporate them into regulation and standard-setting for approaches to offsetting and net zero.*

The Oxford Principles for Net Zero Aligned Carbon Offsetting*

Myles Allen[1,2], Kaya Axelsson[1,3], Ben Caldecott[2,3], Thomas Hale[2,4], Cameron Hepburn[2,3], Conor Hickey[3], Eli Mitchell-Larson*[1,5], Yadvinder Malhi[1], Friederike Otto[1], Nathalie Seddon[6], & Steve Smith[2,3]

[1] Environmental Change Institute, University of Oxford
[2] Oxford Martin School, University of Oxford
[3] Smith School of Enterprise and the Environment, University of Oxford
[4] Blavatnik School of Government, University of Oxford
[5] Saïd Business School, University of Oxford
[6] Nature-based Solutions Initiative, Department of Zoology, University of Oxford
* Corresponding author: eli.mitchell-larson@chch.ox.ac.uk

To meet the Paris Agreement's objective of "holding the increase in the global average temperature to well below 2°C above preindustrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels" we must rapidly move toward net zero carbon dioxide (CO_2) emissions by mid-century. This means substantially reducing emissions ("sources") and balancing any residual emissions with removals ("sinks") on an ongoing basis.[1]

Many countries and "non-state actors", such as cities, regions, companies, organisations and financial institutions, are pledging to achieve net zero emissions. While some actors can feasibly eliminate all of their emissions to reach "absolute zero", some actors will have residual emissions. For example, emissions from biological processes in agriculture, some industrial processes, and fossil fuel combustion for aviation will likely be difficult to eliminate fully by 2050. A number of actors therefore include "carbon offsets" within their climate strategy. These are purchased credits representing a certified unit of emission reduction or carbon removal carried out by another actor.

A number of critically important questions emerge for the users of offsets. How can offsetting be made a credible means of achieving net zero? What types of offsets should be used and when? How can actors purchasing offsets, and stakeholders holding them accountable, avoid the risk of greenwashing? How can users catalyse the cost-effective supply of the right kind of offsets at scale?

The Oxford Principles for Net Zero Aligned Carbon Offsetting are designed to help clarify these questions, particularly for non-state actors who want to design and deliver rigorous voluntary net zero commitments and develop high quality carbon markets.

* The Oxford Principles for Net Zero Aligned Carbon Offsetting were devised through collaboration with experts across the University of Oxford. The Principles incorporate expertise from the Blavatnik School of Government, Environmental Change Institute, Nature-based Solutions Initiative, Oxford Martin School, Oxford Sustainable Finance Programme, Saïd Business School, School of Geography and the Environment, and the Smith School of Enterprise and the Environment.

We urge offset buyers to adopt and integrate the **Oxford Offsetting Principles** into their activities. We also encourage regulators and standard setters to reflect them in the design of offsetting systems and net zero standards. Observing these Principles will help ensure that users avoid buying low-quality offsets and that their decarbonisation plans are compatible with achieving net zero.

The Oxford Offsetting Principles are intended to be used by a variety of stakeholders:

- Corporations and organisations designing and delivering credible plans for achieving net zero.
- Financial institutions for the same purpose, as well as to assess the plans of investees and borrowers. This can inform risk and impact analysis, as well as engagement and stewardship activities.
- Civil society to gauge which organisations are aligning with the Paris Agreement, revealing leaders and laggards.
- Initiatives and networks that promote net zero target setting and disclosure by non-state actors, who can align their requirements with the Oxford Offsetting Principles.
- Regulatory and standard setting bodies to create voluntary or mandatory rules or other policy interventions that drive the economy toward net zero, including enabling investments that can support the realisation of the Oxford Offsetting Principles on a global basis.
- Researchers and academic institutions to address their own emissions, or to guide research to fill time-sensitive knowledge gaps in the carbon offsetting space.

Principle 1: Cut emissions, use high quality offsets, and regularly revise offsetting strategy as best practice evolves

A number of best practices have been developed to set international consensus on what constitutes credible carbon offsetting. Adherents to these principles must first and foremost observe these best practices for all purchased offsets, as summarised in the Stockholm Environment Institute's comprehensive introduction to the topic and other similar guides.[2] Best practice generally covers the following areas:

Prioritise reducing your own emissions and scaling up removals, minimising the need for offsets to achieve net zero

Cutting emissions and scaling up removals can take many forms and is often sector specific. Actors can benchmark themselves against peers to help determine if they have maximised all reduction opportunities. This can be done informally, for example an airline emulating or exceeding the fleet upgrades of its peers or a law firm comparing its emission intensity against similar firms. Formal frameworks for benchmarking emissions are also available,[3] as are industry-specific associations focused on climate action.

The amount of net emissions that remain and must therefore be offset will be specific to the organisation, based on available technologies, strategic goals in terms of equity and inclusivity, and their own financial strength. Criteria should be revisited frequently, since emissions that were previously considered hard-to-reduce may become easier to reduce due to new technologies, falling costs, or new incentives. Many initiatives exist to help organisations to do this, including: Climate Action 100+, LEED, Net Zero Asset Owners Alliance, Oxford Martin Principles for Climate-Conscious Investment, RE100, Science Based Targets initiative, and The Investor Agenda.

Use offsets that are verifiable and correctly accounted for, have a low risk of non-additionality, reversal, and creating negative unintended consequences

Verifying offsets ensures that the emission reduction or carbon removal actually takes place, and that all forms of double-counting, including double-claiming of the emission reduction benefit, are avoided. Forward-selling, and any time gap between the purchase of the offset and the successful execution of the emission reducing or carbon removing activity must be minimised, and mechanisms to ensure that the environmental benefits from an offset are actually delivered must be strong. Care must be taken to ensure offset providers are properly converting the climate impacts of non-CO_2 climate pollutants into CO_2 terms according to their actual warming impact, particularly for short-lived greenhouse gases like methane.[4]

Offsets should also be additional, meaning they represent an emission reduction or carbon removal relative to a counterfactual baseline that would not have taken place but for the offsetting activity.[5,6] Additionality can be difficult to determine and verify, and ultimately involves some degree of subjectivity since the counterfactual world in which the offsetting activity was not performed cannot be observed directly.

Permanence refers to how long a greenhouse gas stays out of the atmosphere, whether stored in a physical reservoir or whose emission was deferred through avoidance.[7] In the case of physically storing carbon in a reservoir (e.g. a forest, or a geological sink), the risk of reversal of that carbon back into the atmosphere must be acknowledged and accounted for in the offsetting plan. For example, afforestation or reforestation generates carbon removal carbon offsets, but if forests are subsequently cut down or destroyed by pests, fire, or other natural disturbances the stored carbon is reversed and the carbon offset must be invalidated.

Potential unintended negative consequences associated with nature-based offsetting could include but are not limited to loss of livelihood to farmers or those from local communities who rely on forest products, loss of agricultural land, violations of local community land rights, decreased biodiversity in low-diversity tree plantations or from tree-planting on biodiverse and naturally low tree cover habitats such as grasslands, savannas, and peatlands, unanticipated changes to hydrological or nutrient cycles and other adverse impacts on the social and ecological resilience of landscapes. High quality nature-based offsets can embed additional value, such as enhancements to biodiversity, local incomes, climate-change resilience and safeguarding community rights.

Disclose current emissions, accounting practices and targets to reach net zero

Disclosure includes all emissions within an organisation's sphere of influence, often categorised according to the Greenhouse Gas Protocol framework for reporting emissions[8]:

- Scope 1 emissions are direct emissions from owned or controlled sources e.g. company vehicles.
- Scope 2 emissions are indirect emissions from the generation of purchased energy e.g. purchased electricity.
- Scope 3 emissions are all other indirect emissions that occur in the value chain, including both upstream and downstream emissions e.g. emissions associated with the use of products or services sold or used by an organisation.

Organisations must disclose the accounting practices they use to measure emissions and convert the climate impacts of short-lived gases (e.g. methane) into carbon dioxide (a long-lived gas) equivalent terms.

Following current best practice is crucial for all actors but, as we outline below, it is just the point of departure.

Principle 2 – Shift to carbon removal offsetting

An immediate transition to 100% carbon removals is not necessary, nor is it currently feasible, but organisations must commit to gradually increase the percentage of carbon removal offsets they procure with a view to exclusively sourcing carbon removals by mid-century.

Most offsets available today are **emission reductions**, which are necessary but not sufficient to maintain net zero in the long run. **Carbon removals** scrub carbon directly from the atmosphere which can counteract ongoing emissions after net zero is achieved, as well as create the possibility of net removal for those actors who choose to remove more carbon than they emit.

Figure 1 provides a simplified classification of offsets and guidance on how to assess these differences.

Figure 1: *Taxonomy of Carbon Offsets*

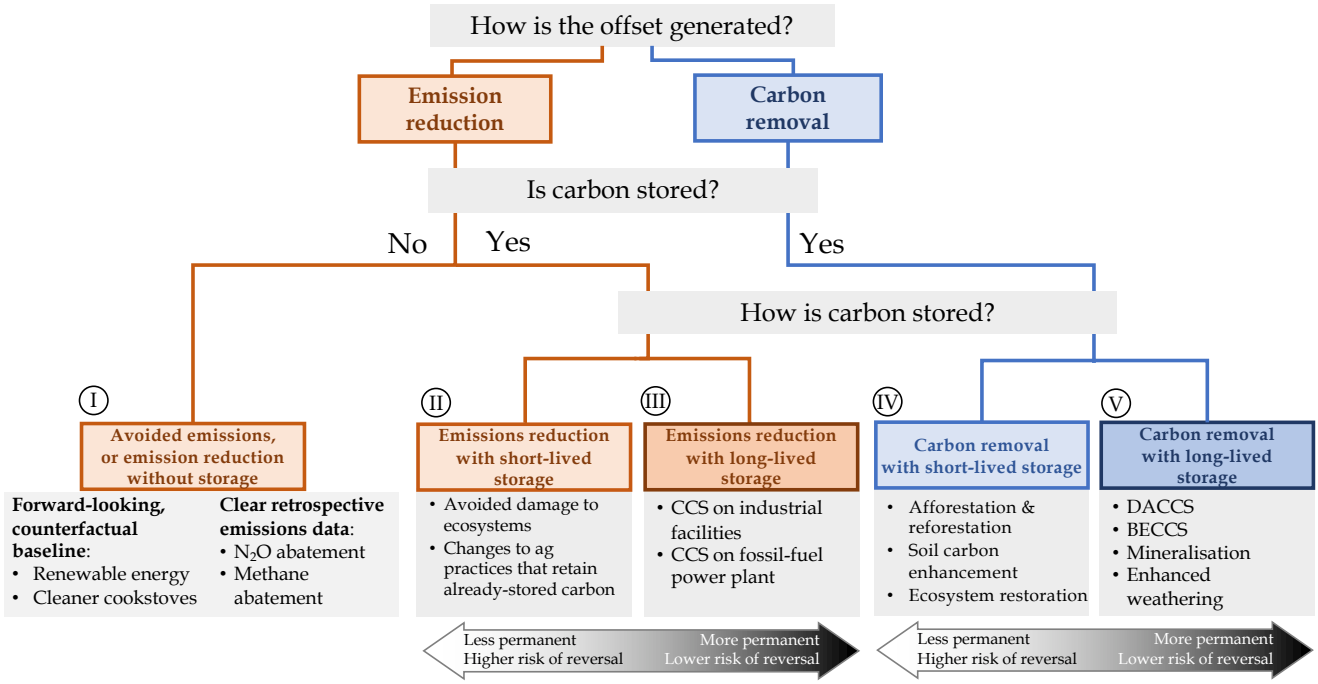

Figure 1 – This simplified classification scheme shows five types of carbon offset based on whether carbon is stored, and the nature of that storage. Carbon removal is defined as the act of taking CO_2 out of the air and permanently storing it. For all forms of carbon removal, whether nature-based solutions or technologically-mediated processes, carbon must be stored. Principle 2 addresses the distinction between emission reduction and carbon removal. For offsets that involve storing carbon, a further distinction is made as to whether that storage is likely to be short-lived (on the order of decades) or long-lived (on the order of centuries to millennia). Principle 3 addresses the distinction between short-lived and long-lived storage. Note that avoided emissions (Type I) should not be considered superior to Types II-V on the basis of permanence, since such emissions may only be temporarily avoided. The marginal quantity of fossil fuel whose use is avoided by such an offset might get purchased and consumed by someone else (carbon leakage), or it may remain in the ground for years, only to be extracted and emitted at a later date when prices and other conditions change (intertemporal carbon leakage). Avoided emissions can therefore also suffer from poor "permanence" if the reduction is not enduring. Figures 1 & 2 prepared by Eli Mitchell-Larson.

Offsets eventually need to come exclusively from carbon removals, but emission reductions will remain crucial for decades. **Emission reductions** include avoided emissions, for example the deployment of renewable energy to replace planned fossil fuel power plants, programmes to update inefficient cook stoves, and the destruction of potent greenhouse gases like methane and nitrous oxide before they reach the atmosphere. In other cases, the emission reduction requires physically storing the carbon whose emission was averted, for example, installing Carbon Capture and Storage (CCS) on industrial point sources or gas power stations. Paying someone to avoid damage to natural and semi-natural ecosystems, an offset class that suffers from hard-to-prove additionality and concerns over carbon leakage, is technically a form of emission reduction in which carbon is stored – in this case within the preserved ecosystem itself. For such offsets, it is critical that the storage employed is sufficiently permanent (see Principle 3) whether in biological carbon reservoirs through avoided damage to natural and semi-natural ecosystems, or in geological reservoirs as with CCS.

In contrast, **carbon removals** are offsets generated by projects that remove carbon dioxide directly from the atmosphere. Examples include biological carbon sequestration (planting trees, soil carbon enhancement, etc.), bioenergy with carbon capture and storage (BECCS), direct air capture with geological storage (DACCS), or converting atmospheric carbon back into rock through remineralisation. High-quality emission reductions have exactly the same effect on the atmosphere as carbon removals in the near term. But carbon removals have a critical advantage over emission reductions because they scrub emissions from the atmosphere. As a result, they will eventually play a hugely important role in stabilising atmospheric concentrations of carbon dioxide, and potentially even reducing them after net zero is achieved.

Users of offsets must increase the portion of their offsets that come from carbon removals, rather than from emission reductions, ultimately reaching 100% carbon removals by mid-century to ensure compatibility with the Paris Agreement goals. Creating demand for carbon removal offsets today will send a signal to the market to increase supply.

Principle 3: Shift to long-lived storage

Offsets increasingly need to come from activities that store carbon permanently, with very low risk of re-release into the atmosphere. Whereas Principle 2 concerned the distinction between emissions reduction and carbon removals (orange and blue pathways in Figure 1), Principle 3 addresses the importance of shifting from short-lived storage to long-term storage (lighter and darker box shading in Figure 1).

Short-lived storage refers to methods of storing carbon which have an uncertain or higher risk of being reversed within decades. These include many biological storage methods like afforestation, reforestation and soil carbon enhancement. Such methods are capable of storing carbon for millennia, provided that land use and environmental conditions do not change. However, challenging conditions such as changing political priorities, economic pressures, fire, disease and risks associated with climate change itself, all conspire to increase the risk that this trapped carbon will be re-emitted in the near-to-medium term. Provided offsetting in high-risk regions and situations (whether for climate, geopolitical, or other factors) is avoided or approached with appropriate caution, ecosystem-based carbon storage can be low-risk over the long term.

Figure 2: *Example net zero aligned offsetting trajectory*

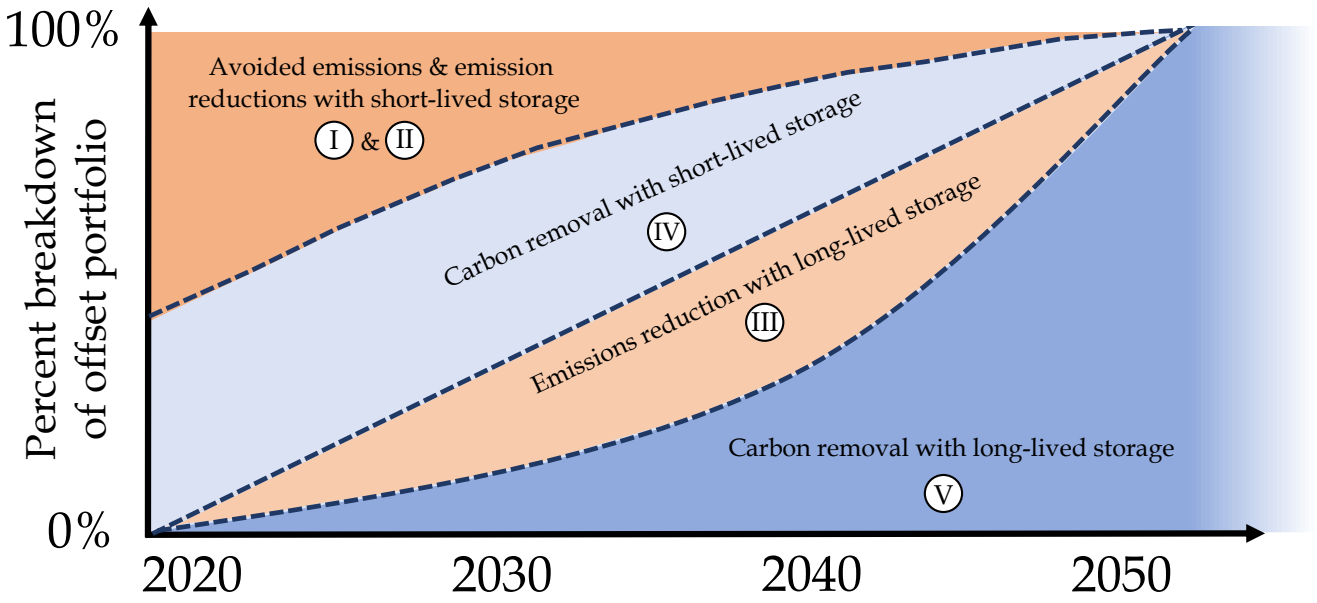

Figure 2 - An illustrative breakdown showing the percentages of different types of offsets that could be used to address unmitigable emissions between 2020 and 2050. It is not intended to be prescriptive, but shows one plausible pathway an offsetting plan that is compatible with Principles 2 & 3 could follow, showing the shift away from emissions reductions (orange colours) toward carbon removal (blue colours) and the shift away from short-lived storage (above the diagonal line) to long-lived storage (below the diagonal line).

Long-lived storage refers to methods of storing carbon which have low risk of reversal over centuries to millennia. This includes storing CO_2 in geological reservoirs or mineralising carbon into stable forms. While robust monitoring and verification is still needed to ensure the CO_2 added to these stores does not leak out, they are generally much more inert and secure than biological storage methods.

The duration of storage does not map directly onto the carbon removal-emission reduction distinction. Some carbon removal offsets can suffer from short-lived storage (e.g. some afforestation or soil carbon projects), and conversely some emission reduction offsets offer very long-term storage (e.g. carbon capture equipped on a cement plant with subsequent geological storage). Offsets that constitute both a carbon removal and offer long-lived storage do exist (e.g. DACCS), but are challenging to procure due to their early stage, limited supply, and, for the time being, high costs.[9,10] It is critical that investment in scaling and improving the technologies that enable long-lived storage begins now. A net zero aligned portfolio of offsets must increase the portion of **carbon removals** over **emission reductions**, and the portion of **long-lived storage** over **short-lived storage**, over time (see Figure 2 above).

Principle 4: Support the development of net zero aligned offsetting

Principle 1 reaffirms the need to reduce first, offset with high-quality offsets second, and continually revise one's offsetting strategy as best practices evolve. Principles 2 and 3 introduce a new framework for proactively evolving the mix of carbon offsets in one's portfolio toward an end-state compatible with achieving net zero. However, while some carbon removal and long-lived storage options to meet Principles 2 and 3 exist today, volumes must rise and cost must decline to make this long-term transition more feasible are not yet in place.

What explicit actions can buyers and sellers of offsets take in the short to medium term to support net zero aligned offsetting? What early impacts should users of offsets aim to bring about? Organisations can use their buying power and political and social credibility to drive meaningful change today in the following ways:

- **Market signalling**. Adopting the Oxford Offsetting Principles and publicising their adoption can create demand for offsets that are net zero aligned, thus motivating investment and project creation. Currently there are too few offsets employing long-lived storage. There are also too many offsets with short-lived storage and low integrity on other metrics such as additionality (see Principle 1). Creating demand for long-lived storage will help accelerate their deployment to deliver the necessary supply over the long-term.
- **Aggregating demand and supply**. Organisations adopting the Oxford Offsetting Principles have an opportunity to be more proactive than simply signalling demand. For example, users could individually or collectively enter into long-term offset purchase agreements, similar to the power purchase agreements which supercharged solar and wind deployment. Such agreements provide long-term guaranteed revenue streams that allow developers to finance carbon projects upfront, and they provide price certainty for offset users. These could be designed as Contracts-for-Difference or could have different call or put option characteristics to provide a credible price signal to suppliers to motivate investment, while giving buyers flexibility and value for money. An example of how this can work includes the recently announced Woodland Carbon Guarantee Scheme[11].
- **Forming sector-specific alliances**. Each sector has its own unique considerations around absolute emissions reductions it can take before using offsets, and additional goals it may wish to accomplish through offsetting. Users of offsets can build partnerships and collaborate across their sector(s) to leverage shared opportunities and set out sector-specific offsetting rules and commitments consistent with the Oxford Offsetting Principles. They can also advocate for industry bodies to take clearer and stronger stances on climate policy and offsetting standards. Note that these Principles are primarily buyer-facing, but offset sellers and carbon project developers have an enormously important role to play, and can adopt the spirit of the principles by actively advocating that their customers shift their demand in the manner described in Principles 2 and 3.

- **Support the restoration and protection of a wide range of natural and semi-natural ecosystems in their own right**. Not only will this secure the ecosystem goods and services on which humans depend, including resilience to the impacts of climate change, but will contribute to carbon storage over the long term. Nature based solutions may well be needed to balance carbon released from natural feedbacks under a warming scenario, even as we do achieve a net zero balance of long-term emissions and removals[12]. Ecosystems can provide a wide range of other social and environmental benefits beyond carbon, including biodiversity[13,14]. For these reasons, the protection and restoration of ecosystems must be rapidly scaled up, irrespective of any carbon benefits they may or may not provide. While carbon offsets can help to fund some of this work, such efforts should be valued and funded for the broad suite of benefits and values they create, not incidentally through carbon offsetting. Carbon offsetting can be one of these values and in some cases can help facilitate the broad range of values, but safeguards should be employed such that carbon offsetting does not pre-empt other ecological and social values, and conversely that the pursuit of ecological and social values does not undermine the professed carbon benefits.
- **Incorporating the Principles into regulations and standards**. A wide range of voluntary and regulatory standards currently govern both approaches to offsetting and how net zero is defined. Going forward, actors adopting the Principles should work to ensure that such regulations and standards evolve to reflect a science-based approach to offsetting and net zero, as defined in the Principles.

These are just some of the immediate ways in which organisations can work to ensure that the offsetting market develops in a way that can deliver net zero alignment. There are a variety of enabling conditions that can and should be pursued simultaneously, from supporting new marketplaces, standards, and relevant certifications, to conducting research and development to increase the quality and quantity of high-quality sustainable offsets. An offsetting strategy aligned with the aim of achieving net zero at a global scale must include ways to support these conditions.

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Smith School of Enterprise and the Environment
University of Oxford
South Parks Road
Oxford, OX1 3QY
United Kingdom

E enquiries@smithschool.ox.ac.uk
T +44 (0)1865 614942
F +44 (0)1865 614960
www.smithschool.ox.ac.uk