The Micro-Internship Programme - Report on Carbon Offsetting for Abingdon Carbon Cutters

Hilary 2020

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Contents/Structure

Introduction and Aim

Background to Carbon Offsetting

What exactly is a Carbon Offsetting Scheme?

Total Volume and Value

Analysis of the case for and against Carbon Offsetting

Arguments in favour

Arguments against

Key criteria of effective offsetting schemes

Carbon Offsetting Standards

Recommendations

Choosing schemes with care

Recommended organisations

Conclusion

Introduction and Aim

This report has been created for Abingdon Carbon Cutters: a community action group (CAG) which aims to reduce the carbon footprint of the town of Abingdon and to promote actions that can increase the sustainability of day to day life to its residents. The aim of my research was to explore whether carbon offsetting (funding projects that reduce emissions in other geographical areas and/or countries) is an effective way of balancing out our own carbon footprint in the case of difficult to avoid, emission-heavy activities. A prime example of this is international travel to visit family or relatives, the emissions of which will massively outweigh any other actions taken to reduce one's carbon footprint. In this scenario, it would be impossible to reduce emissions without carbon offsetting bar avoiding travel entirely. Offsetting is typically at low cost; an average of £10 per tonne of CO2e offset.

I chose to evaluate the main arguments in favour and against using carbon offsets to reach a 'net zero' footprint to determine what conditions offsetting can be deemed an effective method of reducing our carbon footprint. This was mainly achieved through a literature review, drawing on the wide range of case studies, project information and journal articles available from sources such as newspapers (e.g. the Guardian, the Financial Times), reports from governments and international organisations (e.g. the Government of Norway, the UN Environment Programme) and NGOs and thinktanks (e.g. Ecosystem Marketplace and the Carbon Offset Watch).

As an outcome, I will recommend a few select carbon offsetting schemes that meet the conditions of effectiveness so that climate-conscious members of Abingdon Carbon Cutters and the wider population of Abingdon have the information necessary to take steps to balance out their carbon footprint beyond the limit of conventional measures such as driving less, eating locally grown produce and investing in domestic renewable energy. This report does not recommend that carbon offsetting can supersede efforts to transition to a more sustainable way of life, but merely that it can be used alongside these measures to reduce an individual's carbon footprint more rapidly in the short term, especially with regard to residual emissions from activities where it is not possible to reduce emissions to zero.

Background to Carbon Offsetting What exactly is a Carbon Offsetting Scheme?

Carbon offsetting schemes encompass a wide range of schemes located across the globe, but the underlying principle is very simple. A holidaymaker or businessperson visits an offsetting organisation's website, uses an online carbon calculator to estimate the emissions of the specific activity they are offsetting, and then pays the offset company. The offsetting organisation then uses this money to support projects that reduce greenhouse emissions elsewhere in the world by the amount the individual is looking to offset – the price required per tonne of carbon emissions reduction will vary project by project and between organisations because industries and project types vary in cost effectiveness.

Offsetting allows individuals and businesses to balance out their carbon footprint by investing their money in schemes that save greenhouse gases reaching the atmosphere elsewhere, whilst continuing to contribute to carbon emissions through their activities. Projects are most commonly based in the developing world and normally function by reducing future (rather than immediate) emissions, for example by facilitating energy efficiency measures or investing in renewable energy projects, which otherwise would have led to additional emissions from fossil fuel combustion. Data from the Voluntary Carbon Markets Outlooks and Trends¹ report suggested that carbon offsetting projects exist in 83 countries across the world. There are many other projects promoted by international charities and non-governmental organisations that are not labelled as carbon reduction schemes but effectively reduce emissions as an additional benefit as carbon reduction and sustainable development are intrinsically linked.

Carbon offsetting entered the political conversation in 1992 after the Kyoto Protocol was signed. Within this international agreement there was an article that proposed an effective mechanism for carbon offsets called the *'Clean Development Mechanism'*. This encouraged developed countries to invest in infrastructure and technology in developing countries by allowing them to claim effective reductions in emissions as a credit towards meeting their own carbon emissions targets laid out in the Kyoto Protocol. The market for carbon offsetting programs has since soared, reaching a valuation of \$300m in 2018 and trading a total of 1.2 billion metric tonnes of carbon dioxide equivalent over the last decade according to the Ecosystem Marketplace. This is roughly equivalent to the average annual emissions of Japan's economy.

Schemes fall under two broad categories; land use-based and technology-based, though this is by no means a complete list of the categories of carbon offsetting mechanisms:

Land Use-based offset schemes	Technology-based offset schemes		
Forestry and land use	Chemical and industrial processes		
Agriculture	Energy efficiency and fuel		
	Renewable sources of energy		
	Waste Disposal		

¹ (Ecosystem Marketplace, 2019)

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Brief examples of each category are detailed below:

- Forestry and Land Use this utilises natural carbon sinks such as forests, peat bogs and soil. Deforestation, particularly in tropical regions such as Brazil and Indonesia, accounts for nearly 10% of global greenhouse emissions. Projects either protect existing forests by paying for protection and using the funds raised to provide substitutes for forest-based projects or restore and create new forests on land that was previously unforested.
- **Agriculture** farming is the second largest industry that contributes to climate change behind the energy sector. Projects could reduce emissions by converting liquid waste from livestock to biogas via fermentation to provide a source of energy. Livestock could also be fed with a corn-mix that reduces the amount of methane (a potent greenhouse gas) that they emit.
- Chemical and Industrial Processes industrial pollutants such as
 hydrofluorocarbons (HFCs) and nitrous oxide (N20) are potent greenhouse gases.
 Projects can ensure that these chemicals are captured or destroyed before emission, reducing the detrimental effect they will have on the globe.
- **Energy efficiency and fuel** by reducing the demand for energy, projects can reduce the amount of greenhouse gases emitted by providing essentials such as heating, electricity and light. Energy efficient buildings reduce the amount of energy wasted through efficient lighting, heating or cooling systems.
- Renewable sources of energy these are typically more costly than using fossil fuels as a source of energy, at least initially. Carbon offsetting programs can help support the initial cost of creating renewable energy infrastructure, such as solar panels or wind turbines, and provide a permanent carbon-free alternative energy source.
- Waste Disposal landfill waste can be anaerobically (i.e. a lack of oxygen) digested, producing methane. Projects can capture this gas and use it as a fuel, breaking it down to produce carbon dioxide (a less potent greenhouse gas).

Total volume and value of offsets

Information from a report conducted by the Ecosystem Marketplace² in 2018 (see tables on the next page) shows the volume of offsets issued by category – totalling 437Mt of CO2e since 2005. This is equivalent to more than the annual emissions of the United Kingdom but corresponds to a mere 1% of annual global emissions over a 13-year period. This data shows that carbon offsets are very small relative to the scale of the problem.

An interesting conclusion of the data available from Ecosystem Marketplace's report is that all carbon offsets are not created equally; with some categories offering a lower cost per tonne of CO2e emissions prevented. As each category utilises a different mechanism to prevent or reverse emissions, this is not surprising, but provides something to consider if we can justify carbon offsetting schemes. Namely; that we must evaluate each offsetting scheme individually to assess where our money will make the most difference in emissions balanced out, rather than considering all carbon offsetting programs equal.

However, on the whole carbon offsetting schemes offer a low cost, rapid solution to balance out one's carbon footprint. With the average UK person emitting approximately 10

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² (Ecosystem Marketplace, 2018)

tonnes per year and carbon offsetting offering an average of £8/tonne to balance out your emissions, an outgoing of less than £80/year is surely too good to be true?

Figure 1: A table showing voluntary carbon projects over a 10-year period by category, detailing the volume of offsets issued in MtCO2e. Taken from (Ecosystem Marketplace, 2018)

Table 1. Categories of Voluntary Carbon Projects, 2008-2018³

Project Categories	Projects with Issued Offsets	Volume of Offsets Issued in MtCO₂e (2005 - Present)⁴	New Projects ⁵
Agriculture – modifying agricultural practices to reduce emissions by switching to no-till farming, reducing chemical fertilizer use, etc.	87	6.7	1
Chemical Processes and Industrial Manufacturing – modifying industrial processes to emit fewer greenhouse gases.	72	63.5	0
Energy Efficiency and Fuel Switching – improving energy efficiency or switching to cleaner fuel sources.	633	127.9	8
Forestry and Land Use – managing forests, soil, grasslands, and other land types to avoid releasing carbon and/or increasing the amount of carbon the land absorbs.	170	95.3	3
Household Devices – distributing cleaner-burning stoves or water purification devices to reduce or eliminate the need to burn wood (or other inefficient types of energy).	161	23.4	0
Renewable Energy – installing solar, wind, and other forms of renewable energy production.	611	61.9	2
Transportation – increasing access to public and/or alternative transportation (like bicycling) and reducing emissions from private transportation like cars and trucks.	43	1.1	0
Waste Disposal – reducing methane emissions from landfills or wastewater, often by collecting converting it to usable fuel.	238	57.5	0

Figure 2: A table showing the Transacted Value and **Volume of Voluntary Carbon Offsets by Category in 2017** and 2018. Taken from (Ecosystem Marketplace, 2019)

TABLE 1 Transacted Voluntary Carbon Offset Volume, Value, and Weighted Average Price by Project Category, 2017 and 2018

	2017			2018		
	VOLUME MtCO ₂ e	AVERAGE PRICE	VALUE	VOLUME MtCO _{,e}	AVERAGE PRICE	VALUE
FORESTRY AND LAND USE	16.6	\$3.4	\$63.4M	50.7	\$3.2	\$171.9M
RENEWABLE ENERGY	16.8	\$1.9	\$31.5M	23.8	\$1.7	\$40.9 M
WASTE DISPOSAL	3.7	\$2.0	\$7.4 M	4.5	\$2.2	\$10.0M
HOUSEHOLD DEVICES	2.3	\$5.0	\$11.8M	6.1	\$4.8	\$29.5M
CHEMICAL PROCESSES/ INDUSTRIAL MANUFACTURING	2.6	\$1.9	\$4.9 M	2.5	\$3.1	\$7.9 M
ENERGY EFFICIENCY/ FUEL SWITCHING	1.1	\$2.1	\$3.3M	2.8	\$2.8	\$7.8 M
TRANSPORTATION	0.1	\$2.9	\$0.2M	0.3	\$1.7	\$0.5 M

Analysis of the case for and against Carbon Offsetting Arguments in favour

Carbon offset schemes allow individuals and businesses to balance out their carbon footprint by investing in reducing emissions elsewhere. Climate neutrality, though desirable, is often impossible for certain industries, especially in the short term and without the support of a global carbon tax, and as such carbon offsets offer a useful opportunity *in the short term* to effectively 'reduce' a business's carbon footprint whilst infrastructure and technology make the transition to carbon neutral processes. They can be the only viable short-term means of addressing the impact of certain industries – for example aviation – short of simply stopping them functioning.

When chosen with care, carbon offsets will reduce an individual's carbon footprint – if we are avoiding including carbon reductions as a direct result of our actions merely because they are geographically distanced from us, then surely we should ignore the cascading carbon emissions that come from products and services that we consume, and the whole idea of summing up our direct and indirect carbon emissions that make up our footprint would fall apart. As long as projects help to make an additional impact to global warming that would not have happened anyway (this criterion is called *additionality*), it can be considered as an effective balancing of emissions. Careful selection can avoid issues with the quality of reductions, fairness and unanticipated side effects of carbon offsetting schemes.

Many offsetting programs often have cascading benefits aside from just the carbon emissions saved. These are referred to as *co-benefits*. Many offsetting schemes are inextricably linked with sustainable development, and as a result can create additional positive social and economic benefits. For example, a biogas project which delivers sustainable energy by creating methane from organic waste will (i) Improve residents' health by reducing indoor air pollution associated with burning wood, (ii) save residents' money by reducing the amount of fuel they require and (iii) will conserve the local forest by reducing the demand for wood. A study from Imperial College³ showed that for every tonne of CO2e removed/prevented from entering the atmosphere, there would be an average of \$665 dollars delivered in social, economic and environmental benefits.

Projects are normally focused in the developing world and offer an opportunity to contribute to the development of areas of the world which have been 'left behind' so far from the industrial revolutions that have shaped our modern technology and society. This also means that projects are low-cost, at typically £8 per tonne of CO2e balanced out, and so relative to the cost of the products and services that are emitting greenhouse gases this cost is affordable. No wonder Amazon, Google and airlines such as EasyJet are using carbon

³ (Kountouris, April 2014)

offsetting to balance out their contributions to climate change – but is this truly an effective investment?

Arguments against

Many of the arguments against and concerns with relation to carbon offsetting schemes are centralised around their effectiveness. The benefits of carbon offsetting projects may be difficult to quantify and may not even be additional to the emissions savings that would have occurred naturally without the project. Energy efficiency measures such as LED-lightbulbs may be taken up because they save on their user's energy bills, meaning any project that aims to do this in a region in which customers have the capacity to make the switch themselves is providing little in the way of emissions reductions.

Programs must also be selected to ensure that carbon emission reductions are permanent, otherwise they cannot be considered effective in balancing out an individual's carbon footprint. One of the biggest criticisms of carbon offsetting schemes comes from programs that protect forests, because it is difficult to guarantee that the carbon that is locked up in the forest will not be released in the future due to natural disasters or deforestation. The risk of emission removals in the future is referred to as *non-permanence* and for an offsetting scheme to be considered effective the risk of non-permanence of savings must be minimal, if not zero.

There is also a risk that carbon offsetting programs may result in cascading impacts that actually increase carbon emissions elsewhere. Protecting or planting a forest could be an effective way of reducing carbon emissions, provided that there is a guarantee that the forest will be protected in the future, but if this leads to deforestation in a nearby region with the aim of using the wood as a fuel then the carbon savings are weighed out by the emissions from activities that leak outside of the project. When a carbon offsetting program displaces activities that create emissions outside of the boundaries of the project, this is referred to as *leakage*. An effective carbon offsetting scheme must ensure that the emission-intensive activities it tackles are not shifted outside of the project's boundaries, otherwise it may cause as much harm as it aims to allay.

The final argument against carbon offsetting is that it avoids dealing with the real problem – the activities that result in emissions in the first place. Offsetting is a way to avoid responsibility for one's own emissions and may subsequently lead to a "rebound effect", where if given the chance to absolve one's self of the responsibility of contributing to global warming, an individual may choose to increase carbon-emitting behaviour. It is also voluntary, so will not change collective action in the same way that a carbon tax would – meaning that it must be used alongside a large-scale, societal transition to sustainable living if climate change is truly to be abated, otherwise it will remain an incredibly small drop in the ocean relative to global emissions.

Key criteria of effective offsetting schemes

Although carbon offsetting doesn't deal with the real problem, it is "clearly better than doing nothing", in Cameron Hepburn's⁴ (Director of the Economics of Sustainability Programme at the University of Oxford) words, and can finance emerging green practices and services that otherwise would struggle without the monetary support of individuals and businesses offsetting their emissions. In the case of emission-heavy activities that completely cannot be avoided, it can be a cost-effective, rapid and efficient way to reduce our residual footprint. Individuals and businesses will be left with a carbon footprint regardless of the efforts that they make to reduce their impact which will not change until low emission technologies become widespread throughout our society, and so carbon offsetting allows us to bridge the gap whilst infrastructure and technology develops.

However, the effectiveness of carbon offsetting schemes must be effectively evaluated before supporting them, to ensure that the emissions savings that they quote are in fact what they claim to be. This can be ensured if the project meets the key requirements that were identified above;

- Additionality the carbon emissions after the implementation of the project must be lower than what would have plausibly occurred if the project had not been supported.
- Permanence the carbon savings must be permanent, and the risk of emission removals being reversed must be minimised. In practice, this limits the effectiveness of land use and forestry-based emission reduction schemes.
- Leakage projects must be effectively designed according to local circumstances to
 ensure that emission heavy activities are not simply shifted to outside the projects'
 boundaries.
- Verified monitoring and verification of emission reductions guarantee that the reductions claimed by a project have actually been achieved.

Carbon Offsetting standards

Given the range of carbon offsetting programs available, it can be easy to be unsure about which projects meet the requirements to be effective. The fact is that significant project-specific knowledge is required in order to assess how effective a carbon offset programme, which can mean that it is time-consuming, difficult or even downright impossible to evaluate the claims of emissions reductions made by carbon offsetting organisations.

This is where standards come in. The voluntary offsetting market has developed various certification systems that provide a guarantee to the investor that the projects are functioning effectively, such as the Gold Standard⁵, the Quality Assurance Standard⁶ and the Verified Carbon Standard ⁷(VCS). Standards differ by the specifics of their methodologies, and some standards focus





⁴ (Niiler, 2020)

⁵ (WWF, 2003)

⁶ (OAS, 2012)

⁷ (Verified Carbon Standard, 2005)

on specific types of schemes, but all standards verify that projects meet certain criteria which are independently audited by the standards organisations. As such, offsets with these standards offer extra credibility, and it is important when selecting a carbon offsetting scheme to ensure that it adheres to one (or more) of the standards that exist in the voluntary carbon market.

From my research I would recommend the Quality Assurance Scheme, as it requires projects to carry a certificate from one of the other standards (e.g. Gold Standard or VCS) as well as a 40-point checklist to ensure the highest standards. I would also recommend the Gold Standard, which is endorsed by 80+ international NGOs, because it has more stringent requirements than other standards and also requires that carbon offsetting projects have *co-benefits* that meet the sustainable development goals set out by the UN.

Recommendations

Choosing schemes with care

Many offsetting organisations offer the opportunity to direct your money a specific project from the portfolio of programs that the organisation supports, which is important when aiming to maximise the effectiveness of your offset as some project types tend to have a higher likelihood of delivering the promised emissions saving compared to others. Research from the Stockholm Environmental Institute⁸ through its Carbon Offset Research and Education (CORE) initiative launched in 2011 shows that programs which limit the emission of industrial chemicals and are related to methane capture, utilisation or destruction tend to have the lowest risk of not meeting all offset quality requirements (see the table below⁹).

This guide from the Stockholm Environmental Institute can be misleading however, as it doesn't take into account co-benefits – and the kind of projects that have higher risks of not being effective tend to have greater co-benefits. A project that avoids N20 emissions at a nitric acid plant, will generally be highly additional, easy to quantify and will pose no permanence concerns – but will do little to provide additional social and economic benefits for the local community. On the other hand, a project aimed at protecting an existing forest from deforestation by supporting jobs in eco-tourism or inter-cropping (growing crops inbetween the trees) will have significant environmental, economic and social benefits to the local residents – but may be higher risk in terms of the carbon emissions it reduces, with a

Lower risk	Medium risk	Higher risk
 CO₂ usage Methane destruction (w/o utilization) N₂O avoidance from nitric acid production N₂O – adipic acid* Ozone-depleting substance (ODS) destruction 	 Methane capture and utilization Methane avoidance Energy distribution Energy efficiency, household demand side PFCs & SF₆ 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

high risk of leakage and non-permanence.

It is important to select projects with care in order to be sure that the project's emissions savings will be additional, pose no permanence risks and will not cause leakage. There is a range of projects that can deliver greenhouse gas emissions reductions, but some projects have a harder time meeting the essential criteria than others — so the easiest way of reducing the risk of supporting low quality, ineffective carbon offsetting projects is restricting investments to projects that are low risk.

Recommended organisations

In this report I have chosen to recommend the four top carbon offsetting vendors that I have found during my research and consider to be the most effective; this is by no means an exhaustive list and there are many other high-quality offsetting schemes out there.

Carbon Footprint – Extensive portfolio of carbon offsetting projects (https://www.carbonfootprint.com/carbonoffsetprojects.html):

Carbon Footprint are one of the founding members of the Quality
Assurance Standard and have an extensive carbon offsetting portfolio. Al
projects within this portfolio adhere to voluntary standards such as the Gold Standard and
Verified Carbon Standard, whilst also meeting the stringent requirements of the Quality
Assurance Standard (QAS) for Carbon Offsetting. Many of these projects have additional cobenefits in line with the Sustainable Development Goals, and Carbon Footprint offers the
opportunity to choose from a range of portfolios to support. However, one drawback is that
unless you are offsetting more than 100 tonnes you cannot choose a specific project to
support, instead choosing to support a portfolio of 3-5 projects.

Atmosfair – mitigation of air travel's emissions (https://www.atmosfair.de/en/offset/flight)

A German non-profit organisation, Atmosfair's projects are exclusively Gold Standard approved or pending approval. It also avoids tree-planting projects (for which meting additionality, permanence and no leakage requirements are hard to ensure) and is highly regarded in multiple comparisons of carbon offset vendors. The website provides a lot of useful information about its carbon policies and the projects that is supports. However, it only takes payments in Euros on its website, which is a significant drawback.

ClimateCare- A certified B Corporation

(https://climatecare.org/calculator/)

Climate Care sets a standard price of £7.50 per tonne of CO2 and has been closely involved in the development of the Gold



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atmosfair



Standard and Voluntary Carbon Standard. It has been awarded the Environmental Finance Award for Best Project Developer every year since this was created in 2012 and was recognised as the Best B Corporation in the World in 2019. Certified B corporations are a new kind of business that are legally required to consider the social and environmental impacts of their decisions, and the award recognises businesses that create the most positive overall social and environmental impact. It offers a Climate+Care mixed portfolio that provides a mix of the highest quality emissions reductions projects that ClimateCare offers – from efficient cookstoves in Kenya and Ghana to wind farms across the world. The projects selected also deliver the most sustainable development impacts from ClimateCare's portfolio.

Clear – Offsetting daily travel (https://clear-offset.com/)

If your travel plans are limited, consider opting for Clear, which offers a service to offset your car, commute or even your home by entering details about your fuel or energy consumption. Clear is Quality Assurance Certified and is independently audited every



year to ensure that it continues to meet the stringent criteria. It is a UK based programme and focuses on efficient stoves, forest protection and renewable energy, and many of its projects are VCS or Gold Standard certified.

Conclusion

Ultimately, in line with the UN Environment Programmes' evaluation of carbon offsets¹⁰, I agree that when used as part of an overall emissions reduction strategy and when schemes are chosen with care, carbon offsetting can offer a useful opportunity to balance out the carbon footprint of our unavoidable emission-heavy actions. Carbon offsetting programs must meet the requirements of *additionality, permanence and lack of leakage* in order to be considered an effective way of balancing out one's carbon footprint, and this involves selecting the organisation and project with care.

Recent years have seen a surge in the voluntary carbon offsetting market, in particular with regard to air travel where voluntary offsets have seen a 140-fold growth in the decade between 2008 and 2018. This has generated a total of 430m tonnes of emission reductions. However, this makes up just 1% of total passengers, showing that carbon offsetting is let down by its voluntary nature. If more people were educated about the benefits of carbon offsetting, I believe that offsetting would become increasingly widespread, because it offers a rapid, low cost opportunity to balance out the emissions from our essential activities that contribute to our carbon footprint.

Unlike many of the critics of carbon offsetting, who argue that carbon offsetting poses a moral hazard which provides an avenue to feel better about our emissions heavy activity whilst disincentivising us to change our activities, this report has found that if carbon reductions are effective, then there is no reason to assign a moral value to emitting greenhouse gases. That is, if the impact of our emissions heavy activity is fully and

¹⁰ (UN Environment Programme, 2019)

effectively balanced out by an offsetting program, then there is no negative implication of emitting carbon dioxide.

The problem comes when the carbon reduction is not what it claims to be, but this risk can be minimised by sticking to projects that are lower risk and selecting projects that adhere to the voluntary standards of the industry, such as the Gold Standard. Organisations such as ClimateCare, Carbon Footprint, Clear and Atmosfair all offer inexpensive and effective opportunities to reduce emissions whilst contributing to the Sustainable Development Goals. When paired with taking steps to increase the sustainability of your day to day life, such as using public transport, reducing your energy consumption at home and eating local food, carbon offsetting is a rapid and effective method to balance out your residual carbon footprint whilst contributing to making the world a better place by supporting sustainable development overseas.

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