

continues regrettably with much more destructive weaponry today.¹⁷ Other recent examples of the targeting of civilians and vital infrastructure include conflicts in former Yugoslavia, Iraq, Afghanistan, Syria, Yemen and several ongoing conflicts across the horn of Africa. That today, in Europe, yet another conflict is seeing deliberate attacks on civilian targets including highly vulnerable nuclear power plants, water supplies and the electricity grid is yet another example of how vital it is to find peaceful solutions to conflict and how ultimately military action creates long-lasting destruction that will take decades of post-conflict rebuilding and many generations to heal.

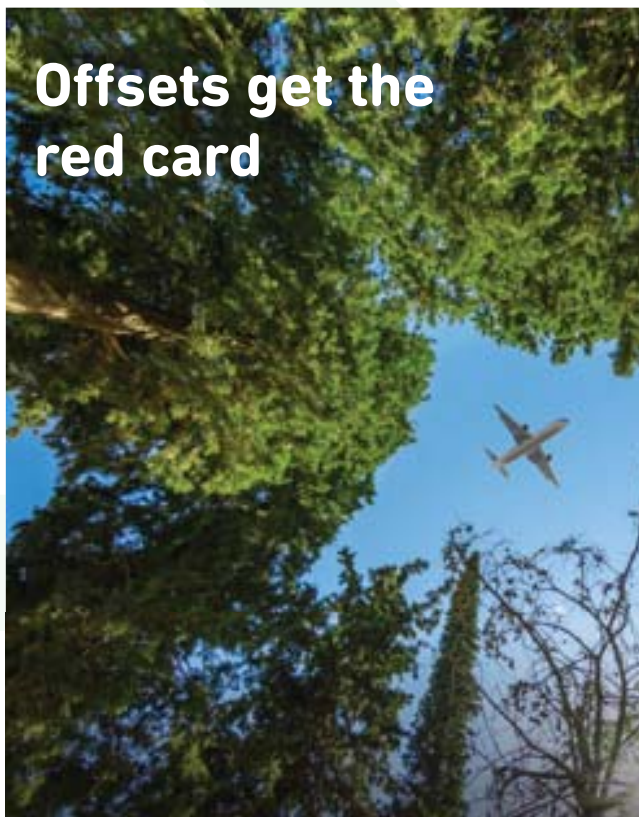
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For the latest on the situation, see IAEA updates: <https://www.iaea.org/nuclear-safety-and-security-in-ukraine>

References

[all references correct as of December 2022]

- 1 Wikipedia (2022a) https://en.wikipedia.org/wiki/Zaporizhzhia_Nuclear_Power_Plant
- 2 The VVR reactors are not only Russian designed and built but also supplied with enriched uranium from Russia. Despite much publicised sanctions, 20% of the nuclear fuel used by the EU is still supplied by Russia. No2NuclearPower (2022). 2 December. <https://www.no2nuclearpower.org.uk/news/nuclear-fuel-3-12-22/>
- 3 Wikipedia (2022b) <https://en.wikipedia.org/wiki/Enerhodar>
- 4 A reactor containment structure is a massive concrete and steel structure designed to contain intense radiation and superheated steam circuit pipework and valves protecting the highly radioactive reactor core.
- 5 The river is dammed in several places, so strictly speaking the body of water to the north of Zaporizhzhia is part of the extensive Kakhovka reservoir 240km long and up to 23km wide.
- 6 IAEA (2022). Director General Statement on Situation in Ukraine, 20 November. <https://www.iaea.org/newscenter/pressreleases/update-128-iaea-director-general-statement-on-situation-in-ukraine>
- 7 *The Observer* (2022) 27 November. <https://www.theguardian.com/world/2022/nov/26/fears-for-all-ukraines-nuclear-plants-after-emergency-shutdowns>
- 8 Electricity Info (2022) 9 October. <https://electricityinfo.org/news/ukraine-zaporizhzhia/>
- 9 Wikipedia (2022c). https://en.wikipedia.org/wiki/Fukushima_nuclear_disaster
- 10 Wikipedia (2022d). https://en.wikipedia.org/wiki/Nuclear_meltdown (also see note 13)
- 11 Popovych, Z., Bondar, D. and Ramana, M. (2022) 7 October. <https://thebulletin.org/2022/10/zaporizhzhia-on-the-brink-how-deteriorating-conditions-at-the-nuclear-power-plant-could-lead-to-disaster/>; Ouest France (2022) 1 September. <https://www.ouest-france.fr/monde/guerre-en-ukraine/guerre-en-ukraine-queles-sont-les-risques-d-accident-nucleaire-autour-de-la-centrale-de-zaporijjia-b1108af8-29e8-11ed-bd3f-f86da3bd80f7>
- 12 Reference 133: *The Economist*, 10 March 2012 from: Wikipedia (2022c) – as note 9.
- 13 Fetter, S. and Tsipis, K. (1981) Catastrophic Releases of Radioactivity. *Scientific American*, vol. 244, no. 4, pp.41–47; Rotblat, J. (1981) *Nuclear radiation in warfare*. SIPRI/ Taylor & Francis; Fetter, S. (1982) *The Vulnerability of Nuclear Reactors to Attack by Nuclear Weapons*. Massachusetts Institute of Technology, Program in Science and Technology for International Security, Report No.7.
- 14 This estimate is based on fallout spread for a 1kt weapon from nuclear tests entraining reactor products. Data from: Fetter, S. (1982); Rotblat, J. (1981) – as note 13.
- 15 The danger zone (1 gray cumulative dose causing radiation sickness and some longer-term deaths) for a 1GW reactor and 1MT weapon is 550km x 100km. Rotblat, J. (1981) – as note 13.
- 16 In a legacy from the Soviet Union, the Ukraine, Russian and Moldovan electrical power grids remain part of a common infrastructure. Quite apart from efforts by the EU to secure energy independence from Russia and self-sufficiency this is another example of how interdependence of energy supplies can be used as a weapon of war.
- 17 Some weapons have been specifically designed to damage electricity generation for example by air-dropped conducting fibres.



Offsets get the red card

The idea that people can merrily continue polluting if they just pay into offsetting schemes always seemed too good to be true. SGR's **Andrew Simms** and New Weather Institute's **Freddie Daley** spell out six reasons why it is.

From 'Jet Zero', the **UK government's plan** to shrink aviation pollution, to its net zero plans for the wider economy, most mainstream efforts to make the economy and our lifestyles comply with maintaining a habitable climate have one thing in common. They rely to a significant degree on offsetting polluting emissions rather than stopping them. There are many problems with this approach that we explore below. Perhaps the largest (apart from the fact that most appear simply not to work) is that offsetting is used primarily as an excuse to continue business as usual, when the scientists of the IPCC specifically stated in 2018 that meeting climate targets meant "rapid, far-reaching and unprecedented changes in all aspects of society."

The UK's net zero target is already problematic in terms of it lacking environmental integrity, but government even now is reviewing it, not to correct its weaknesses, but to make sure it

is “[pro-business and pro-growth](#)”. Whilst orthodox growth has long been debunked as a useful or meaningful economic goal for societies like the UK, the implication that a rapid, low carbon shift might be bad for the economy is, in itself, revealing of a lack of awareness of where the world is going.

[Big polluters seem to view carbon offsetting](#) as a ‘get out of jail free card’. But offsetting can actually make the climate problem worse, and excuse some of the world’s most high profile sporting and cultural events being used as a propaganda platform for fossil fuel interests. The Men’s FIFA World Cup in Qatar was, now notoriously, promoted as the first “[fully carbon neutral FIFA World Cup tournament](#)”. This claim, made before the tournament had even begun, depended on questionable carbon accounting tricks and extensive use of offsetting. Yet both [have been called-out](#) for lacking scientific credibility, transparency, and integrity. Rising awareness of the climate emergency means many in the world of sport – clubs, events, and fans – and far beyond, are turning to offsetting as a well-intentioned, or just convenient way to compensate for the impact of their carbon emissions.

But, it wasn’t even as if FIFA or Qatar were promising to do the offsetting themselves, partly they just provided fans and players with ideas on how to cut their carbon footprint in their everyday lives. Travelling fans were also invited to voluntarily offset their flight emissions, even though few typically do and flight offset schemes are [known to be deeply flawed](#).

But even direct efforts by FIFA were little better. The competition claimed to offset emissions by purchasing carbon credits through a non-standard carbon market initiative set up specifically for the Qatar World Cup, the Global Carbon Council. This claims it will support renewable energy projects in the region that displace fossil fuel generation, but for many of these projects it highly likely that they’d have been built anyway, meaning that the purchasing of carbon credits does little to reduce overall emissions. A tree and turf nursery were also set up in the desert to capture carbon, produce trees for stadium exteriors, and grass for the pitches and training grounds. But tree plantations used for offsetting have already been shown to burn down during forest fires, in heatwaves set to be more common and intense in a warming world. In this smouldering cloud, a ‘fossil fuels for trees’ swap is exchanging stable, reliable carbon storage for something that can easily go up in smoke – it’s basically a kind of carbon laundering.

Climate goals disallowed

Offsetting is a bit like trying to give up smoking by paying someone else to bake a cake. It fails to compare like for like. Using stable stores of fossil carbon from the geosphere will not be ‘cancelled out’ by planting a tree that may, or may not grow, whose lifespan is uncertain, and could fall victim to drought, flood, or blight. Baking a cake may be a good thing to do in itself, but it’s unlikely to help you quit cigarettes. Similarly, planting a tree will not make up for the real, long-lived impacts of carbon emissions released into a saturated atmosphere now.

The problem is that offsetting in its current form simply does not do what the name implies. Due to a mix of scientific and practical problems, offsetting often doesn’t work at all, and can even make the problem worse. The theory goes that through offsets, organisations, events or individuals, effectively ‘erase’ or ‘cancel out’ the emissions that arise from their on-going activities, whether it’s from transport, constructing stadiums, or powering facilities. Following this logic, organisations can purchase additional offsets to reduce their ‘overall’ impact, thereby making it possible to claim absolute reductions in their

emissions and environmental impact when, in reality, they have made no adjustments to their habits, behaviour, operations, procurement process, or organisational structures.

This theory, however, quickly collapses in the face of the climate crisis. Under the latest climate models produced by the Intergovernmental Panel on Climate Change (IPCC), limiting global heating to 1.5°C requires global emissions to peak before 2025 and be cut by 43% by 2030, reaching net-zero in the early 2050s. According to the IPCC, to achieve these temperature goals, global emissions need to fall by around 90%, while various types of carbon removal will be relied upon to deliver [just the other 10% of required reductions](#). On a basic level, relying on carbon offsetting instead of pursuing emissions cuts at source is simply out of touch with the science. But, it runs into big problems on several other levels too.

Offsetting has become a central pillar of corporate sustainability strategies, net-zero pledges, and national governments’ climate policy programmes too. Household names like EasyJet, Heathrow Airport, BP, and Shell all heavily rely on offsetting schemes to ‘cancel out’ their operational emissions, appear as environmentally friendly, and claim carbon neutrality. Implicitly they are heavily relied on in national climate plans, and used patchily by consumers to assuage consciences guilty, for example, at taking long haul flights.

Carbon offsets are big business and the global market is set to balloon in size as an ever-increasing number of organisations seek to claim carbon neutrality. According to analysts, the demand for carbon offsets will [increase by a factor of 15](#) or more by 2030 and by a factor of up to 100 by 2050. By 2050, the global carbon market could increase to a value of \$200 billion. There are concerns that demand for offsets will outstrip supply by as early as 2024, with new monoculture forestries putting immense pressures on land, communities, and wildlife.

Also, through offsetting projects and common, but controversial, emissions bookkeeping methods, known as ‘market-based accounting’, organisations can claim vast reductions in planet-warming emissions without transforming their operations, partnerships, or governance. To illustrate this point, look no further than Cisco Systems, one of the largest tech conglomerates in the world that employs nearly 80,000 people. In 2021, Cisco claimed triumphantly that they had cut their pollution across scope 1 & 2 (those emissions that are ‘owned’ or ‘controlled’ by the company) by 60% over the past 15 years. But when these claims were assessed through a different accounting method, which excluded the offset and renewable credits purchased by Cisco, the picture is entirely different: [emissions climbed by 22%](#).

A number of offsetting mechanisms are popular and set to dominate the global carbon offsetting market in the years ahead. These include nature-based offsets – a category that uses plants, trees, forests, soil, or the ocean to remove carbon from the atmosphere and store it. Depending on the offset project in question, this approach can, in theory, also protect and conserve ecosystems that are considered carbon sinks, such as rainforests and peat bogs, and embrace rewilding schemes. In 2019, nature-based offsets made up over half (56.4%) [of the voluntary offset market](#). Then there are renewable energy offsets that seek to maintain or increase renewable energy generation, ultimately displacing fossil fuel use and therefore preventing carbon emissions being emitted in the first place. In 2019, renewable energy projects [made up 21.3% of voluntary offset markets](#).

Cash is being made – but huge questions remain over their credibility, transparency and integrity. Even some of the more

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» traditionally cautious organisations are sceptical about the role of offsets. The [International Energy Agency \(IEA\)](#) stated in 2021 that, “there is likely to be a limited supply of emissions credits consistent with net-zero emissions globally and the use of such credits could divert investment from options that enable direct emissions reductions.”

Six ways that offsetting leaves us locked in climate jail

Offsetting doesn't work

In its current form, scientific evidence suggests that offsetting doesn't deliver on its promises. [One study for the EU Commission](#) found that 85% of the offset projects under the UN's Clean Development Mechanism (CDM) failed to actually reduce emissions, and that only 2% of had a high likelihood of doing so. Some big corporate offsetting schemes have been ravaged by the very climate impacts they are meant to push back. In 2021, as record-breaking wildfires engulfed California, Oregon, and Washington in the USA, [forest offsets bought by Microsoft and fossil fuel major BP were destroyed](#). These occurrences are not rare. Since 2015, wildfires in California have [damaged six forest offset buffer projects](#), releasing between 5.7 million and 6.8 million tonnes of carbon back into the atmosphere, according to CarbonPlan.

Schemes can cause real harm

Offset projects can be harmful both in terms of direct failure, and also due to the impact of projects on local communities, economies, and the natural world. There are multiple examples of nature-based offsetting schemes being implemented without regard to the legal or [customary land use rights of local people](#). These poor quality and shoddily implemented offset schemes have been [shown to lead to human rights abuses](#), adverse effects on biodiversity and are [less likely to provide long-term stores](#) of carbon emissions. [One common example](#) is when native forests brimming with biodiversity are cut down to make way for fast-growing eucalyptus plantations, creating monocultures, devoid of wildlife, that can pull groundwater away from local communities and disrupt agriculture.

Offsetting is a form of carbon laundering

Attempting to offset the burning of stable stores of fossil carbon by planting unstable stores like trees, that face multiple threats in our warming world, is not swapping like-for-like. Scientists believe that it will take close to [half a million years for a tonne of CO₂ emissions](#) released today through the burning of fossil fuels to be removed from the atmosphere naturally. This hard scientific truth runs right to the heart of the offsetting predicament: to effectively undo emissions, offsetting mechanisms must remain in place for hundreds of thousands of years. The average contract for a tree planting offset scheme, however, is around 40 years.

The system can be gamed

Through accounting tricks and murky carbon markets, offsets can be misallocated on a mass scale, which often means there is no reduction in overall emissions. It is very difficult to prove that renewable projects would not have been built anyway. Research from Berkeley, Oxford, and Carbon Plan [found that up to 85% of offsets sold today are not additional](#), which means the sale of these credits has no impact on reducing emissions.

It provides an excuse for 'pollution as usual'

Offsetting can justify and legitimise the status quo, allowing organisations to continue polluting while claiming leadership and progress on sustainable and environmental issues. Relying on offsets allowed one company, mentioned above, Cisco Systems, to claim a 60% cut in emissions, [when their actual emissions had risen 22%](#). By analysing the carbon credits allocated to 1,350 wind farms across India, researchers found that at least 52% of approved [carbon credits were allocated to projects that would have been built anyway](#). The researchers concluded that “in addition to wasting scarce resources, we estimate that the sale of these offsets to regulate polluters has substantially increased global carbon dioxide emissions.”

Offsets inhibits real change

The cost and apparent convenience of offsetting means that the more challenging structural decisions required to address an organisation's climate impact may be delayed. As an approach, offsetting is the flawed, temporary fix that by default becomes the main response to the problem. Especially where the wealthy are concerned, whether nations, corporations or individuals, if you can buy your way out of actually changing behaviour, why change at all? Thinking they are a realistic option for more systemic change, when they aren't, restricts our thinking, creativity and ambition to find genuine ways to thrive in a bounded biosphere.

Get out of jail?

It's clear that offsets cannot break the carbon pollution bonds currently locking humanity and the rest of the natural world into the brutal upheaval of a warming world. In the race to decarbonise the global economy, if there is to be place for offsets, however small, they need to live up to certain basic criteria. The means to escape the jail of global heating every offset project must be: a genuine addition to other efforts to reduce emissions – as in, the carbon saving would not have happened without the scheme; permanent – carbon must be stored on a permanent basis to have 'offset' status – not, for example in an ecosystem that, due to warming, could flip from being a store to source; supported by local people – far too many projects disrupt and damage surrounding communities, so ensuring and maintaining local support is key; used only for residual emissions as a last resort: offsets must not be used to allow organisations to continue business-as-usual without transforming their internal operations, or individuals there behaviours.

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A fully referenced version of this article can be viewed via: <https://www.sgr.org.uk/publications/responsible-science-no-5>