BALANCE

Balance™ Methodology Part Two

The History of Carbon Offsetting and the Context for Balance

Balance Eco Ltd.

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Contents

Abstract

'Balance Methodology Part Two: The History of Carbon Offsetting and the Context for Balance', provides a comprehensive literature review to create an argument for the relevance and comparative benefits of the Balance approach to carbon offsetting. This involves an explanation and rationalisation of the historical and contemporary political context, defining the carbon market from its infancy to the present day, and outlining the various weaknesses and incompetencies of previous carbon offsetting initiatives and their relative impacts upon global efforts to mitigate the effects of the climate crisis.

Also discussed, with reference to the most recent available evidence, is the relevance of the Balance approach to and complicity with current and projected national and international climate mitigation goals, displaying the extent to which the carbon market is being increasingly tasked with carrying the burden of compensating for global emissions. As such, in discussing the various obstacles carbon offsetting must avoid and the equally disparate responsibilities it must carry, this paper sets a precedent for the advent of a new type of offset initiative which will prove a vital contributor to global climate mitigation efforts. Balance serves as an example in this regard by incorporating biodiversity and the prioritisation of emissions reductions within organisations to offer a compelling alternative to other carbon offsetting initiatives. By doing so, validity and efficiency in carbon sequestration is ensured, while the avoidance of participation in the primary points of ethical concerns is proved socially, economically and environmentally beneficial. This paper, in tandem with 'Balance Methodology Part Three: Lessons From Nature-Based Solutions', serves as a complementary evidence base for the Balance Methodology Part One, which outlines how Balance has used the key concepts discussed in this paper to form its core philosophy.

It is important to note that **this paper does not provide guidelines or obligations for partners or clients, but instead serves as a contextual study to ratify and promote Balance's approach and planting methodology which is outlined in Part One.** Recommendations for carbon offset providers, based on the findings in this paper, are established in the conclusion, though fulfil primarily a referential purpose rather than establishing a set of obligations for partners and clients.

1. Introduction

Since the industrial revolution, the conversion of natural ecosystems to agricultural use has resulted in the rapid depletion of soil organic carbon levels, releasing approximately 50 to 100 gigatons of carbon from soil into the atmosphere (Lal, 2009), as the combined result of reductions in the abundance of plants capable of storing carbon, increased decomposition from agricultural processes such soil tillage, and increased soil erosion via ever-accelerating land use change. In this same period, climate change and atmospheric degradation have advanced such that environmental and climatic tipping points are being reached and, depending on the urgency of changes in political and social approach, surpassed. Leading climate scientists in the 2021 Intergovernmental Report on Climate Change (IPCC) are insisting that we have less than ten years to effectively mitigate climate change before we reach ‘climate departure’; a scenario which would entail irreversible climate change. The IPCC report warns we may exceed the 1.5 degree C target by as early as 2034 (IPCC, 2021).

The challenges that this poses require ever-increasing concern and urgency in action. In recent years, momentum attempting to address these two challenges of biodiversity loss and climate change has grown at levels ranging from international policy to grassroots actions in local communities, by planting trees for voluntary carbon offset initiatives. It is questionable to what degree tree planting alone can provide the positive impacts required on a global scale, particularly while financial support is limited and policy initiatives are still too restricted in scope, quantity, consistency, quality. Perhaps required are more ambitious actions on a far greater scale with effective monitoring and evaluation systems put in place, subject to constant review; REDD+, in terms of modern standards, is certainly the closest of all wide-reaching initiatives to achieving this goal.

In the last eighteen months following the COVID pandemic, evidence from surveys implies a growing desire to “build back better" as part of a “green recovery”. Together with this, the facilitation of radical new rethinking of climate action incentives has led to a recent burst of interest and creative thinking about how the landscapes and ecosystems of this biodiversity-depleted world might be better managed to facilitate biodiversity recovery and contribute towards addressing climate change. An interlinked approach between biodiversity and climate change, while producing numerous benefits for carbon storage and ecosystem service provision, also provides for the welfare and livelihoods of local communities.

Indeed, the UN has launched the ‘decade on ecosystem restoration (2021-2030)’, an urgent call for the large-scale revival of nature in forests and other ecosystems.

Governments must deliver on a commitment to restore at least 1 billion hectares of degraded forest land by 2030, while making a similar pledge for the oceans. To avoid the most damaging impacts of the expected tipping points, building an approach that both addresses biodiversity and climate change by coupling together social, ecological and technological systems is required, while focussing on global emissions reductions. To achieve this, any approach must complete conversion to renewable energy sources. Disenfranchisement of environmentally disastrous activities such as deforestation and industrial fishing, and the heightening of our planet's ability to sequester the carbon currently present in our atmosphere are essential. The UN's State of Finance for Nature report (UN, 2021) found that the world needs, at the very least, to quadruple its annual investment in nature if the climate, biodiversity and land degradation crises are to be tackled by the middle of the century. Carbon offsetting, if done with the correct considerations, harbours enormous potential to contribute to meeting these targets. This methodology outlines exactly how this might be most efficiently achieved with reference to recent scientific, economic and political studies.

1.1 The Political Context for Balance

The most recent decade has seen an almost unanimous political transition towards acceptance and implementation of increasingly ambitious climate goals and environmental policies. All countries under the Paris Climate Agreement (2015) in 2021 are required to report their Nationally Determined Contributions (NDCs). The UK has participated in this process by reviewing and renewing many points of its NDC with far more relative frequency than before Paris, with the central point being a near-term target for 2030 on emissions cuts, usually compared with a 1990 baseline. For the UK the target will be a 68% reduction on 1990 levels by 2030, as advised by the Committee on Climate Change (CCC).

Due to the considerable political momentum of the Paris Agreement, NDC targets are often in the limelight, and due to the Agreement there is an built-in mechanism for increasing ambition whereby, every 5 years, progress towards targets set out in the NDCs must be reported on, monitored and compared with other nations. In the late 2000's, the UK committed to reduce Greenhouse Gas (GHG) emissions by at least 80 percent compared to 1990 levels, by the year 2050. By June 2019, far more ambitious targets were instated, with the UK becoming the first of the major economies to commit to 'net-zero' emissions by 2050. There are a range of other international commitments, including the United Nations Sustainable Development Goals (SDGs) and the Convention on Biological Diversity (CBD), which also commit the UK to tackle both the climate and biodiversity crises globally.

The United Nations Environment Assembly (UNEA) in Nairobi (2019) declared the decade of 2021-2030 as the UN Decade on Ecosystem Restoration. This was a specific response to the biodiversity crisis, and 2020 was generally labelled amongst environmentalists as the "year of ambition", with universal renovations to NDC's to be submitted by the end of the year. The UN Environment Programme (UNEP) and the Food and Agriculture Organisation (FAO) are the co-leads for this global movement to 're-imagine, recreate and restore ecosystems'. The announcements of longer-term mitigation efforts with those countries that have submitted their NDCs were plentiful across the board, with the new "Net Zero" by 2050 target widely adopted as a governmental trend. This has also become a rallying point for the lower levels of government, from the parish to the local, to the sub-national and also to industries.

Net zero, as it is widely interpreted, means that for an organisation, region or country, total GHG emissions to the atmosphere are equal to, or less than, emissions removed from the atmosphere. Towards the end of 2020, Japan, China, South Korea, Canada, South Africa and many smaller emitters committed to some variant of Net Zero by 2050, with the European Union, and the UK, having led the way. On 11 December 2020, European leaders agreed to strengthen the EU's 2030 emissions target to "at least 55 percent" below 1990 levels. In May this year, the UK Environmental Agency strengthened the country's stance on the required emissions reductions, claiming that, to achieve the UK's net zero targets by 2050 the annual rate of GHG emissions will need to be cut by over 260 million tonnes from 2019 levels to let than 90 MtCO2e (carbon dioxide-equivalent) in 2050 (Environmental Agency, 2021), while reviewing a wide range of approaches to carbon offsetting in the UK.

In June 2021, the European Commission's release of the 'fit for 55' package of legislative proposals aimed to bolster this target, particularly with renovations to the carbon market. In order to reach these targets in less than a decade, practically all climate and energy-related legislation will have to be revised and there must be a rapid acceleration of climate mitigation implementation. Included are the requirements for new technologies, most obviously relating to renewable energy sources, adjustment of policies, evolution of businesses and streamlining of public communications. Many argue that current emissions and technological migration trajectories amongst the most polluting sectors will not allow countries to reach their new targets, and others still debate that such targets themselves are not extreme enough; that too much agency is permitted to organisations which benefit from the maintenance of high emissions levels or that too much attention is being payed to the economic viability of reaching such targets. Nevertheless, the last year or so has seen considerable progress, and progress should always be welcomed.

In tandem with emissions reductions, the other significant parameter by which governments are measuring future climate mitigation efforts is global temperature rise above a baseline level, typically defined as the 'preindustrial level'. In this field, researchers are considerably less optimistic in analysing the possibility of reaching targets established by the Paris Climate Agreement, with 1.5ºC now increasingly seen as the appropriate scenario to pursue in line with sustainable development principles. As warned by the Intergovernmental Panel on Climate Change (IPCC) in its Special Report on Global Warming (IPCC, 2018), the Earth must be kept below the dangerous threshold of 1.5°C in global average temperature rise above pre-industrial levels if we are to avoid a worsening of climate-related impacts.

Baseline data for temperatures across the world are typically overwhelmingly higher than the previous decade, however; the latest analysis of government commitments by Climate Action Tracker estimates the current pledges would result in about 2.85˚C of global temperature rise. A recent systematic scan of Earth system model projections has detected a cluster of abrupt shifts between 1.5 and 2.0°C of global warming, with warming of 2.0ºC likely causing the abrupt and rapid loss of tropical coral reefs (Lenton, 2020), while solar models simultaneously predict an increase in sunspot activity with additional impacts upon Earth's average temperature.

According to a report published in May this year by the U.N., there is now a 40 percent chance that global temperatures will temporarily reach the 1.5ºC mark within the next five years, with a 90 percent chance that at least one of the years between 2021-2025 will be the warmest on record (WMO, 2021). Last year (2020), the same group reported only a 20 percent chance of the 1.5ºC threshold being breached. For this year, meteorologists claim large parts of land in the Northern Hemisphere will be 0.8ºC warmer than recent decades, while other sources claim it is closer to 1.2ºC (British Ecological Society, 2021), and almost all regions, except parts of the southern oceans and the North Atlantic are likely to be warmer than the recent past.

In the UK, the annual average land temperature in the most recent decade has been 0.9ºC warmer than the 1961-1990 average, with sea levels having risen by 16cm since the start of the 20th century (Met Office, Latest Climate Projections), and with the increase in frequency of heatwaves (Kendon et al. 2019, Stott et al. 2004) along with the occurrence of flooding and droughts. According to Kovats et al (2016), there are approximately 2.6 million people in the UK currently living in areas with 'high risk potential', whether that be in flood plains, coastal regions vulnerable to sea level rise and cliff erosion, and areas with high risk of drought intensification, by 2050.

Staying below 1.5°C in global average temperature rise, according to multiple sources, requires reaching the momentous target of net zero emissions by 2035-2040. Humans today release approximately 39 GtCO2 per year, mostly from the burning of fossil fuels. According to One Earth, at current levels of emissions, we would only have seven years to completely cease the use of all fossil fuels, which is evidently not feasible (One Earth, 2020). Some researchers are slightly less pessimistic, suggesting that there still remains the possibility to achieve the 1.5ºC target if governments unify under the goal to reach 100 percent renewable energy by 2050, though such a rapid transition is unlikely with current trajectories, and many doubt that a transition to 100 percent renewables is even possible. Scientists at the IPCC, for example, have concluded that there is no way of keeping the global temperature rise to 1.5C without both cutting emissions on a far more drastic scale than currently achieved, and removing billions of tonnes of CO2 a year by 2050 (Guardian, 2021). Under this assumption, the UK, specifically, would need to remove upwards of 100 million tonnes of CO2 a year to reach net zero in this timeframe. Other studies suggest that not only is it possible, but that it will cost much less to operate than the current fossil-based energy system; scientists at UTS created a sophisticated computer model of the world's electrical grids to date – with 10 regional and 72 sub-regional energy grids modelled in hourly increments to the year 2050 along with a comprehensive assessment of available renewable resources, minerals required for manufacturing of components, and configurations for meeting projected energy demand and storage most efficiently for all sectors over the next 30 years, asserting that the transition is feasible, and that it will cost approximately $US1.7 trillion per year in global investment. This sum pales in comparison to the vast subsidies governments currently provide to prop up the ailing fossil fuel industry, estimated at more than $US4.7 trillion per year by the International Monetary Fund (IMF). In any case, the global pandemic has proved beneficial, if nothing else, in reducing global emissions; after rising steadily for decades, global carbon dioxide emissions fell by 6.4%, or 2.3 billion tonnes, in 2020, as the COVID-19 pandemic suppressed economic and social activities worldwide (Liu et al. 2020). The decline is significant – roughly double Japan's yearly emissions – but smaller than many climate researchers expected given the scale of the pandemic, and, it is assumed, such a rate would need to be continued or even increase year upon year over the next decade if we are to maintain the 1.5ºC threshold.

In response to the ever-shrinking window for action, more and more countries are joining the growing international climate mitigation mission. The U.S., following the inauguration of Joe Biden, committed this year to a number of plans designed to rejoin the global push for more effective climate crisis mitigation (Whitehouse Statement: President Biden's Leaders Summit on Climate, April 2021). On his first day in office, Biden fulfilled his commitment to rejoin the Paris Agreement, and organised a Major Economies Forum (MEF) on Energy and Climate, in which the new United States 2030 target realigned the U.S. with the 1.5ºC limit amounts the 17 major global economies, responsible for approximately 80 percent of global greenhouse gas emissions. The heads of state and leaders of the MEF participants were also joined by the leaders of countries that are especially vulnerable to climate impacts, as well as countries charting innovative pathways to a net-zero economy. Business leaders, innovators, local officials, and indigenous and youth representatives participated in the summit, sharing their insights and planned contributions to help tackle the climate crisis.

The U.S. International Development Finance Corporation (DFC) is also committing to achieve a net zero portfolio by 2040, assuring that at least one-third of all new investments will have a climate nexus. Also promised is investment in nature-based solutions, advancement of circular carbon economy approach and development of carbon capture initiatives and technologies, net-zero strategies in developing countries, renewable energy and low-carbon economic development, sustainability in industry, transportation (such as lower-emission buses, international shipping, aviation and electric vehicles), power and buildings, all with an increase of $US14 billion in the President's budget across the entire government to tackle the climate crisis. The Biden administration also announced plans to quadruple clean energy innovation funding over the next four years, and established Mission Innovation 2.0 at COP26, which represents a major technology mission on atmospheric carbon dioxide removal. Further commitment, too, was pledged to the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), an initiative which started in 2020 to which 65 nations had signed up prior to the U.S., an equivalent to 87 percent of all international aviation activity. Significantly, too, the United States is joining other governments and private sector companies to announce the Lowering Emissions by Accelerating Forest finance (LEAF) Coalition, which is expected to mobilise at least $US1 billion to incentivise developing countries to pay for verified emissions reductions by halting deforestation, protecting and replanting forests. The promised support of forest protection, development of the carbon economy, carbon capturing initiatives and nature-based solutions within the United States and abroad promises to strengthen the global importance of forest-based carbon offsetting for national- level climate mitigation in the near future.

Alongside the increasing acknowledgment of the need for more drastic measures amongst governments, the concept of individual organisations achieving their own net-zero status is growing in popularity. In November 2019, Climate Change practice survey of just under 400 industry professionals: 18 percent indicated their organisation had already declared a Climate Emergency. 24 percent had set a Science Based reduction target. 29 percent had already set a net zero target. 44 percent had used the concept of carbon neutrality, with 36 percent of the remainder stating this was under consideration. 58 percent had used another climate action related target or objective. (IEMA, November 2020). Identified as the primary driver for these organisations newly committing to carbon reductions is the 'reputation of the organisation or brand', with 'Compliance with Legislation' second and 'Cost savings and financial efficiency' third. In 2010, these three drivers were in reverse order, suggesting that awareness of corporate responsibility to emissions reductions is evolving and growing.

Another recent trend in analysing and categorising necessary emissions reductions is research into 'sectoral pathways' in the One Earth Climate Model Sector Pathways Report (OECM, 2020), developed by the scientific community and industry intelligence to target the highest emitting sectors and their potential for decarbonisation in the short and long term. In recent years, they have been recognized as viable processes through which the world can meet its climate goals, and their scope is flexible enough to include more sectors. The five highest emitting sectors globally, in descending order, are...

1) Energy (including coal, oil and gas),
2) Utilities (with a focus on power and gas supply),
3) Steel,
4) Cement
5) Transport (including aviation, shipping, and heavy and light-duty road travel).

This categorisation is based purely on Scope 1 Emissions (direct emissions from owned or controlled sources), with Scope 2 and 3 emissions (indirect emissions) typically proportional to Scope 1 emissions. Only sector-specific emissions are used, as opposed to company-specific emissions, which, when aggregated, would create higher emissions per sector as these would include, for example, vehicles used by the sector or sub-sector. The required reduction in carbon dioxide emissions per sector in the next five years, as well as the required average investment per annum over the same period, are given below.

1. Energy. Required reduction in CO2 2019-2025 = 30 percent. Required average investment per annum 2021-2050 = $660 bn.
2. Utilities. Required reduction in CO2 2019-2025 = 37 percent. Required average investment per annum 2021-2050 = $505 bn.
3. Steel. Required reduction in CO2 2019-2025 = 22 percent. Required average investment per annum 2021-2050 = $223 bn.
4. Cement. Required reduction in CO2 2019-2025 = 13 percent. Required average investment per annum 2021-2050 = $70 bn.
5. Transport. Required average investment per annum 2021-2050 = $20 bn.
    - Aviation. Required reduction in CO2 2019-2025 = 34 percent
    - Shipping. Required reduction in CO2 2019-2025 = 6 percent
    - Heavy-duty road/freight. Required reduction in CO2 2019-2025 = 27 percent
    - Light-duty road/passenger. Required reduction in CO2 2019-2025 = 32 percent

Synthesising these statistics, emissions must decrease globally between 2022 and 2025 by around 28 percent, with varying priority across different sectors. Equally, the rapid and consequent decarbonisation of the power sector is vital to achieve the 1.5ºC target, with renewables-based power generation as the backbone of decarbonisation for all the financial sectors. The energy sector plays a key role in allowing the other industries to reach their targets, and as such must be the first movers to decarbonise. Critically, the 1.5°C pathway does not allow the energy sector to invest in any new oil or gas extraction projects or new coal-mining projects. Instead, security of supply will rely on new renewable energy projects, although existing fossil fuel infrastructure will nevertheless be employed to meet energy demand requirements until such a time that decarbonised generation has matured enough to take up the slack.

One important factor is the streamlined processes for the issue of construction permits for all renewable-energy- related projects (power, heat, and fuels). Another is the guaranteed, mandatory access to the power grids for renewable-produced electricity, with priority dispatch for all renewable power generators. Gradual discontinuation of all subsidies for fossil energy investments and establishment of national taxation systems which exclusively permit renewable energy projects is also fundamental. The desired outcome is tipping into an alternative ‘green growth’ economic global community, accompanied by increased Gross Domestic product (GDP) and employment, triggered by bold long-term policy targets and supported by a virtuous circle of investment, learning-by-doing and increased growth expectations.

1.2 Carbon Offsetting as a Solution

Carbon offsetting has played its role in global efforts to mitigate carbon emissions, and, particularly in cases where offsetting does not annex attempted emissions reductions, can prove vital in the future if initiatives promote careful consideration of best practice. Since, based on current technologies and evidence, global emissions cannot be reduced to zero, nature-based carbon sinks are typically factored in to compensate for the residual cement emissions in 2050 in scientific reports. While intact terrestrial ecosystems act as carbon sinks, they currently sequester only approximately 29 percent of annual anthropogenic CO2 emissions (IPCC, 2019), with oceans removing around 24 percent. Implementation of afforestation on lands that are suitable for forestry in carbon offsetting initiatives, whether through the compliance or voluntary market, is vital to increasing the amount of carbon stored in terrestrial carbon sinks. A landmass the size of North America, it is estimated, is available for reforestation, which could, if done responsibly, aid in storing as much as 20 percent of current annual atmospheric greenhouse gas emissions. Large-scale afforestation is also important to mitigating the damaging changes caused by land-use changes over centuries, as agriculture, forestry and other land-use (AFOLU) activities , which have replaced forests and other terrestrial ecosystems (often almost entirely depending on the country), account for around 23 percent of total net anthropogenic emissions of GHGs.

In turning areas into low-emitting regions with high carbon-storing potential, as long as the project is suitable to the area’s terrain and climate and does not threaten to displace or disadvantage local people without comprehensive mitigation, carbon offsetting can help to efficiently reduce global atmospheric GHG levels. Carbon offsetting can also be utilised to achieve an immediate ‘economic’ carbon neutrality, whilst the more direct business transitions progress, as the cost of carbon offsetting can generate an additional financial driver to investments that more directly drive out carbon from the business model. It is now widely accepted that a genuine net-zero can be achieved in the medium or longer term only where there is a reduced global carbon footprint made via optimal emissions reductions, with the remaining emissions at the very least ‘neutralised’ through recognised high-quality carbon offsets.

Recent years have seen carbon offsetting grow in popularity and necessity. In 2019, 25 percent of corporations purchased carbon offsets as a method to reduce emissions (IEMA GHG Hierarchy). Although the overall use of carbon offsetting has remained low, there are indications of change. It is notable that in 2010 only 15 percent stated that they were investigating carbon offsets, compared to 25 percent in 2019. It is now widely recognised that, in particular, voluntary carbon markets will have an important contribution to make, with the voluntary market growing in size and reach, accompanied by the requirement for elevated support and development. With developing popularity, carbon offsetting has thus been progressively scrutinised to find and implement the most efficient project planning and management, with the stipulation that only carbon offsetting projects that remove GHGs from the atmosphere, including forest-based carbon offsets, are truly compatible with net zero emissions.

The search for the best carbon offsetting methodologies has been a major concern for governments and individual businesses alike in the last few years. Announced in May this year, for example, was a new £30 million project funded by UK Research and Innovation, which will test ways to store far greater amounts carbon in trees, peat, rock chips and charcoal in over 100 hectares of land, making it one of the largest of such national trials in the world (The Guardian, 2021). As part of this approach, the best large-scale approaches to using trees to sequester carbon will also be examined, such as where and how to plant, as well as which species, in order not to release unnecessary carbon into the atmosphere and create other undesired social or environmental side effects. Proving vital to the search for the most efficient carbon offsetting is the increasing evidence of Nature-based solutions (NbS) as viable initiatives both for climate mitigation benefits and, if established with careful and well-supported management, co-benefits to ecological conservation and creation, biodiversity and social and economic rewards. At the heart of the NbS movement is the growing recognition of the necessity of conserving biodiverse natural ecosystems, both to prevent further carbon sequestration damage and for their innate value both to human and non-human life.

Indeed, protecting both terrestrial and marine ecosystems is vital to global climate goals. In 2015, phytoplankton in the ocean, trees, and other plants absorbed about 20 Gt of anthropogenic CO2 emissions, or roughly half of our annual total. Coral reefs are also important in storing carbon, yet one-third of the world’s coral have died, and another third are expected to perish by 2030 through successive annual bleaching as a response to global oceanic temperature increase, destroying entire ecosystems and endangering global fisheries. Similarly, protecting natural forests from deforestation is recognised internationally as an essential approach to removing carbon dioxide from the atmosphere (Houghton et al. 2015); previously logged woodlands become major carbon sinks once allowed to regenerate, and even after maturity can continue to accumulate carbon in dead wood and soil, which aids in facilitating biodiversity growth (Luyssaert et al. 2008). Without the benefit of these functioning ecosystems, the amount of carbon pollution entering the atmosphere would double annually, almost certainly locking in catastrophic climate change.

Developing in recent years is a movement termed ‘blue carbon’, including projects based on the regrowth of marine ecosystems, such as seagrass, while coastal ecosystems such as mangroves and salt marshes have also been developed, with greater carbon sequestration potential per unit area than any terrestrial landscape type. Mangroves are being deforested at an alarming rate, although there is also uncertainty in the extent of deforestation (0.2% – 2%) (Atwood et al. 2017; Alongi & Mukhopadhyay 2015) and in the associated emissions. Indonesia accounts for about half of mangrove deforestation, the next most significant countries being Malaysia, the U.S. and Brazil (Atwood et al. 2017). Eliminating mangrove deforestation in Indonesia and Malaysia alone could reduce global soil carbon emissions from mangrove deforestation by ~70%. The IPCC’s AR5 report gives a range for the estimated carbon loss of 70-420 MtCO2/yr; at its upper end, this could represent as much as 10% of emissions from deforestation (Donato et al. 2011). Salt marshes, too, are under particular threat globally from rising sea levels, drainage, erosion and runoff as a result of extreme weather, while anthropogenic land use changes to reclaim land from the sea for agriculture, development or coastal flood defences has proven deleterious to salt marshes, particularly along British coasts. In the UK, the planned UK Saltmarsh Carbon Code will operate on a similar basis to the Peatland Code and Woodland Code, and it is hoped the scheme will pave the way for at least £1 billion of private investment in restoration projects over 25 years, covering 22,000 hectares of habitat. Despite the potential to redevelop mangroves and salt marshes, however, Carbon flows within coastal zones are typically highly variable and difficult to measure in comparison with forest carbon, particularly in developing countries, so estimates of carbon sequestration are highly uncertain.

Forests, however, comprise the most consistent, accessible and longstanding ecosystem type for carbon offsetting. Covering 31 percent of the world's land surface (just over 4 billion hectares), forests contain the highest concentration of both biodiversity and carbon on land. Of that, only about one-quarter are still considered intact forest landscapes (IFLs). Healthy forest ecosystems provide a wide range of services, including reliable clean water, climate regulation, and productive soils, and forests underpin many of society’s basic needs, economic processes, cultural or spiritual values, and medicinal products. Not only are forests home to more than 80 percent of all species living on land, they are also crucial sources of food, medicine, drinking water, and essential recreational, aesthetic, and spiritual benefits for millions of people (Jenkins, Schaap, 2018, p.5). Tropical forests, in particular, are on the brink of collapse. While covering only 15 percent of the global land area, they contain over half of all animal and plant species and, in optimal conditions, store one-quarter of the world’s atmospheric carbon.

Exploitative deforestation for timber, establishing slash and burn agriculture plots or industrial monoculture cash crops, is removing primary forests, along with their rich biodiversity, at alarming rates. In Indonesia and Malaysia, the continued growth of the palm oil industry, particularly for use in biofuels, is removing entire ecosystems, releasing dangerous amounts stored in the carbon-dense tropical peatlands, and further destroying the peatland's ability to sequester carbon by runoff and soil degradation. Since 1990, Indonesia has lost 50 percent of its original forest. Under the smokescreen of the COVID-19 pandemic, deforestation in this region has further accelerated, with RSPO regulations loosened or made easier to bypass in order for smallholder or large-scale palm oil planters to obtain plantation permits incorrectly labelled as 'sustainable'. Most infamously, the Amazon rainforest is still being removed at disheartening rates, with deforestation in Brazil reaching its highest level since 2008 in November 2020. A total of 11,088 sq km (4,281 sq miles) of rainforest were destroyed from August 2019 to July 2020, 9.5 percent increase from the previous year. Deforestation in Central Africa's Congo Basin, largely to make room for local, self-subsistent farmers or for fuelwood, is accelerating too. Recently, researchers have suggested that the Congo Basin rainforest may be gone by 2100 (Tyukavina et al., 2018). Kothandaraman et al. (2020) estimate that the total amount of stored C in the forest vegetation is approximately 359 billion tonnes, with 42, 8, 5 and 44 percent stored in living biomass, deadwood, litter and soil respectively.

Less than two decades ago, it was estimated that the amount of carbon stored in forest ecosystems was twice that of the atmosphere, though this ratio is now considerably less favourable (Lal. 2005). In order to maintain the integrity of existing forest landscapes as carbon sinks, a phasing out of industrial deforestation entirely by the 2030s is absolutely pivotal. Today, deforestation and land use changes account for more than 10 percent of global CO_2 emissions, approximately 4 $GtCO_2$ per year, resulting largely from the clearing of forests for agriculture or other forms of development. A new study by Kennedy et al. (2018) shows that only 49 percent of the world's lands remain in a relatively intact state. If you subtract the solid ice portion of Greenland and regions that receive less than 1" rainfall per year in the Sahara desert, the figure drops to 46 percent. The remaining green areas are the terrestrial sponge that absorbs approximately one-quarter of our annual CO_2 emissions. Yet, since 1970, the world has lost nearly one-third of this terrestrial carbon sink, just as humans have tripled global CO_2 emissions.

Naturally, the effort to restore as much naturally forested land as possible, restricted specifically to land suitable for forest regrowth, is critical to maintaining temperature increases below the 1.5ºC target. Under the 1.5°C model established by the OECM report, 300 mega hectares (Mha) of land area will need to be reforested in the tropics and an additional 50 Mha will need to be reforested in temperate regions. A fairly conservative analysis derived from "Natural Climate Solutions" by Griscom et al. (2017) identifies approximately 800 Mha of degraded lands that are suitable for ecological restoration. Taking just a portion of this potential, the world's natural lands could be expanded by 2-3M km^2 (approximately 2 percent of additional lands), delivering 175 $GtCO_2$ in negative emissions through to 2100. Other studies identify far more land suitable for forest regrowth, and further emphasise the additional carbon storing potential if deforestation is halted and forest regrowth is achieved globally. The OECM calculates that restoration of natural carbon sinks through forestry and land-use pathways can remove up to 513 $GtCO_2$ by the end of the century (OECM REPORT). Restoration of natural carbon sinks is a necessary global effort which must be facilitated, first, by wider implementation of anti-deforestation policy, and subsequently, if performed sensibly, by large-scale forest planting initiatives to re-establish and protect natural forest landscapes. Without carbon offsetting and nature-based solutions, the 1.5°C limit is not possible, even with a rapid decline in fossil fuel emissions.

Regenerating and protecting natural forest landscapes is the core focus of Balance, and their importance is being recognised nearly as fast as they are being removed as a result of land-use changes to accommodate industrial logging and agriculture. Protecting biological diversity encompasses not just trees, but the multitude of plants, animals and microorganisms that inhabit forest areas and their associated genetic diversity, all of these species must be accounted for in order to properly regenerate forest ecosystems. Ultimately, the loss of biodiversity can weaken forests' resilience, decreasing their ability to withstand imminent threats such as increased temperatures, extreme weather events and habitat degradation, creating a negative-feedback cycle that leads to even more biodiversity loss. To accommodate these requirements, it is essential that the carbon market and carbon offsetting is well equipped and willing to alter its approaches, and that it is performed on a suitable scale by the highest emitting countries.

1.3 Carbon Offsetting in the UK

As a high-emitting nation, tree planting, whether as a result of carbon offsetting or other forestry strategies, has generally been performed on an unsatisfactory scale on UK land. In 2018, for example, about 1,400 hectares of trees were planted in England, against a government target of 5,000 hectares. Less than £1 per person per year is spent on planting English trees, and less than £2 across the UK, according to estimates by Friends of the Earth, compared with £90 per person per year on roads and £150 on fossil fuel subsidies (The Guardian, 2019). Similarly, the implementation of carbon offsetting projects in the UK is less widespread than in other developed countries. Given that the UK currently emits upwards of 351 million tonnes of carbon dioxide per year (CCC, 2019), the predicted potential of 6.2 million tonnes of carbon stored in total as a result of carbon offsetting projects in the UK is relatively small. This scarcity is most directly the result of an international carbon offsetting system that has historically prioritised carbon offsetting activities in countries across Africa, Asia, South America and North America. However, the implementation of the Paris Climate Agreement and potential changes to rules on international carbon trading, are currently creating new opportunities to implement carbon offsetting projects in the UK, and are likely to do so at an even greater scale in the near future. This potential change to international carbon trading rules, combined with growing numbers of UK-based organisations with net zero targets, has prompted increasing interest in the potential for carbon offsetting in the UK.

According to the British Ecological Society (2021, p.10), the UK's forests currently store around 1.09 billion tonnes of carbon and sequester only approximately 4.6 percent of the country's total emissions, declining steadily over the past 20 years, and, if one accounts for total forest cover and not exclusively natural woodland cover only cover about 13 percent of the UK's total land area, making the UK one of Europe's least-wooded countries. Even more dishearteningly, of the remaining woodland cover, only about 2% of the UK's original forests remain. The reasons for the lack of woodland across the UK stretch back centuries, from the timber needed for ships to bolster the empire's navy and the industrial revolution, to the first world war, when the countryside was so denuded that the government set up the Forestry Commission in 1919 to reforest emptied land and provide a national resource to meet future needs. For decades, too, agricultural policy has, logically, focused almost exclusively on food production over environmental gains, though little consideration for the latter has resulted in wide scale alterations in agricultural strategies and policy, and landowners have been given little incentive to surrender their lands to slower-growing forests which carry significant upfront costs but no promise of financial return for the initial few decades. Spending priorities, on the large part, have landed elsewhere.

The UK's network of forests today include 42,000 ancient woodlands which stand, on the most part, less than 5 hectares in size and are typically highly fragmented (The Woodland Trust, 2018). Many of which, too, are under constant threat from deforestation, land use change, diseases, pests, invasive species and accelerating climate-related threats. There is considerable scope to increase both forest cover and carbon sequestration within woodlands, which would bring many additional benefits, including the provision of adaption through reduced flood risk, and shade and cooling in both rural and urban settings. Through Balance's collaboration with projects which include forest connectivity as a key consideration, Balance hopes to have a considerable impact on restoration of fragmented forests.

New 'native' woodland, which prioritises the selection of native (as opposed to exotic) species as well as species diversity, will increase woodland biodiversity and resilience to future climate change in the UK, while also enhancing woodland connectivity which creates further benefits for biodiversity. This brings great potential for carbon offsetting initiatives to provide co-benefits, beyond the exclusive target of climate mitigation, including varying ecosystem services, social and economic benefits, plus indirectly reducing emissions through the reduction of necessary dependency on energy intensive practices such as air conditioning by providing shade in urban environments. There is also considerable (largely untapped) potential for the creation of carbon offsetting initiatives within various other ecosystem types, including peatlands, salt marshes, arable landscapes such as hedgerows and field margins, urban landscapes and agroforestry.

The independent UK Committee on Climate Change (CCC) has recommended that tree cover be increased from 13 percent to at least 17 percent, planting at least 30,000 hectares of woodland per year by 2025, and that existing woodlands are managed more effectively and agroforestry is encouraged (CCC, 2019). The 25 Year Environment Plan also commits the UK to establishing new woodlands (DEFRA, 2018). The CCC estimates that these new woodlands will sequester an additional 2 million tonnes of carbon dioxide per year by the year 2030, and simulation models imply that the continuing this rate of reforestation over the next 40 years would eventually sequester upwards of 12 million tonnes per year, reaching a peak by 2070. In the UK, as around the world, ambitious policies such as this are often met with differing opinions. For example, in England, Confor, which represents the views of forestry businesses, urges large-scale commercial planting, facilitated by a simplified planning process (Confor, 2020). In contrast, two environmental charities call for woodland cover to be doubled, while others emphasise that new woodlands could help reconnect nature (Marsh, 2020). This variety of views is likely caused by the differing priorities of each institution, and the varying implications in enacting reforestation that this entails. It is also widely suggested that an alternative, or at least a necessary contemporaneous approach to increased forest cover within the UK is to allow natural afforestation (Garcia et al. 2020).

Two carbon offsetting project certification bodies currently operate in the UK: the Woodland Carbon Code (WCC), and the Peatland Code. Woodland carbon offset projects, including forest planting and natural regeneration, are the most advanced carbon offsetting approaches in the UK, and are advantaged by their certification through the Woodland Carbon Code, due to the steps it is taking to make tree planting a financially viable and environmentally efficient option. Studies of the carbon sequestration of such projects are well developed. Upland peat restoration is also a well-developed approach as certified through the Peatland Code, but Lowland peat restoration, despite harbouring good potential, is not as widely researched or implemented, largely due to its exclusion from the Peatland Code. Floodplain restoration with increasing forest and biodiversity cover similarly presents potential, though this approach has not been extensively reviewed in scientific literature. Saltmarsh and seagrass restoration have both been shown to achieve high rates of GHG removal in the UK, with the latter particularly showing strong co-benefits, however the challenges of sea level rise, measurement and monitoring processes are particularly troublesome in the marine environment.

2. The Carbon Market

2.1 Introduction to the Carbon Market

With the race to tackle the climate crisis unfolding over the past few decades, governments and private businesses have been actively searching for ways to mitigate and compensate for GHG emissions. Since the Paris Climate Agreement, corporate climate commitments have increased five-fold, with 30 percent of leading companies now making at least one public commitment to carbon neutrality or net zero by 2030 (Carbon Neutral Protocol, 2021).

Based on current net-zero commitments from more than 700 of the world's largest companies, there will already have been commitments of carbon credits of around 0.2 gigatons (Gt) of CO2 by 2030 (McKinsey Report, 2021). While the global coronavirus pandemic has somewhat stalled progress of NDC declaration, companies show no sign of relenting in committing to internal emissions reductions targets. Since its inception in the late 1980s, carbon offsetting and the ever-evolving carbon market has provided various platforms through which individual, corporate or even national emissions mitigation can be achieved, by placing a price on and creating a market through which reductions or removals of atmospheric GHG emissions can be traded with significant market incentives. Carbon finance is increasingly recognised as a vehicle not only for climate action, but, if planned and enacted properly, for broad sustainable development. Progressively, through the voluntary carbon market, corporate buyers can choose to do more than offset their emissions: they can focus on projects with attributes that align with their values and deliver value to communities and ecosystems.

Offset projects, whether operating as offset providers through the compliance or voluntary carbon market, produce reductions or removals through a wide variety of approaches, each of which create differing benefits and face varying challenges. Offsetting is practiced by many businesses, public sector organisations and governments through the purchase of carbon offset credits from an offset provider, but there is no unifying definition which explains what it means. For the purposes of this methodology, it is defined as:

The practice of reducing or removing greenhouse gas emissions to balance ongoing greenhouse gas emissions, in order to achieve, whether through compliance or by voluntary internal targets, claims such as carbon neutrality or net zero.

Carbon offsetting approaches which remove emissions are most compatible with Net Zero, which is a core concern of the Paris ambition to limit global temperature rise to below 1.5ºC (Environment Agency, 2021). This is not to say that emissions reductions projects can be entirely discounted, and it is possible that a combination of both approaches will lead to greater results, yet emissions removal carbon offsetting is nevertheless more prominent.

GHG emissions are unified under the label ‘carbon’ for the purpose of measuring and quantifying emissions more effectively. Carbon dioxide equivalents (CO2e) allow the greenhouse effect of all relevant GHGs to be combined into a single measure (the sum of the amount of each GHG emitted multiplied by its 100-year Global Warming Potential [GWP]). They depend on the period over which measurements are made and therefore are not precisely equivalent. Nonetheless, this is a well- established approach that allows comparison, and many reports use CO2e as the unit of mass for GHG emissions, while noting that for certain gases such as methane there is a significant additional benefit associated with avoiding them in the short-term which is not captured in the CO2e figures. Measuring and monitoring of carbon sequestration typically gives values simply for carbon (C) rather than CO2e since the carbon is not stored as a gas but as a compound. In this methodology, stored carbon (C) is referenced as well as CO2e.

There are two markets for carbon offsets: (1) The larger compliance market, where companies, governments, or other entities buy carbon offsets in order to comply with caps on the total amount of carbon dioxide they are allowed to emit; and (2) the smaller voluntary market, where individuals, companies, or governments purchase carbon offsets to mitigate their own greenhouse gas emissions from transportation, electricity use, and other sources. In the voluntary market, carbon credits direct private financing to climate mitigation projects that would not otherwise get off the ground. Cumulatively, the market volume in both the compliance and voluntary carbon markets topped 1.3 billion mt CO2 equivalent in 2019, with total value exceeding $US 5.5 billion according to the 2020 Ecosystem Marketplace report.

Within the compliance and voluntary markets, offsets can be generated from a variety of emissions reductions projects such as renewable energy including wind and hydropower, and plantation forestry, upland and lowland peat restoration, grassland management, freshwater wetlands, agricultural soil management practices, saltmarsh and seagrass restoration. Others include the destruction of industrial pollutants or agricultural byproducts (Tsai, 2020), the destruction of landfill methane, and Land Use, Land-Use Change, and Forestry (LULUCF).

Built environment offsetting approaches, though considerably less common, can include household insulation, low carbon heating, timber construction and low carbon transport. The most widely researched and scrutinised voluntary carbon offset initiatives are forest-based projects, with only renewable energy project related credits more common in implementation, thus they have developed, particularly in recent years, at a faster rate to a point where registering, verifying and monitoring processes are more well-understood and systemised. Renewable energy offset credits are obtained from renewable energy projects such as wind farms or hydro dams, with an established baseline for the equivalent energy produced from a fossil-fuel system and the relevant additionality metrics provided by the renewable energy produced with the project. Though, as outlined below, it is increasingly recognised that renewable energy-based projects are, at least relative to forest-based projects, unlikely to prove additional. As a recent trend, renewable energy offset projects are increasingly being discontinued through a lack of evidence for their additionality. Increasing in popularity in recent years are nature-based solutions (NbS) as carbon offsets, such as natural and biodiversity-based reforestation and the management of coastal wetlands. Such projects which rely on the carbon sequestering properties of natural ecosystems have been acclaimed for their ability to better support global efforts to mitigate climate change while also providing environmental and social benefits.

The value of compensating emissions is quantified through units called Carbon offset credits, or Certified Emissions Reductions (CERs), a certificate and form of currency through which allowances that represent one unit of carbon dioxide emissions that are linked to climate change. The unit is usually measured as a metric ton, or 2,205 pounds, of carbon dioxide-equivalent (CO_2e), which may represent six primary categories of greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF_6). One carbon offset thus represents the reduction of one metric ton of carbon dioxide or its equivalent in other greenhouse gases. Offset providers sell these allowances to customers who are interested in carbon emissions reductions, and the sales revenues are used to finance carbon reduction projects. Thus, in theory, the amount of carbon dioxide reduced by purchase of the allowance corresponds to carbon produced elsewhere. The principle was encouraged by the Paris Agreement; Article 6 outlines how countries can use offsets and carbon pricing to meet their Nationally Defined Contributions (NDCs) for reducing carbon emissions through international treaties, bilateral agreements between nations and in-country schemes. Businesses weigh the cost of eliminating the harmful effects of pollution against the cost of purchasing the right to pollute, leading to utilisation of factors of production where the value of the product yielded is greatest, thereby minimising external social and environmental costs more efficiently than under alternative systems (Wilson, 2011). Annually, the legal limit on GHG emissions are reduced by assigning reduced quantities of emissions permits, allowances or carbon credits to different sectors. In this 'cap and trade' system, incentives to reduce emissions in line with these reductions are such that those who are able to reduce their emissions easily and cheaply will have surplus credits, which they can sell to those who have higher marginal abatement costs. As such, by limiting the right to emit greenhouse gases and allowing individuals to trade those rights, the market places a price on carbon, forcing businesses to internalise the cost of their greenhouse gas emissions on the environment, and to change their spending patterns as a result of increasing costs.

2.2 The Compliance Market

Within the compliance market, with the transition to the Paris Climate Agreement's framework and the commitment of all countries to make mitigation pledges in the form of Nationally Determined Contributions (NDCs), an important implication has been that host countries with ambitious and economy-wide pledges have mandated incentives to limit international transfers of credits annually to activities with a high likelihood of delivering additional emission reductions, so that transferred credits do not compromise the host country's ability to reach their own mitigation targets. A second important implication has been that countries should only transfer emission reductions where this is consistent with their NDC, implying that baselines may have to be determined in relation to the host country's mitigation pledges.

The Clean Development Mechanism (CDM) has provided the framework for the majority of compliance offset projects. With almost 7,700 CDM projects and almost 300 programmes of activities (PoAs) registered and more than 1.6 billion Certified Emissions Reductions (CER) issued, the CDM has developed into a central component of the global carbon market (Öko Institut, 2016, p20). However, with the adoption of the Paris Agreement and its establishment of new GHG emissions reduction mechanisms (Article 6.4), it is clear that the role of the CDM as a component of the Kyoto Protocol will end (Öko Institut, 2016). Nonetheless, in terms of its standards, procedures and institutional arrangements, the CDM currently forms an important base for the elaboration and design of future mechanisms for international carbon markets. The CDM allows industrialised countries to buy CERs and to invest in emission reductions where it is cheapest globally, which aids in meeting their own emissions targets. Unlike the voluntary carbon market, particularly of recent years, CERs are consistently re-traded, and are considered eligible under various domestic carbon pricing schemes and carbon taxes in Colombia, Mexico, South Korea and South Africa, the last two of which, in particular, were the largest users of CERs for compliance purposes in 2020. Altogether, there is very little volume of CER-generating CDM projects compared to a decade ago, where hundreds of millions of CERs changed hands every year. In 2020, only roughly 3 million CERs traded on exchanges during 2020 – the same volume as 2019 - while prices remained minimal (CarbonNeutral.Com, 2021).

Overall, however, the projected growth of the compliance carbon market is promising. With data collected from trading platforms such as ICE, KRX and EEX, along with an estimation of the size of bilateral transactions, a review has estimated the actual volume of carbon traded, suggesting that global carbon markets grew nearly 20 percent in 2020, reaching €229 billion, marking the fourth successive year of continual growth, and reaching more than five times the size of the market in 2017. By quantity, traded global carbon reached a record high of 10.3 Gt. The EU ETS constitutes nearly 90 percent of global carbon market value, with the compliance market seen as an important driver in tackling carbon emissions. Similarly, the North American regional carbon markets also grew overall 16 percent in market value from 2019. China's national ETS is positioned to enter the market in Q2 of 2021 (Refinitiv, 2020). The compliance market, therefore, is positioned to experience further growth through globalisation and expanded market reach.

2.3 The Voluntary Market

The voluntary carbon market enables companies and individuals to offset their carbon emissions on a purely voluntary basis by purchasing carbon credits generated from projects that either capture carbon from the atmosphere or reduce GHG emissions. Voluntary market participants may choose to be part of a voluntary cap-and-trade system in which emissions rights are traded akin to the compliance market, or, as is most often the case, they might assess their own carbon footprint themselves, attempt to reduce their internal emissions as far as possible (if done properly), and then offset additional emissions either by buying carbon credits from carbon offset projects which reduce emissions elsewhere, or by directly investing in these projects. In contrast with the compliance market, the voluntary market is self-regulating, and projects are not obliged to become certified to a standard. Although the vast majority of credits sold to voluntary buyers adhere to third-party standards, credit producers become certified because they attract considerably higher prices than non-certified credits.

For offset producers, the certification procedure on the voluntary market tends to be less complicated and less costly than that on the compliance market. Whereas the compliance market typically relies on investment from large companies, the voluntary market tends to attract smaller businesses, largely due to the lower cost of certification. For offset providers, the voluntary market might also be more attractive as generating only 50,000 tCO2e a year might make CDM certification too costly and too risky; it may prove difficult to earn back the cost of certification, and there is a risk that registration with the CDM will not be successful in the first place (Hamilton et al. 2011).

The global market for voluntary offsetting is small compared to the compliance systems, standing at only about one hundredth of their size. In 2010, 131 MtCO2e were traded on the voluntary market (about 2 percent of the total) compared to 6692 MtCO2e on the compliance market (TSVCM, 2021). However, it has been growing considerably for more than a decade, and has clear potential for further rapid growth.

According to Natural Capital Partners, 170 voluntary forest carbon and land-use projects were creating carbon credits between 2008 and 2018, with 92 percent of voluntary market demand for forest offsets driven by the private sector (NaturalCapitalPartners.com). Unfortunately, due to the bilateral and over-the-counter nature of voluntary offset transactions, and the lack of a centralised repository for price and volume data, detailed quantitative evidence on the growth of the market is fragmented and often missing. The Taskforce on Scaling Voluntary Carbon Markets (TSVCM), one of the highest profile efforts to aid the growth of the voluntary market, however, has committed to gathering data, and has advertised the importance of voluntary offsetting for compensating and neutralising emissions on a global scale. Their study highlights recent growth in corporate confidence in the voluntary market, and the promise for further development. The last ten years has seen voluntary offset volume increase nearly tenfold; just 8.8 million tonnes of CO2e were covered in 2006 but, by 2017, the figure stood at 62.7 million tonnes. Between 2017 and 2020, it is estimated that total credits grew particularly quickly to some 95 million tonnes. In the next ten years, the TSVCM estimates that demand for voluntary carbon credits could increase by a factor of 15 or more by 2030 and by a factor of up to 100 by 2050, from 1.5 to 2.0 gigatons of carbon dioxide (GtCO2) by 2030 and up to 7 to 13 GtCO2 by 2050 (TSVCM, 2021), if the 1.5ºC limit is committed to on a global scale. Thus, overall, the market for carbon credits could be worth upward of $US50 billion in 2030. A more conservative estimate is between $US5 billion and $US30 billion, depending on different price scenarios and their underlying drivers.

According to the 2020 Ecosystem Marketplace Carbon Survey report, corporate carbon-neutral pledges fueled a record transaction volume of at least 104 MtCO2e in 2019, an increase of 6 percent over 2018. Anecdotal evidence suggests that volume exceeded that of 2019 in 2020 despite the global COVID-19 pandemic and thus the loss of credits provided by aviation and tourism-related offsetting, reaching near-record volumes largely arriving through broader pledges by large companies such as Microsoft and Amazon (Donofrio et al., 2020), and other companies that had never made carbon-neutral pledges, or indeed taken any climate action, before. This is in addition to the Carbon Initiative, which commits the company to being carbon negative by 2030. Similarly, Google in September 2020 announced it would be carbon-free by 2030, suggesting that it would offset the emissions it could not eliminate, and also offset its historical emissions dating back to its founding in 1998. By late 2019 and early 2020, some NGOs and businesses offering carbon credits (CERs) were reporting a tenfold increase in interest from businesses (edie. 2020). Broader corporate demand for voluntary carbon offsets in 2020 reflects a recent wider commitment to lowering the environmental impact of business operations.

Refinitiv's Carbon Market Survey (Refinitiv, 2020) reports that many of their respondents consider the voluntary market as a key source of offset demand in the near future, with 70 percent of respondents agreeing that offsets allow their firms to achieve maximum emission reductions at the lowest cost, and 81 of 296 respondents suggesting that voluntary markets will become the main source of demand for offsets in the next five years. Nevertheless, the same survey implies that voluntary offsetting has not welcomed a host of new clients as suggested by other sources, finding that 63 percent (out of 43 respondents to this question) had started offsetting in 2018 or earlier, and only 14 percent had started purchasing offsets in 2019. The lack of new clients, however, does not negate the overall growth of the voluntary market of the past few years.

It is especially notable that the demand for offsets associated with forest management remained especially strong throughout 2020, demonstrating the strength of forest-based projects as resilient and consistent providers of credits to consumers.

Project Type	Volume (mil mt CO_2e)	Average Price ($/ mt CO_2e)	Total Value (Mil $)
Renewable Energy	42.4	1.40	60.1
Forestry and Land Use	36.7	4.30	159.1
Waste Disposal	7.3	2.50	18.0
Household Devices	6.4	3.80	24.8
Chemical Processes/ Industrial Manufacturing	4.1	1.90	7.7
Energy Efficiency/Fuel Switching	3.1	3.90	11.9
Transportation	0.4	1.70	0.7

Figure 1: Volume, Average Price and Total Value of different voluntary carbon offset types. Adapted from Donofrio et al. Ecosystem Marketplace Insights Brief 2020. 2020.

Overall, as of 2019, the largest volume of voluntary carbon offsets were derived from renewable energy projects (42.4 mil mt CO_2e), with forestry and land use second (36.7 mil mt CO_2e), both of which comprise the vast majority of voluntary offset projects (Figure 1). Due to the comparatively high price of forestry and land use offsets, however, the total value exceeds the sum of the remaining project types. The strength of forest-based offsetting promises to grow as certification and validation of projects and systemisation of evidence makes forestry projects more economically and environmentally beneficial.

Various market research studies have outlined a number of critical steps for the market to achieve the projected growth. The TSVCM defined the six points to address the voluntary market's deficiencies and grow the market (TSVCM, 2021), including the consolidation of offset standards and certification under one commonly accepted international standards body, the establishment of good practices, rigorous measurement and certification methods to address public concerns of validity, the prioritisation of high-quality credits with numerous co-benefits, and the improvement and development of infrastructure and financing to support the growth of projects producing traceable credits, possibly including ‘carbon reference’ contracts that allow prices to reflect co-benefits of projects. Also outlined is the necessity to radically improve the availability of voluntary market data, and centralise carbon exchanges under one system, as well as facilitating the more simple international transfer of carbon credits and increasing collaboration amongst stakeholders to address credibility issues related to voluntary carbon credits.

Further work needs to be done in understanding exactly how the voluntary market can and should contribute to NDCs, sectoral pathways and individual organisations’ own actionable climate plans. Given the demand for carbon credits that could ensue from global efforts to reduce greenhouse-gas emissions, it is apparent that the world needs a voluntary carbon market that is large, transparent, verifiable, and environmentally robust, progressive in its aims and streamlined in its efficacy. If current trends continue, the coming years shall see considerable progress in this regard, as with transparency comes both liquidity and a natural development of trust with both the client and consumer bases.

3. The Challenges Facing Carbon Offsetting

With the outlined growth of the carbon market, as well as the growing political focus on offsetting as a necessary component of global climate mitigation efforts, it might seem obvious that carbon offsetting and NbS projects are prioritised internationally as significant, necessary and credible contributors to international climate mitigation, with appropriate scope, investment and integrated scientific foundation. However, a review of the major problems and shortcomings that have plagued carbon offsetting initiatives thus far shows that, while their potential is acknowledged, practical implementation has sparked debates concerning viability, additionality, permanence, longevity, legitimacy, heterogeneity and transparency.

Addressing these issues has thus far distinguished the best carbon offset initiatives, and is critical to ensuring effective contribution to global climate crisis mitigation in the future. In this section, these challenges, amongst others, are discussed methodically in the context of past offsetting. Unless stated otherwise, criticisms refer primarily towards forest creation offset projects, as, in general, they have become synonymous and inseparable, above any other offset project type, with the concept of carbon offsetting amongst academic and non-academic commentators alike. While this can sometimes prove problematic, the reliance of the carbon market on forest-based carbon offset projects, particularly in the 1990s and 2000s, makes this equation viable in the context of criticisms of past carbon offsetting. Balance is committed to improving the standard set by carbon offset providers by mitigating the issues outlined below, and by improving the stewardship of carbon offset project implementation to a new set of standards.

3.1 Additionality

Perhaps the most important task facing the offset provider is both ensuring and proving that carbon sequestration adds to the baseline; that proposed or actualised increases in carbon storage would not have occurred had the project not been implemented, and thus the carbon emitted elsewhere is actually compensated for. For example, if a habitat creation project was going ahead anyway irrespective of it being considered a carbon offsetting project, it would not be considered ‘additional’. From a financial perspective, a project is only additional if it requires carbon income to transform it from a project which is not financially viable or affordable to one which is. Buyers of carbon units want to know, and should be informed, whether their input has enabled more carbon sequestration than would otherwise have happened under pre-existing circumstances.

The established carbon offsetting market requires projects to pass a set of ‘additionality tests’, which are used to demonstrate whether a project adds to the baseline for an area. The additionality test is central to all offset projects; it uses a price signal to attempt to distinguish the projects that achieve real carbon reduction from the projects that would have been undertaken anyway (UNFCCC, 2012). The baseline is set according to detailed information about typical project practices over a wide range of sectors.

Only offset projects that would not have occurred under a business-as-usual (BAU) scenario and that can ‘prove’ carbon reduction additionality are considered additional. These projects are eligible to produce offsets and sell them to regulated entities. Rowe (2020, p19) cites a damning European Commission report which found that, thus far, 85 percent of CDM carbon offset schemes have a low likelihood of producing additional emission reductions, and only two percent of projects were found to have a high likelihood of ensuring additionality. The 85 percent of the CDM offset projects they looked at, importantly, would also likely have gone ahead even without the purchase of offsets (Öko Institut, 2016).

They also found that most renewable energy-related offset project types (wind, hydro, waste heat recovery, fossil fuel switch and efficient lighting) are unlikely to be additional, irrespective of whether they involve an increase of renewable energy, energy efficiency improvements or fossil fuel switch. On the other hand, biomass-related projects, such as reforestation, are more likely to be additional even in cases where additionality is not proven, although the assessment of additionality depends on the local conditions of individual projects.

3.2 Permanence and Unsuitable Forests

Another challenge is that of permanence – whether the positive carbon sequestration created by the offset will stay intact, an issue tied intrinsically to forest sustainability and longevity (Dhanda, K. K., Murphy, P. J. ,2011). A planted tree that sequesters carbon must be protected indefinitely; if it is cut down and burned, the CO_2 that it absorbed is released. In this case, CO_2 sequestered was ‘nonpermanent’.

Most carbon removal offset projects carry some vulnerability to lack of permanence; for example, it takes decades for the carbon capture potential of trees planted in forest regeneration projects to be realised, and there are no guarantees that trees will live long enough to store the promised carbon. Certain forests also need to be ‘thinned’ to ensure the health of the trees and to maximise sequestration rates, and failure to do so would damage the health of the forest.

Even in natural processes, the carbon absorbed by a tree in its lifetime is released back into the atmosphere once the tree dies, and even then, there is the pervasive risk of tree diseases, further deforestation, and climate change-related risks such as droughts, flooding and wildfires. Yet momoculture forests thus far created by offsetting initiatives have, in many cases, proved unsustainable and inefficient in carbon sequestration when compared with natural forests, and, in particular, unable to stand up to the inevitable challenges posed by climate change. Permanently removing carbon that has been locked away under the lithosphere for millions of years is challenging enough, so ensuring that the core process underlining carbon offset initiatives – that is, streamlining the optimisation of carbon sequestration – is vital.

In multiple cases, as mentioned, carbon credits have not offset the amount of carbon they are alleged to have offset. Large-scale reforestation carbon offset projects have, on numerous occasions, have created monoculture forests which are not only unsustainable but may be detrimental to the local environment, particularly when planted on lands unsuitable for forest growth. Commercial forests dominate because they provide income for landowners, tax revenue for governments, jobs for local communities and fibre, food or fuel resources, which also reduces the likelihood that the forest will be illegally cleared after establishment (Dave et al. 2019). They have also been fuelled by the rather simplified concept of tree planting employed by most large-scale past tree- planting initiatives unaccompanied by knowledge of where forests should be planted, not to mention knowledge of ideal forest composition, biodiversity and ecosystem creation. Many simply rely upon the simple statement of how many trees will be planted or how large a space they will be planted in.

For example, the African Forest Landscape Restoration Initiative (AFR100), with $US1.4 billion funding from Germany and the World Bank to African governments, has resulted in 100 Mha FLR by 2030. According to Seddon et al. (2021), much of this will be used to create commercial forests on savannah terrain, entirely unsuited to forest ecosystems and creating great risk of endangering species and the existing carbon stored within the savannah.

As another example, Mastercard and Partners’ ‘Priceless Planet Coalition’ pledged to plant 100 million trees over 5 years (2020-2025), as managed by the World Resources Institute and Conservation International, but the initiative has not outlined how in any detail how and where the project will take place, or what considerations (if any) are given for biodiversity, ecosystem creation and/or protection, or sustainability, and potential social or economic benefits beyond the statement that planting will occur in ‘areas of greatest global need’ (www.mastercard.us/en-us/vision/corp-responsibility/priceless-planet/).

Within these projects and many other previous carbon offsetting initiatives, invasion of foreign species may also compete with local species, damaging pre-existing ecosystems and their ability to sequester carbon. This results in ‘leakage’ – if a project demonstrates leakage, then implementing a project to reduce or remove GHG emissions leads to more emissions elsewhere, thus hampering or entirely removing the project's "additionality." For example, changing management of a particular habitat may cause the current land management practices to move elsewhere, undermining some of the carbon benefit of the original land use change. Or, during project implementation, GHG emissions could be released through construction works, which reduce the overall GHG emissions savings achieved. It is important that any carbon measurement approaches applied in a carbon offsetting project account for the leakage of emissions.

Often, trees prioritised for these monoculture forests do not "work with the environment", with inappropriate tree planting potentially causing more harm than good, particularly in cases of forests on naturally 'open' habitats, or on especially high-carbon soils. In the latter case, associated soil disturbance of tree planting causes significant losses in carbon-rich soils, particularly of the more resilient deep soil carbon which takes many decades to accumulate. Afforestation in unsuitable locations, or with unsuitable species, can also reduce ecosystem resilience and thus long-term carbon sequestration.

For example, fire-adapted savannah and dry grassland ecosystems hold large carbon stores below ground; while they readily recover from relatively cool and frequent grassland fires, which do not destroy soil carbon, afforestation risks much greater carbon losses during intensely hot forest fires (Bennett, Kruger. 2015). Fire risk is also increased in peatlands in temperate regions, creating increased risk for carbon release from carbon-rich peat. Current evidence also shows that low diversity, intensively managed forests may also cause water pollution from soil disturbance and increased agrochemical use (Drinan et al. 2013). Similarly, woodland creation on a species rich grassland could damage biodiversity, and, at least where grassland is found on degraded peat soils, restoration by re-wetting is likely to have better outcomes for biodiversity and GHG reduction.

Many large scale carbon offset forests have included fast-growing, single species such as eucalyptus or pines, because they are more capable of storing carbon quickly due to their fast growth rate and quick return and for their heightened timber production, which, along with the overuse of fertilisers, potentially causes long-term damage to soil health, plant and animal species biodiversity, and lack of longevity (Donadieu P. 2019). Similarly, such projects have often failed to account for the fact that saplings do not absorb as much CO2 as old growth forests that have long since been torn down. A common example of such a negative effect is the conversion of native grasslands to forests, introducing and even encouraging the invasion of non-native species into the landscape, which may not contain the same habitat for local species, thus endangering native animal and plant species. These species have also been criticised for introducing foreign diseases to landscapes incapable of dealing with them, and for worsening local impacts of drought or flooding. In contrast, forest restoration in previously forested areas can halt and even reverse biodiversity losses.

The generalisation of the 'tree planting is good' mentality, as such, has long prevailed in carbon offsetting, but, in many cases, has contributed to complex effects on carbon and hydrological cycles, local and global temperature, biodiversity, ecosystem resilience and social issues far more complex than most people recognise. In all, many factors must be considered in forest planting carbon offsets, including the species used, the state of the landscape prior to the intervention, the management regime and the scale at which outcomes are measured, with particular consideration for avoidance of planting non-native trees which replace intact ecosystems or negatively impact biodiversity (Ghazoul et al. 2019). A thorough analysis according to local context is needed to select the right species, spatial arrangement, and appropriate quantity, and, in every offsetting project, the preservation of native flora and species threatened by climate change.

3.3 Heterogeneity and Lack of Transparency

The complexity of the voluntary carbon market has proved a further issue. Both as a strength and a weakness, buyers vary from individuals, nonprofit groups or corporate entities, and sellers include companies, community groups, charities and international agencies. The heterogeneity of carbon credits, particularly in the voluntary market, has also meant that credits of particular types have been traded in too small volumes to generate reliable price signals and settle the market. Offset prices have varied widely, straining perceptions of what constitutes valid emissions reductions in projects and leading consumers to search for carbon offset providers based primarily on price-based metrics as opposed to any measurable comparative carbon sequestration efficiency. Adding to price volatility, within both the compliance and the voluntary market, is the notion that one offset can technically be sold numerous times. As within any market, buyers seek assurance of sole ownership of their purchase, and ensuring that this is the case with offset provision is especially crucial due to the fact that multiple ownership of a single offset results in excess emission insufficiently compensated by carbon sequestration. Because of the lack of clarity around this particular issue, one certifier infamously referred to a voluntary carbon offset market as a ‘no-man’s-land’ (Dhanda, K. K., Murphy, P. J., 2011). The incongruous nature of credits creates considerable potential for errors and fraud, particularly in pricing and additionality reporting; thus, making carbon credits more uniform is important both for consolidating trading activity, promoting liquidity on exchanges, and ensuring validity of offset providers. One potential corrective measure is establishing a uniform digital process by which projects are registered and credits are verified and issued, which could both lower issuance costs, shorten payment terms, accelerate credit issuance, allow credits to be traced, and improve credibility of corporate claims related to the use of offsets. Such a resource has yet to be developed, but would certainly aid the carbon market’s credit heterogeneity.

A lack of regulation has also proved problematic; in the early 2010’s the regulated portions of these markets were worth $US70 billion globally, yet the unregulated components of these markets are worth over $US4 billion (Dhanda, K. K., Murphy, P. J., 2011), meaning that little oversight checks the validity of offset initiatives or proof of additionality until recently. Certification from third parties or external entities has long been seen as necessary to verify the strength of the project, leading to a wide variety of independent standards, making offset initiatives difficult to compare and harming consumer confidence through a lack of transparency. Indeed, research in the early 2010s indicated that, at least at the time, top offset providers were prone to losing sight of their original objectives as they became more viable, and less inclined to explicitly demonstrate transparency and explain project purpose. It is evident that there has long been an urgent need for a single set of criteria and regulations among carbon offset providers that is readily understandable by the common consumer and through which systematic evaluations of the successes and failures of offset initiatives are mandated.

3.4 The Compliance Market and CDM

A lack of standardisation in the compliance market has met just as much criticism as a shortage of regulation within the voluntary market. Some argue that the many potential methodologies presented by the CDM call for providers to measure their own projects on a case- by-case basis, with offset providers themselves expressing exasperation with the task of project approval (Dhanda, K. K., Murphy, P. J., 2011).

Demonstrating value and setting baselines are the areas in which most concerns have been raised with the CDM, in particular regarding investment, barrier and common practice analysis and the assessment of prior consideration. Given its counterfactual nature, asymmetries of information regarding costs, financing, barriers and local project conditions, it has proved difficult to implement a reliable method for assessing value and setting baselines. Other factors that affect the overall mitigation outcome include the length of the crediting period used, how leakage concerns are dealt with and whether any perverse incentives are addressed.

A fundamental feature of the CDM is that, by its own declaration, it aims to achieve environmental integrity by ensuring that only real, measurable and additional emission reductions are generated. Many commentators, however, have highlighted the considerable uncertainty involved in the assessment of CDM projects' value and the information asymmetry between project developers and regulators. With CDM projects, certainty in additionality is rare, and a 2016 study by the Öko-Institut estimated that only 2 percent of the studied CDM projects had a high likelihood of ensuring that emission reductions are additional, with only 3 percent of the projects reach maturity and delivering the carbon benefits they ostensibly ensured.

The cost-efficiency of the CDM has been raised as a major concern, too; according to the Carbon Neutral Protocol (CarbonNeutral.com, 2021), approximately 30 percent of the money spent on the open market buying CDM credits goes directly to project operating and capital expenditure costs. Other significant costs include the broker's premium (about 30 percent, understood to represent the risk of a project not delivering) and the project shareholders' dividend (another 30 percent). The risk of fraud is also present, with the possible exaggeration of the carbon benefits and covering up that the projects are actually financially viable by themselves.

Various studies on the CDM in the early 2010s also criticised their inability to assist in sustainable local development. While this goal is mandated under their framework, until 2016, no part specifically incorporated social, environmental or economic considerations beyond the quantity or quality of short-term emission reductions achieved, implying that greenhouse gas emission reductions, by themselves, are the sole and unmitigated purpose of CDM offsets. In many cases, the project developer and host country failed to consider significant social and local environmental impacts of projects, with local stakeholders in the dark due to a lack (or lateness) of information supplied by the CDM itself. The use of culturally inappropriate modes of communication, exclusion of local communities and stakeholders entirely in project decision processes, the deliberate avoidance of negative feedback and lack of assurances of basic needs in communities have all been highlighted as problems inherent in CDM projects of the past (Wilson, 2011). As such, the CDM has been blamed for almost exclusively representing the interests of private commercial or governmental economic interests, particularly of high-polluting countries and sectors.

The difficulties with these traditional approaches resulted in refinement and revision of these approaches following the 2016 Paris Climate Agreement, as well as the introduction of several alternative approaches to the setting of baselines and testing additionality. Examples include the use of default values, performance benchmarks or penetration rates and discounting approaches. More fundamental changes include the use of highly standardised baselines and additionality tests at the sectoral level. Despite the promising signs related to improved regulation and homogeneity (and thus measurability and monitoring) of CDM, it remains to be seen whether methodological difficulties with highly standardised approaches can be solved to make them operational, and whether they will result in a lower likelihood of non-additional credits being issued. The two previous COPs both failed to decide what will become of the CDM, with countries divided between those which are keen to keep the mechanism, others which favour some kind of partial carryover of certain CDM features, and others still, most notably European countries, which are pushing to eliminate it altogether.

3.5 Duplicity and 'Cowboy Markets'

Despite the highly ethical purpose of carbon offsetting, many initiatives have contributed to the creation of a type of 'cowboy' atmosphere, as it has been termed, in which guile is common, resulting in many cases where credits yield no tangible emission reductions. The cowboy atmosphere has also been associated with a lack of technical literacy of some stakeholders who participate in the market, as well as heterogeneity in certification structure and a lack of consistent quality control.

Studies of voluntary carbon trading almost exclusively assume the baselines are set by regulators who have either entirely perfect or imperfect information about the costs and emissions of projects. In practice, however, regulators are often less informed than project proponents, leading to baselines likely being privately defined. The major related concern is that private companies may manipulate baselines in order to reduce the price designated to offset their emissions. The equation is simple; it starts with an estimated baseline, a guess at what the forest would look like without offsets; the more severe the suggestions, the more credits you generate, the more money you stand to make. From the earliest years of carbon offsets, both in renewable energy based projects and reforestation projects, it has proved relatively easy to game the system by shifting the numbers toward the bleakest alternative reality. It is worth noting here, however, that many of such accusations have been levelled towards renewable energy carbon offset projects, and not forestry projects, as the latter were incorporated into the compliance market far more recently than the former.

A 2017 study finds that the more the baseline developing company emits, the more likely the developer is to manipulate the baseline in voluntary offset initiatives (Liu X., Cui Q. 2017). A generous baseline for carbon emissions had an offset project not gone ahead, for example, promotes participation but produces a large volume of non-additional offsets by increasing the number of carbon offsets that are produced, thereby indirectly permitting and increasing global emissions via the increase in emissions caps. With the exception of cases of extremely low emissions, the baseline developer is more likely to increase the baseline level and enjoy extra revenue from selling non-additional carbon offsets. The study finds that, if baselines were always unbiased, offset trading can, on average, reduce global emission by 771 gCO2e/ft2. However, if the baseline is allowed to be privately defined, it is highly likely to be manipulated to produce large amounts of non-additional offsets. Even with third-party verification, manipulation can still result in a net increase in global emissions. As such, issues of trust amongst project leaders, sellers and consumers of offsets have resulted in cases where projects become little more than profit- generation systems, easy to manipulate to one's own gain. The implications for the validity and effectiveness of past offset initiatives that have not received sufficient research or lack empirical evidence are bleak, and have caused anxiety for all sections of the market. This serves as a principal reason for the creation of the Balance Methodology, as well as the formulation of Balance as an ethically and ecologically-valid and effective form of carbon offsetting.

3.6 Ethical Concerns of Forest-Based Offsetting

The very nature of forest-based carbon offsetting; the planting of trees, has come under fire from commentators, suggesting that focusing to such an extent on tree planting, while relinquishing focus on the more specific aspects that enhance the effectiveness of such projects, creates a "low quality" carbon offset option. Early critics of forest-based carbon offsets argued that while they often failed to achieve cost-effective carbon sequestration, they also failed in assisting developing countries in achieving sustainable development. While it must be acknowledged that developing a carbon offset project that is both environmentally, economically and socially successful is not an easy task, and that, unfortunately, there is little empirical basis for analysing positive or negative social impacts from carbon offset initiatives thus far, examples of carbon offset projects with negative social impacts exist. Local communities do not always receive or see the benefits of carbon payment schemes and have often not been involved properly in the development or the implementation of such projects.

Trying to address such social shortcomings, and due to the concerns expressed around other environmental, effectiveness, justice and equity issues, some Standard Setting Organisations (SSOs) participating in the carbon market developed new approaches to overcome the lack of transparent and credibility towards implementing and measuring social impacts (Herr et al. 2019). SSOs such as Plan Vivo, the Climate, Community, and Biodiversity Standard (CCBS), as well as Social Carbon are trying to overcome these shortcomings. These new social standards require that projects incorporate stakeholder participation, uphold customary and statutory rights, obtain 'free, prior, and informed consent' of forest communities, account for indirect costs and benefits, and attempt to bring net positive benefits for climate, communities, and biodiversity. While not mandatory, these requirements send strong signals about the qualities of forest governance expected by carbon markets and carbon credits buyers, even if they are not always achieved.

Environmental organisations such as Greenpeace have also levelled accusations of ‘climate colonialism’ against both compliance and voluntary offset providers and consumers, focusing on Western governments and companies for using resources, such as land, that developing countries themselves require, as well as outsourcing climate action to developing countries in the Global South due to economic feasibility, so that carbon emissions rates and related economic growth within polluter countries nationally and within sectors can continue. In a simplified sense, carbon reductions are akin to many other commodities in that they are easier and cheaper to produce in the developing world, where industrial processes are generally less efficient, regulatory requirements are less onerous, and raw materials, labor, and land are usually less expensive. For example, in the early years of carbon offsetting, it was estimated that the cost of emission reductions in the United States was $US125 per metric ton of carbon dioxide equivalent, compared to $US14-23 per metric ton in the developing world (Wilson, 2011). In this case, American energy producers experienced diminishing returns in terms of the quantity of greenhouse gas reductions for each dollar invested in cleaner technologies, thus benefitted from offsetting with projects in developing countries.

While, on the surface, this means that the same level of investment can result in greater emission reductions in the developing world, it has also been evidenced that such projects have resulted in the sacrifice of land for projects that, in many cases, do not bring local social or economic growth, may come at the cost of indigenous peoples’ rights, and may not provide actual additionality. Some projects have imposed a range of environmental and social costs upon local communities, displacing and marginalising local stakeholders and indigenous communities, ignoring basic local needs and human rights (Wilson, 2011). In the context of climate change which already promises to discriminately impact and create further divisions between classes, races and ethnicities, unevenly affecting the poorest and most vulnerable individuals in society, offset projects should not place further socioeconomic pressure on disadvantaged peoples. Defenders of projects based in the Global South suggest that a further scaled-up voluntary carbon market should facilitate mobilisation of capital to the Global South, where most of the potential supply of avoided nature loss and of nature-based sequestration is concentrated. Despite the validity of focussing on re-establishing forests, in particular, where the potential for creating efficient carbon sinks is greater, ethical concerns must be tackled if the variety of benefits are to be experienced locally.

Others still criticise the concept of using markets to mitigate an issue widely believed to have been exacerbated by the impacts of capitalistic market growth, thus advocating non-market- based policy implementation based on moral grounds (Monast et al. 2017). For some, opposition to emissions trading is rooted in the view that allowing entities to buy and sell emissions credits is equivalent to licensing the ‘right to pollute’, citing that emissions markets establish allowances to a unit of pollution, thus creating a tradable good out of environmental harm and commodifying the environment. For example, in May 2015, Pope Francis released

Laudato Si, a papal encyclical discussing the themes of environmental protection, inequality, and the failures of the modern economy to provide for the wellbeing of all. Broadly, he questioned whether market capitalism in relation to climate action can effectively protect the interests of the poor, and specifically criticised the carbon market and: “the strategy of buying and selling ‘carbon credits’”. Citing the negative implications of the pursuit of profit maximisation, prioritisation of the most “cost- effective” projects, technocratic decision making and over-reliance on technological advancements, and the carbon credit market seeming “to provide a quick and easy solution under the guise of a certain commitment to the environment… rather, it may simply become a ploy which permits maintaining the excessive consumption of some countries and sectors”, thus leading to unjust results for the world’s poor.

3.7 Distraction From Direct Emissions Reductions and Greenwashing

In raising such concerns, the Pope echoed the critiques of numerous environmental commentators; that carbon offsets are ethically corrupted by their permission of emissions continuation amongst nations and companies which pollute the most. This represents perhaps the most common criticism of carbon offsetting; it can, and does, provide an excuse for corporations to avoid action to reduce emissions, which can in turn lead to increased emissions as organisations grow while offsetting remains fixed. While some studies argue that the majority of recent high- profile commitments use voluntary offsets as just one part of a broader emissions reductions strategy (Tucker, 2019), and that offsets primarily serve as a way to deepen reductions rather than as the reductions themselves, many other studies have discussed examples of high-profile and high-emitting companies failing to reduce emissions despite their commitment to offsetting. For example, Amazon is spending $US10 million to restore 1.6 million hectares of forest in the United States, and Shell is planting five million trees in the Netherlands, among other climate commitments, despite the continuation of emissions levels throughout their supply chains, and, at least in the case of Shell, there is negligible hope of eliminating net positive emissions. As such, it is necessary to acknowledge that scope 1, 2 and 3 emissions reductions, at all levels of the supply and production lines, should be prioritised, in addition to the halting of deforestation and destruction of vital carbon-storing ecosystems.

Protecting forests and restoring natural ecosystems is vital both for biodiversity and the climate, but it should not supersede cutting emissions directly. It is widely recommended that carbon offset consumers should accompany purchase of CERs with support for a transition of host countries to broader and more effective climate policies. In the short–term, where offsetting is used, it should only be on the basis that purchase of CERs does not undermine the ability of host countries or individual companies to achieve their mitigation pledges.

In addition, it has long been suggested that carbon offsets run the real risk of becoming little more than a marketing tool, designed for public promotion and mitigation of corporate responsibility to contribute to climate crisis mitigation. Many environmentalists equate carbon offsetting to the medieval, Catholic system of indulgences: pay for the guilt to be washed away without having to change your habits. If and when this occurs, a process which has widely come to be known as “greenwashing”, it has significant negative environmental consequences, as truly environmentally engaged marketers may be less willing to use carbon offsets if they are simply the result of marketing hype (Polonsky et al, 2010). This will mean that consumers are less able to make effective purchasing decisions, since relevant information is unavailable and knowledge of carbon offset project effectiveness is often confused, causing a net detraction from public trust of carbon offsetting and the concept of carbon neutrality.

Corporations have been accused of greenwashing after investing in non-verified credits, and, in some cases, 'double counting' carbon credits, i.e. self-allocating more permission to emit than is actually owed by the carbon credits received, is a recurring concern. It is highly recommended that strong incentives should be provided to consumers to ensure the integrity of international unit transfers. This includes robust accounting provisions to avoid double counting of emission reductions, but could also extend to other elements, such as implementation of ambitious mitigation pledges as a prerequisite to participating in international mechanisms. Also entailed in greenwashing, particularly related to carbon offsetting, is the simple yet powerful narrative of 'plant a tree to save the planet', which, through its universal appeal, has seen consistent reiteration through public campaigns and the media, and has essentially represented the tagline of carbon offsetting for most of its short history. As such, carbon offsetting has most likely, in multiple cases, been used to excuse business-as-usual fossil fuel consumption and GHG emission, whereas, in reality, tree planting is not intrinsically a 'silver bullet'. In fact, a variety of approaches are needed within the geographic contexts to which they are suited, and with every project the utmost scientific and ecological consideration must be taken into account. The concept of tree planting does not, on its own, equate to establishing a healthy forest with a complex functional web of interactions among multiple species, which is required for the benefits of tree planting to be realised.

With ever more businesses turning to carbon offsetting and with the promise of growth of the carbon market in the near future, the requirement for focus on ensuring offset projects create tangible positive effects is more urgent than ever. For example, companies within high-pollution industries, such as BP or much of the aviation industry, use offsetting to continue business as usual. Airports like Heathrow and airlines such as Easyjet offer a carbon offsetting service, allowing passengers to pay to plant up to 12 trees per month. BP runs a 'Target Neutral' programme which incorporates a range of offsetting projects, including protecting forests in Brazil. In these cases, their commitment to offset projects is used, at least in part, for narrative and corporate responsibility purposes; it allows companies to avoid taking meaningful internal decisions and commitments on their own emissions, and to abstain from financial contribution to other meaningful initiatives. As such, in conjunction with fossil fuel companies converting to renewable energy companies, offset schemes can, and have, served to make fossil fuels more palatable to increasingly eco-conscious consumers, which would be tolerable, or even virtuous, if projects were verifiable and consistent in evidenced positive impacts. That is not to say that all commitments are invalid, and they are certainly better than abstinence from internal goals, emissions reductions and offsetting initiatives, but the highest-emitting companies should no doubt be held to the strictest standards, and scrutinising them for clear evidence of the benefits of the offset projects should be customary.

It gets worse; a landmark report as far back as 2013 found that many forest-based offset projects went beyond being insufficient in efficiency, regularity and permanence (Song, 2013), and even beyond their accusations of greenwashing, climate colonialism or excusing emissions. Discussed is the failure of Norway's $US3 billion commitment to REDD; results were "delayed and uncertain," the science of measuring carbon was only "partially in place" and there was "considerable" risk of "leakage" – in this case protecting one patch of land led to deforestation somewhere else. Perhaps the most damning case is that of the Reducing Emissions from Deforestation and forest Degradation (REDD) project launched in 2008 to help Cambodian monks protect the forest where they lived. Enlisting a satellite imagery analysis firm to see how much of the forest remained following this project which started selling credits in 2013, it was found that, four years later, only half of the project areas were forested (46 percent) compared with the previous 88 percent cover, meaning half of the forest had been cut down. While the project received significant financial support, the forest was itself being overrun by border disputes between the Thai and Cambodian militaries, by an influx of refugees and, disturbingly, by logging sanctioned by the same government that professed support for the project. The project was designed to protect 13 forested sites covering a total of 246 square miles, sold 48,000 credits which remain on the market, and in turn the forest was destroyed and is unlikely to be regrown due to permanent land use changes. In essence, perhaps approaching the same extent as renewable energy offset projects, many creators of past forest-based offset credits have been guilty of misusing the mechanisms provided by the voluntary market to serve their own economic benefit, simultaneously overpromising and under delivering the potential carbon stored in the reforested land mass, while undervaluing the numerous global and local benefits of ensuring the greatest efficiency and validity of their projects.

The use of forest-based carbon offset projects to provide an excuse for continued damage to the environment has thus plagued the past of the carbon market. Certain projects that have received considerable funding have not only proved ineffectual in evidencing additionality, but have actually created environmental damage. The disassociation between carbon offsetting and greenwashing is critical for the survival of the carbon market, and one method to do so is the insistence from offset providers in tangent with policy development upon internal emissions reductions amongst purchasers of the offsets.

4. Conclusion: Carbon Offsetting is Necessary

In spite of all the concerns and shortcomings related to carbon offset projects discussed above, it is nevertheless vital, in mitigating the climate crisis, to ensure that they are not discontinued. The Committee on Climate Change, in its 2016 assessment (CCC, 2016), calculates that, even in the case that existing technologies to decarbonise the energy, agriculture, heating, transport and waste sectors are optimised, and if emissions reductions are prioritised with far more urgency than today, there will still be around 130 million tonnes of carbon dioxide equivalent a year in residual emissions, of which greenhouse gases other than carbon dioxide account for 36 percent, which, along with current atmospheric carbon, will have to be removed. Removal-based carbon offsetting projects, as long as they are meaningful, sustainable and involve well-researched, innovative thinking, have considerable potential to contribute to the negation of these emissions.

While countries continue to set increasingly ambitious targets, they cannot predict whether emissions reductions and new technologies will be successful; in the meantime, carbon offsets may be required to pick up the slack. And while critiques of the nature of the carbon market, and the commitment to best practice of carbon offset initiatives, are valid, it is equally valid to consider that environmental protection, in the context of globalisation and the expansion of markets, is too important to leave out of the markets. A realistic perspective sees that, absent economic incentives provided by the cap and trade system, carbon trading and the carbon market, the likelihood of carbon offset projects receiving support sufficient to dent current and future atmospheric carbon levels is highly unlikely.

With the urgency of the climate crisis, offset allowances under a mandatory cap, and, ideally, the retirement of offset credits, create an effective system to ensure widespread corporate and governmental engagement while, providing offset projects optimise efficiency and reliability, compensating for excess and residual GHG emissions on a global scale. The retirement of offset credits is critical to avoid double counting and non-additional credits being resold on the carbon market. Offset accreditation providers such as Carbon Neutral and Woodland Carbon Code now require proof of retirement of credits, or at least a sufficient number of credits, and the certifier must receive full assurance that retired credits cannot in any way be deemed to have been double counted. In this sense, the present and future of offsetting looks to have tackled one of the most significant challenges which has thus far damaged the carbon market's validity.

The voluntary market, in particular, is positioned to overcome the challenges faced by the carbon market through the careful development of an effective and comprehensive system of checks and regulations. In response to the problem of heterogeneity, there are already efforts under way to develop transparent trading venues for offsets and to establish contracts for representative offset standards, though 2022/2023 is likely to see these increase exponentially (TSVCM, 2021).

It must also be acknowledged that, despite its numerous problems, offsetting and carbon finance has already forged considerable change in terms of forest creation and protection. Natural Capital Partners, for example, suggest that their own affiliated projects, globally, have protected more than 3.3 million hectares and benefitted 858,603 'local people', with 12 million hectares protected by forest carbon projects (NaturalCapitalPartners.com). Given that many of the forests planted thus far have lacked biodiversity and sustainability, and projects have often ignored ethical concerns, the extent to which these statistics represent offsetting as a successful business thus far is limited, however, yet clear promise for growth, if set along the correct course, is evident. It must also be recognised that carbon offsets have also yet to reach close to their potential in terms of governmental, corporate or public engagement and funding. For example, while flights currently account for around 2.5 percent of global carbon dioxide production, only small fractions of international travellers choose to purchase tickets compensated by the airline's affiliation with a carbon offset project; only 1 percent of Australians, for example, opt to offset their flights. While Delta Airlines has promised investment over 10 years (2020–2030) in carbon removal through forestry, wetland restoration, grassland conservation, marine and soil carbon capture, and other negative emissions technologies, and, under CORSIA, airports such as Heathrow have committed to UK-based offsetting and has aimed to offset emissions from all flights as well as the airport itself, the percentage of airlines offering offset tickets, as well as the percentage of customers who will commit to offsetting their carbon footprint, is unimpressive, largely due to a prevailing public narrative of the flaws of the carbon offset market.

Certain criteria should be clearly established from the start of offset projects to tackle the problems outlined above. First, the suitability of the landscape for forest growth should be assessed before planning begins, taking into account, among other factors, past land use changes, climate, projected climate change impacts, soil, topography and hydrology. During the planning and project creation phase, project quality should be made ready available to consumers, including information on certification, additionality, transparency in project targets and promises, projected co-benefits (including ecosystem services and social and economic benefits) and all relevant information on sourcing, funding, permanence and monitoring. The equations by which the number of tonnes of carbon offsets need to be purchased should be clearly explained, and contextualised within knowledge of competing calculators. This, as displayed in ‘Part One: Balance in Practice and Planting Obligations’, was a clear priority in the formulation of the Balance carbon calculator. Project baseline setting should be strictly regulated and single ownership should be guaranteed by offset providers. Sustainable forest development, forest composition, biodiversity and resilience, in light of climate change, should all be translated clearly to the public, as well as monoculture forests, should be avoided at all costs. Forests planted exclusively for timber production are not recommendable for purely environmental reasons, yet the provision of wood as a sustainable building material is necessary to wider sustainability goals, and so should not be avoided entirely in carbon offset reforestation. [1]

Recommendations on emissions reductions, ideally, should be provided to align the offset project with the most globally recognised mitigation strategies and more efficiently ‘offset’ the consumer’s emissions. Projects should also be planned and realised through communication with local stakeholders and populations, and transparent strategies for local development and education should be enacted as a core service of the project. While the years since the Paris Climate Agreement have seen greater regulation of offset projects in an attempt to steer away from the “cowboy” atmosphere, particularly in the voluntary market, much more can be done on an individual project basis to ensure that both the determined carbon sequestration as well as the various potential co-benefits can be achieved while project transparency is ensured. It is possible to incorporate these considerations, and when this is achieved the resultant projects have proved among the most successful.

If done correctly, forest carbon offset initiatives can aid in resolving a number of global sustainable developments in various ways beyond carbon sequestration. For example, forest carbon projects can represent “meaningful mitigation actions” in most developing countries, can promote the implementation of sustainable management of all types of forests, halt

[1] This, however, is outside the scope of what Balance affiliated planting projects are able to support.

deforestation, restore degraded forests, and substantially increase afforestation and biodiversity recreation and protection globally, all of which are central to many national SDGs. Also, as poverty reduction is inextricably linked to matters of land ownership in many places, and as carbon is increasingly treated as a form of property, forest carbon initiatives have the potential to be at the forefront of ensuring equal access to economic resources associated with carbon ownership and alleviating socioeconomic pressures in certain locations. Initiatives can also work to give communities equal access to economic resources by considering inclusion based on gender, racial and socioeconomic factors within their design, and ensuring land and carbon rights for local people. With these issues necessitating swift solutions, all that remains, then, is for carbon offsetting initiatives to evolve to take the right steps to a more sustainable and prosperous Balanced future.