# Forest Carbon Projects: Q&As

**July 2020**

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# 1. Permian Global

## A. What is Permian Global?

Permian Global is a mission-led business that is working for the protection and recovery of tropical forests.

Recognising the vital importance of forests as a means of tackling climate change, Permian Global is driving large-scale forest recovery and protection through the sale of verified emission reductions (VERs).

Working with governments and local communities on the management of tropical forests, Permian Global and its partners are not only making a significant contribution to efforts to address climate change, but also enabling the restoration of biodiversity, supporting local economic growth, while also contributing to the fulfilment of the United Nations' Sustainable Development Goals (SDGs).

- **We do this to** address the climate crisis by ensuring that the carbon stored within at-risk tropical forests remains where it is, and that trees, plants and soil can continue performing their job of drawing $CO_2$ from the atmosphere and transforming it to biomass. By doing this, we can also help protect biodiversity and provide local economic development based on social and ecological integrity.
- **We do this by** working to ensure tropical forests remain standing and healthy. This requires working closely with local people, local communities, and local governments to incentivise positive sustainable behaviour and provide sustainable livelihoods that not only protect the forests but provide an economically viable and attractive alternative to deforestation.
- **To achieve this we** have designed a model based on the internationally recognised UN REDD+ programme, that enables corporations, governments and other organisations around the world to finance our forest projects through the generation and selling of verified emissions reductions (VERs) or forest carbon credits.
- **We believe that** only by unlocking private capital can we achieve greenhouse gas (GHG) emissions reduction at the scale that is needed to limit global temperature rises to below 2 degrees. And the best way to do this is to utilise a proven market mechanism that allows these organisations to achieve their own environmental and social commitments by supporting our forest protection projects.

## B. Where does Permian Global work?

Permian Global is involved in forest protection and regeneration activities across the tropics, including Indonesia, Malaysia, Brazil, Colombia, Peru. It has teams based in each of these locations, as well as staff in the UK, the US and Luxembourg. Activities range from ongoing project management to pipeline development and advocacy engagement.

## C. How does Permian Global approach forest management?

Permian Global's forest management is built on five key principles, all of which seek to maximise stored carbon and achieve the best possible healthy forest state:

- **Avoiding deforestation**. Deforestation (the loss of 90 per cent or more of original forest cover) is a major threat in many of the forested regions of the tropics. There are many drivers of deforestation, including forest clearance for agricultural purposes, and conversion for palm oil and biofuels production. Each project management plan will address specific local causes.
- **Avoiding forest degradation**. Forest degradation occurs when some tree extraction occurs in a forest, for example through selective commercial logging, informal or illegal logging, and fires. These impacts often have additional negative consequences, such as loss of tree canopy, collateral damage to trees in areas where extraction takes place, and establishment of roads. As with deforestation, the project management plan will address local degradation drivers.
- **Enabling forest regeneration**. Degradation can be reversed, by preventing loss of individual trees and the collateral damage from extraction, measures to stop fires, and other actions. When degradation is halted, forest regeneration will occur naturally, with the rate, scale and volume of re-growth varying as a function of forest type and density, rainfall, and other biological, ecological and geographical factors. Permian's project management plans will seek to optimise conditions for maximum forest regeneration.
- **Assisting forest ecosystem recovery**. Physical interventions must be carried out on some project sites in order to assist forest ecosystem recovery. These include physical repairs, for example where the hydrology of a forest ecosystem has been damaged by logging, as is often the case in degraded lowland peat forests. Other assisted recovery approaches include strategic planting of native trees, which play key ecological roles, and measures to stimulate seed dispersal, such as the protection or re-introduction of key mammal and bird species.
- **Forest protection**. Overall protection of forest assets are a key priority. This has micro and macro aspects. At the project level, protection mean preventive measures to secure ongoing forest health. At a broader regional level, protection involves engaging with policy processes and actors. Many forest sites are components of larger (often trans-boundary) forest ecosystems, and as a result can be impacted by national or state land-use decisions, for example plans to create or expand new settlements.

# 2. Forests and trees

### A. What is a forest?

Permian Global uses forests in the universally understood sense: large complex ecosystems that (when healthy) are covered with trees of different species that have grown without human intervention.

A healthy natural forest is a dynamic, complex self-regulating ecosystem, composed of a community of species – including animals, trees, plants and micro-organisms – and abiotic components, such as minerals, energy, wind, water and ultraviolet light.

Each species in a forest ecosystem plays a functional role in supporting it: different species of bird consume and spread the seeds of different species of tree; insects pollinate flowering plants; large trees close the canopy, shade out the forest floor and prevent highly competitive grass species invading; top predators keep a check on population numbers of herbivores, which allows tree saplings to become established. Biodiversity is therefore crucial to continuing the provision of 'ecosystem services' such as rainfall generation, soil conservation, and carbon sequestration.

## B. Are natural forests different from plantations?

Natural forests are denser than plantations, have a greater variety of species and are more resilient. Carbon is stored for longer in natural forests as dying biomass transfers its carbon to new biomass and, if left undisturbed, do not experience periodic harvesting.

Plantations are areas of planted trees, usually a single (monoculture) species, such as eucalyptus or acacia, without closed canopies, and usually less than 100 trees per hectare. Plantations hold little more carbon, on average, than the land cleared to plant them. Clearance releases carbon followed by rapid uptake by fast-growing trees such as Eucalyptus and Acacia (at up to 5 tonnes of carbon per hectare per year). But after such trees are harvested and the land is cleared for replanting — typically once a decade — the carbon is released again by the decomposition of plantation waste and products (mostly paper and woodchip boards).

## C. How many trees are in a hectare of natural forest?

The number of trees per hectare varies widely according to soil types, drainage and other conditions. In some of the areas of Brazil there are about 130-400 known trees with a diameter greater than 20cm per hectare. There is a significantly larger number of trees in a tropical forest that are not properly identified as there could be more than 300 different species in a single hectare.

## D. How do forests store carbon?

Carbon is found throughout the living and non-living parts of the world. Elemental carbon can take many forms, including as carbon dioxide ($CO_2$). Organic matter plays a central role in the carbon cycle; importantly as a means sequestering $CO_2$ from the atmosphere and storing it in living tissue – carbon constitutes approximately 50 per cent of all living tissue.

Trees sequester $C0_2$ from the atmosphere through photosynthesis and store the carbon in biomass (leaves, timber, bark and roots). Approximately half the dry weight of a tree's biomass is carbon. One tonne of carbon is equal to 3.67 tonnes of 'carbon dioxide equivalent' ($CO_2e$).

A natural forest contains trees of different shapes and sizes, species, maturity, alongside multiple further variables. Therefore, carbon storage is calculated per hectare of forest. Forests are also subject to wide variability, including density, biodiversity, rainfall, sunlight etc.

Tropical forests are highly biodiverse and complex ecosystems. Located on or close to the equator means the average temperature remains constant. Compare to more temperate forests, tropical forests experience more hours of sunlight and higher rainfall. All of which enable better conditions for rapid growth.

In the Amazon, the above-ground biomass of trees alone can range from 180 to over 480 tonnes/ha depending on its successional stage[1]. Average dry weights range from 300 to 385 tonnes/ha[2]. Assuming that 50 per cent of this dry biomass is carbon, the average carbon content per hectare would be from 150 to 192 tonnes C/ha, when converted in $CO_2e$ equals to 550.5 to 702.7 tonnes

[1] https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0001-37652016000100055

[2] http://philip.inpa.gov.br/publ_livres/mss%20and%20in%20press/Nogueira_etal_2008_EstimatesOfForestBiomassInTheAmazon_PORTUGUES.pdf

$CO_2e$/ha. In primary forests, mean total carbon stocks were estimated as 383.7 ± 55.5 tonnes C/ ha. Of this amount, soil organic carbon to 4 m depth represented 59 per cent, total aboveground biomass 29 per cent, total belowground biomass 10 per cent, and necromass 2 per cent[3].

### E. How much carbon is there in a tree and how much do they store during a lifetime?

Wood is roughly 50 per cent carbon by weight. For illustration, a large tree in the tropics, with a height of [70 metres] and a base diameter of [3 metres] would weigh [6 metric tonnes], so the total stored carbon would be 3 tonnes.

Carbon is sequestered and stored throughout a tree's lifetime. However, the rate of carbon sequestration depends on a number of factors, including the growth characteristics of the species, the environmental conditions and the density of the tree's wood. Carbon sequestration is greatest during the younger stages of tree growth, between 20 to 50 years.

There are about 16,000 species of tree and palm in the Amazon alone, with 227 being dominant[4]. These show large differences in parameters, like size and wood density (for example 0.4 to 1.21g/cm$^3$). Therefore, it is difficult to about a 'typical tree' in a forest. Nevertheless, most studies show trees with a diameter of 70cm and above store most carbon.

### F. How do you calculate the volume of carbon in a forest for a forest protection project?

Carbon stocks across a forest site as well as on a hectare per hectare basis are measured via a combination of on the ground carbon plots[5] and spatial assessments using anything from satellite imagery, LiDAR surveys or drone data[6].

Generally speaking, the area of interest is initially stratified into similar types of forest caterogies and their respective carbon stocks after which carbon plots are set up throughout all identified forest strata to determine the average carbon stocks in each. The carbon plots measure tree Diameter at Breast Height (DBH) and usually also gather data on tree height and species, all of which are combined in well established allometric equations to calculate biomass and carbon stocks across the plots. The spatial data is then used to upscale the ground level data.

Other methodologies are necessary to calculate carbon stock in the soil, as in peat swamp forests. These rely on measuring the depth of the peat and using samples to measure carbon content.

### G. If a large tree is lost, how much $CO_2$ is released?

How much $CO_2$ a tree returns to the atmosphere once it has been felled depends on a long list of variables. How the tree was removed, how the timber is used/disposed of, whether it was cut down at the trunk or entirely uprooted.

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[3] https://www.sciencedirect.com/science/article/abs/pii/S0378112707002411#:~:text=In%20primary%20forests%2C%20mean%20total,%25%2C%20and%20necromass%202%25.

[4] https://science.sciencemag.org/content/342/6156/1243092

[5] The most traditional way of calculating carbon storage capacity per hectare is to carry out a standard forest inventory, where every tree is identified and measured in plots of known areas. Correction factors are used to add the estimates for the biomass of smaller trees and other plants, as well as for the biomass of the tree canopy, which may represent 30 to 40 per cent of the total biomass of an individual tree. This allows for an estimate of the above-ground biomass.

[6] Lidar mounted on aircrafts allows for the forest to be scanned in 3D

If a large tropical tree weighing six tonnes is burned, for example, this would release 11 tonnes of $CO_2$ into the atmosphere. This is roughly equal to the annual emissions of one UK resident.

If a tree is used for timber, the $CO_2$ release depends on the processes and manufacturing involved, the use to which the timber is put and the period of time the timber remains in use.

If the tree dies naturally, the chemical processes at work in all forms of biomass are complex and rarely allow for a simple description. Through photosynthesis $CO_2$ is captured by a plant and converted into different chemical compounds. For trees, some is used by the leaves, some for growing the various layers of trunk, and some for extending the root system.

A leaf will use carbohydrate sugars during the day and release some $CO_2$ at night. When a leaf falls to the forest floor, it may be eaten or absorbed into other lifeforms, at which point some of the carbon is transferred.

Like any other dead organism, once a tree has died it will be broken down through multiple processes. Much of a tree is formed of lignin, a structurally dense carbon-rich material that is difficult to breakdown. And even when it is broken down, much of it will be decomposed into humus, which can go on to form soil. Overall, this means the gradual release of $CO_2$ can take an extremely long time.

### H. What are the 'ecosystem services' provided by natural forests?

Ecosystem services are the direct and indirect contributions ecosystems provide to human wellbeing. This includes ecological functions such as carbon storage, nutrient cycling, producing and protecting soil, water and air purification, maintenance of wildlife habitats. It also includes forest products, such as timber and fuel, as well as 'non-timber products' like fruits and nuts, vegetables, fish and game, medicinal plants, resins, essences and a range of barks and fibres such as bamboo, rattans, and a host of other palms and grasses.

## 3. Climate crisis and forests

The climate crisis is being caused in large part by gases in the atmosphere that trap the sun's heat and warm the planet, these are GHGs. The most common GHGs are carbon dioxide ($CO_2$), methane ($CH_4$) and nitrous oxide ($N_2O$). There are natural cycles that affect the composition of gases in the atmosphere, however, the excessive volumes of today's GHGs are anthropogenic (manmade), the consequence of industrial processes like the burning of fossil fuels.

### A. Why is forest protection important for preventing dangerous climate change?

The world's forests currently lock in more than three trillion tons of carbon, the release of which would be more $CO_2$ into the atmosphere than the burning of all the identified oil, gas and coal reserves.

**Deforestation** and **forest degradation** are the second leading cause of global warming, responsible for around a third of global GHG emissions, which makes the loss and depletion of forests a major issue for climate change. In some countries, such as Brazil and Malaysia, deforestation and forest degradation together are by far the main source of national GHG emissions.

Eighty per cent of the Earth's above-ground terrestrial carbon and forty per cent of below-ground terrestrial carbon is in forests. In addition to the large contribution of deforestation and forest degradation to global emissions, combating both has been identified as one of the most cost-effective ways to lower emissions.

### B. What other benefits do forests provide?

In addition to mitigating climate change, stopping deforestation and forest degradation and supporting sustainable forest management conserves water resources and prevents flooding, reduces run-off, controls soil erosion, reduces river siltation, protects fisheries and investments in hydropower facilities, preserves biodiversity and preserves cultures and traditions.

## 4. Natural Climate Solutions, REDD+ and the private sector

### A. What are Natural Climate Solutions?

To limit global warming in 2100 to below 1.5$^{o}$C above pre-industrial levels, many scientists and policymakers recognise that the large-scale use of negative emissions in the latter half of the 21st century will be needed. Negative emissions require the removal $CO_2$ from the atmosphere, allowing a more gradual reduction of emissions in the near-term.

As the technology develops and becomes commercially viable, carbon capture and storage (CCS) is expected to contribute to negative emissions, but nature's ability to sequester and store carbon, which is both proven and readily available, must also play a vital part of the process.

Natural Climate Solutions (NCS) is the protection and recovery of natural environments to allow carbon to be stored in growing biomass. Carbon is an essential building block for all organic life. As plants grow, they drawdown $CO_2$ from the atmosphere and hold it in living material. In complex ecosystems, such as tropical forests, huge amounts of carbon are stored. Carbon is present in all of the biomass in a forest – living, decomposing and dead trees; bushes, grasses and other vegetation; below ground root systems; and as particles within the soil.

### B. What is REDD+?

Reducing Emissions from Deforestation and forest Degradation, plus the sustainable management of forests, and the conservation and enhancement of forest carbon stocks (REDD+), is an essential part of the global efforts to mitigate climate change. It is an internationally supported initiative that aims to protect forests in developing countries to mitigate climate change, safeguard biodiversity and support sustainable local economic development. REDD+ was explicitly included as Article 5 of the Paris Climate Agreement 2015.

### C. What are forest carbon projects?

Forest carbon projects, sometimes referred to as REDD+ projects, are conservation initiatives in areas where existing forests are at risk of land-use change or reduced carbon storage. The projects focus on conserving forests before they are degraded or deforested, resulting in the avoidance of a business-as usual scenario that would have produced higher emissions. Emissions reductions are currently generated primarily through avoided emissions but the potential for negative emissions has been largely overlooked.

To be a valid and credible forest carbon project that meets the rules and requirements set out in third-party standards, a forest carbon project must be able to demonstrate a set of core principles, including:

- **Additionality**: that without the project activity, significant volumes of carbon dioxide will have been released.
- **Permanence**: that the avoided release of carbon dioxide is permanent i.e. the carbon offset is permanent.
- **Avoided leakage**: that the activities of the project did not resulted in merely displacing the release of carbon dioxide outside the project boundaries.

## D. What are the criteria for developing a new project

Candidate projects focus on areas of tropical forest over a minimum certain scale (usually greater than 50,000 ha) combining significant biomass and biodiversity values and under a clear threat from degradation and/or deforestation. An assessment must be made to analyse whether it is possible to mitigate that threat in an economic manner i.e. is the project economically viable?

As methodologies to estimate carbon in above and below ground biomass in different biomes evolve, this enables us to consider other ecosystems such as peatlands and the Andean paramos, for example.

In parallel, together with the possible partners holding the rights to the land, we assess the land tenure to evaluate any related issues. Security of tenure and management rights are of the uptmost importance.

## E. What is the process for setting up a new project

First, Permian Global targets an area of natural tropical forest that is demonstrably under threat. Our regional team assesses the land rights, the legal ownership and performs extensive research into the carbon content, biodiversity as well as the needs of the people living around the forest.

Next, we work with local communities, local businesses, civil society, government agencies and other stakeholders to begin developing the project. We begin building a project team which will primarily consist of local people. The team will need to be able to fulfil all the project roles, such as monitoring and protecting the forest from fires, illegal logging, illegal poaching etc; forest regeneration activities; developing sustainable livelihoods as alternatives to destructive practices; community outreach to ensure healthcare is provided to remote communities and there is access to clean water and sanitation.

All these activities will need to be fully described and assessed by independent third-party auditors, so that the project can be verified against credible standards. Verification must cover the carbon side of the project as well as the other climate, community and biodiversity factors.

## F. What assurances are there that a forest carbon project is credible?

To be a credible forest carbon project, it must be verified against a recognised third-party standard.

A **third-party standard** is a voluntary, market-based tool that provides credibility for forest carbon projects, through the assessment of its activities against a recognised set of core rules and requirements. The rules and requirements are designed to demonstrate the robustness of a project design and its progress towards specific goals, in this case, limiting atmospheric GHG and mitigating the impact of the climate crisis.

The **Voluntary Carbon Standard** (VCS) is managed by Verra. Verra's standards provide independent assurance, transparency and credibility for projects working across areas of environmental and social impacts and which rely upon market-based mechanisms, such as trading carbon offsets.

The carbon credit verification process is conducted by certified third-party auditors with oversight by the accrediting body, namely Verra, which also manages the Climate, Community, and Biodiversity standard (CCB). The process involves two key components: the validation and verification. In the initial validation audit, the "Project Design Document" (PDD) is audited, which thereby approves the project's baseline, additionality, and business-as-usual emissions. Once a project passes its validation it is officially an active project which must then implement the mitigation strategies as well as community and biodiversity work stipulated in the PDD. The second component is the verification audit in which the performance of the mitigation activities in the project site are audited. This is the stage in which the emission reductions achieved against the validated baseline are audited, cofirming the amount of verified emission reductions (VER) available to be issued and sold.

To maintain valid accreditation, a project must provide regular update reports and submit to robust assessments by third-party auditors known as validation and verification bodies (VVB).

## G. What is forest carbon finance and how can a forest be worth more as a protected area than when converting the land for other uses such as farming or as a plantation?

There are many approaches to extracting value from protecting a natural forest (see: *What are the 'ecosystem services' provided by natural forests?* above).

However, forest carbon finance can be described as payments to improve, maintain or restore a forest's natural ability to store carbon and are designed to provide a competitive financial incentive over converting forest areas to other uses. Payments can be delivered using public finance through mechanisms such as donor support (ODA/bilateral payments), or by the private sector through mechanisms such as both voluntary and compliance carbon markets. Voluntary markets are primarily private sector led whereas compliance markets require government legislation to create regulation over emissions sources but often still heavily involve private sector participation.

Globally, projects financed by the private sector on a voluntary basis have reduced over 500 million tonnes of $CO_2e$ to date[7]. These carbon reductions were achieved independently from any legal requirement[8]. In addition to achieving significant mitigation, the voluntary carbon market (VCM) has been a source of innovation and finance, which has informed compliance systems.

For Permian Global, forest carbon finance that is generated through the sale of robust verified emissions reductions (VERs) or carbon offsets, enables the development and maintenance of forest projects – projects that provide local employment, facilitate sustainable local livelihoods and provide a range of community health and wellbeing benefits. Further benefits include protection and conservation of biodiversity and the protection of watersheds.

[7] https://www.ecosystemmarketplace.com/carbon-markets/

[8] Carbon reduction is an umbrella term used to refer to the avoidance and reduction of GHG emissions at their source, and the removal of carbon from the atmosphere through biological or technological sequestration.

## H. Why is private sector involvement needed?

The scale of the climate emergency is immense, and the scale of investment required to enable NCS to achieve the global impact that is needed means it is crucial that the private sector is a driving force. There simply is not enough public finance to do the job.

Markets for carbon offsets are a growing way to channel funding towards projects that restore, protect, and manage forests and natural landscapes and boost their ability to store carbon.

Private sector finance through voluntary action has been generating credible mitigation for more than 15 years, in response to the IPCC's *call for action* and the need to reach net zero GHG emissions by 2050. These early investments prior to the adoption of the Paris Agreement demonstrated how mitigation can be achieved effectively. In fact, corporates showing climate leadership by voluntarily achieving carbon neutrality are financing immediate carbon reductions in line with the recognized urgency of the global climate situation.

Right now, the sum of all country GHG carbon reduction targets under the Paris Agreement is not yet ambitious enough, and the timely implementation of these Nationally Determined Contributions (NDCs) is uncertain. Until adequate regulations are in place across all countries economy-wide to deliver the goals of the Paris Agreement, there is a real need for more voluntary activity to fund mitigation that would not otherwise happen and to assist countries to increase ambition in their mitigation efforts.