CO_2 2.Low carbon

A short guide to carbon offsetting

Offsetting greenhouse gas emissions will be required in the short term while the construction industry develops zero-carbon materials. Will Arnold summarises the key considerations for engineers looking to offset a project's emissions.

Introduction

A net-zero asset is one where the whole-life carbon asset-related greenhouse gas emissions (modules A–C), plus offsets, equal zero. As such, until we reach a point where zero-carbon or carbon-negative construction materials exist, offsetting will be required in order to claim net zero.

Over the past year or so, over 50 articles have been published in *The Structural Engineer* (www.istructe.org/climate-emergency) examining different ways that our profession can reduce carbon emissions. Offsetting has not yet been covered, as our focus must remain on reducing our emissions.

However, there are benefits to the use of offsetting in the short term while the industry decarbonises, and so it is useful for the engineer to have a basic understanding of the principles of offsetting in order to start a conversation with their client about how offsetting could be used effectively on their project.

Types of offsetting

There are two main types of offsets – removals and reductions:

- Greenhouse gas removal schemes take existing carbon emissions out of the atmosphere, typically through afforestation or reforestation, although in the future this will also be through various forms of carbon capture and storage.
- Emission reduction schemes do not absorb any emissions from the atmosphere, but minimise or prevent emissions by other people. Typically this is through investment in renewable energy generation, household energy efficiency measures, and peatland restoration.*

High-quality offsets of any type should be additional (meaning that they would not have happened if it wasn't for the offsetting scheme†), measurable and verified – there is more on this in the 'Offsetting effectively' section below.

Costs

Currently, offsetting is inexpensive compared with construction, with most offsetting schemes priced at £10–50/tCO_2e. The cost is expected to increase in the future[2] (adding risk to the notion of offsetting operational carbon), but for now, this means that the cost of offsetting the upfront emissions of a 500$kgCO_2e/m^2$ project is around £5–25/m^2 – barely 1% of the construction cost.

Of course, this low cost is both a blessing and a curse: meaning that there is no reason not to offset every project's emissions immediately; but, unfortunately, providing little financial incentive to reduce emissions in the first place – 1% is a small premium in return for being led to believe that you can continue with business as usual.

Limitations and opportunities

Of course, it is well recognised now that business as usual isn't physically possible, and all currently available forms of offsetting are limited as to what is possible to achieve.

Greenhouse gas removal schemes are limited by the amount of land required. The Intergovernmental Panel on Climate Change[3] states that humanity currently emits 42$GtCO_2e$/year, so to reabsorb this would require a forest the size of Russia, China and the USA combined (based on Forest Research[4] numbers of 12tCO_2e/ha/year).

And emission reduction schemes, by definition, don't work once everyone else has already reduced their emissions to match your own – once this has happened, it will be simpler to try and reduce your own emissions, than someone else's.

Offsetting as part of sustainable design

Because of the limitations described above, offsetting can only be used as part of a wider sustainability agenda. As shown in **Figure 1**, our top priority as engineers remains ensuring that as little material ('stuff') as possible is used – through maximising reuse, promoting efficient structural configuration, putting the right materials in the right place, and then maximising design utilisation.

Once this is done, we should pursue a low-carbon material specification, before offsetting whatever remaining emissions result from the final delivered construction.

Offsetting effectively

The *Oxford Principles for Net Zero Aligned Carbon Offsetting*[5] were launched in 2020 to provide guidelines to ensure offsetting helps to achieve a net-zero society. It should be noted at this point that the first step towards complying with the Principles is to cut project emissions, before starting to offset.

The Principles go on to define high-quality offsets as those 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'.

This definition is unpicked further by the diagram reproduced here in **Figure 2**, which orders offset types from least preferable (Type I) to most preferable (Type V).

Carbon removal is prioritised (Types IV and V), with the document advocating for all offsets to be of this type by mid-century, although it maintains that emissions reductions (Types I, II and III) still remain crucial in the shorter term. With both offset types, more permanence will be guaranteed in the future if carbon capture

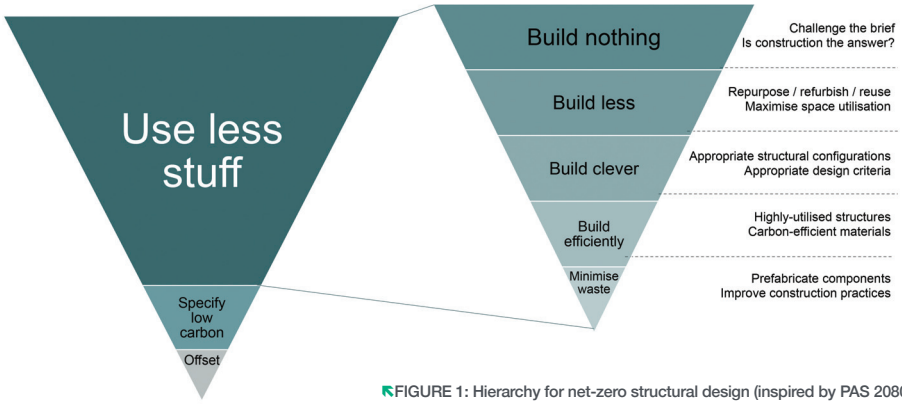

FIGURE 1: Hierarchy for net-zero structural design (inspired by PAS 2080)

* Damaged peatlands around the world currently emit over 1$GtCO_2e$ annually[1].
† e.g. investing in renewable power in Western Europe would not be 'additional' as it is happening anyway.

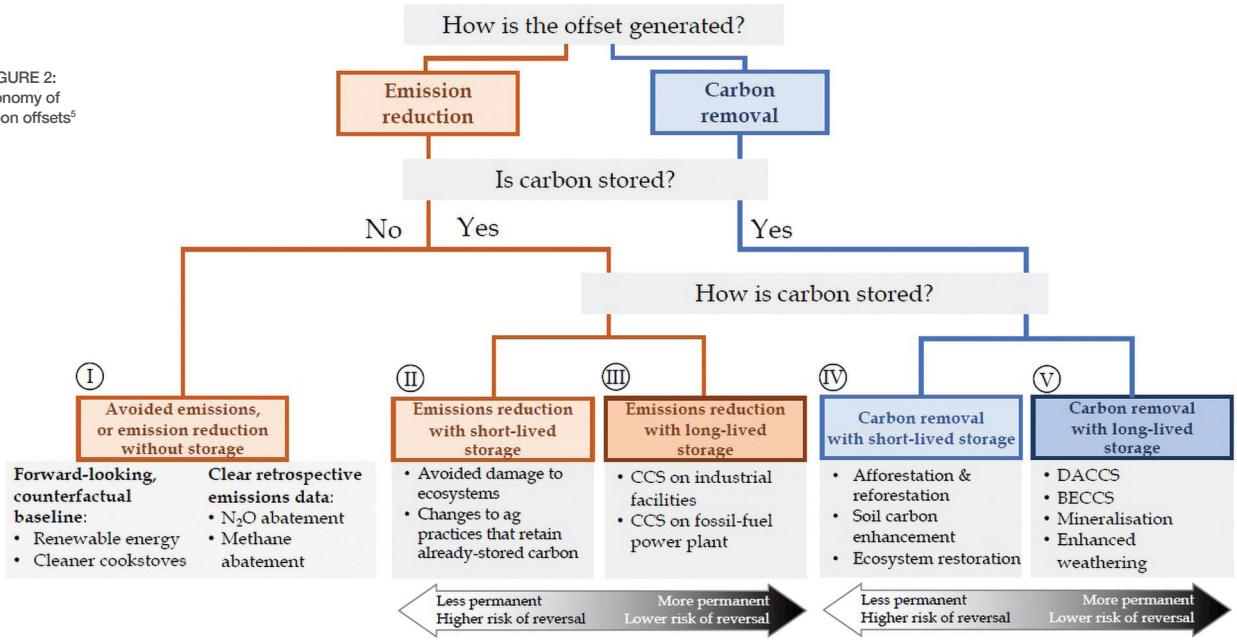

FIGURE 2: Taxonomy of carbon offsets[5]

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technologies are scaled up.

The document highlights the co-benefits that accompany nature-based offsets, including increasing biodiversity and natural flood risk management, and argues that the protection and restoration of ecosystems must be rapidly scaled up regardless of any discussions around carbon offsetting.

There are three further key aspects to the principles, regardless of type. First, offsets must be 'verifiable'. There are several independent accreditation schemes that can be used to ensure this, with the International Carbon Reduction & Offset Alliance (www.icroa.org/ICROA-Audit-Status) auditing and maintaining a list of platforms around the world.

Two common platforms used internationally are Gold Standard (www.goldstandard.org/) and the UN carbon offset platform (https://offset.climateneutralnow.org/) – and in the UK the Woodland Carbon Code (https://woodlandcarboncode.org.uk/) can be used for carbon-removal offsetting, and the Peatland Code (www.iucn-uk-peatlandprogramme.org/peatland-code-0) for nature-based emission-reduction offsetting.

Second, emissions, accounting practices and targets must all be reported in a transparent manner. This is not unique to the Oxford Principles, it is also a requirement of both the Science Based Targets initiative (https://sciencebasedtargets.org/) and the Race to Zero (https://racetozero.unfccc.int/). There is extensive government guidance on this topic[6].

Finally, the Oxford Principles encourage users to enter into individual or collective long-term offset purchase agreements wherever possible, rather than just making one-off purchases. This behaviour provides more guarantee to future revenue, which can be used to plan better for the financing of carbon projects.

Summary

Reducing material consumption remains the focus of the structural engineer's response to the climate emergency. However, until we reach a point where construction materials can be produced for zero (or negative) emissions over and beyond their entire lifecycle, the construction of structures will always result in net emissions of carbon. As such, some form of offsetting will be required in order to reach net zero, and it is our responsibility to guide good decision making around offsetting whenever we can.

High-quality offsetting can bring many positive outcomes: the world needs more forests and peat bogs, and there are many countries in need of emission-reduction technologies. And so, in the short term at least, quality offsetting schemes give the opportunity for clients to invest positively in the future of humanity.

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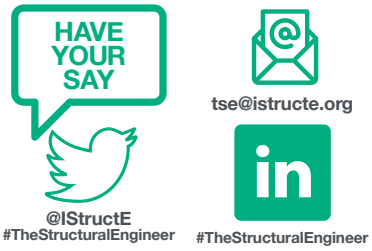

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