Carbon Negative (P) Ltd.,
Bengaluru, India.
February, 2022

WHITE PAPER

Sustainable climate action through nature based interventions:
Challenges and opportunities

Table of contents

Executive Summary:

Climate change is an urgent reality, threatening livelihoods of almost 2/3rd's of the world's population. While scientists and entrepreneurs are testing myriads of innovations to combat climate change, nature based interventions remain the solution of choice for two reasons: They work in alliance with nature and they create a host of other benefits beyond mere climate action.

But ecosystem degradation and thirst for resources are driving our forests – and the lands they stand on – to utter destruction. Unless these are restored, desertification, water scarcity and livelihood loss will force populations to move, as is already happening in places like Uttarakhand, India. Add to this the increasing severity of climate disasters, fragile ecosystems like the Himalayas will collapse completely.

Forestation on degraded lands is not just good for the climate, it restores the whole ecosystem. From habitats for bio-diversity to livelihoods for humans, forests – if managed sustainably - can be great sources of financial, social and environmental wealth.

Forests can also offset carbon intensive products and services – especially energy and materials – with carbon neutral ones. Bamboo and energy from biomass are two examples that have ready, captive markets and that don't need heavy capital expenditure to operationalise.

The challenge is to channel intentions, innovations and investments into nature based projects on degraded lands. This single intervention alone has the potential to neutralise 25% of global greenhouse gases (GHGs).

1. Introduction:

Today, Earth as an eco-system stands at a precipice of climate change caused by human activity.

This is not the first time our planet is facing climate change. It has happened several times in the past.[1] But this is the first time it is happening with such speed – the over-population of homo sapiens and their thirst for resources has put this process in overdrive. So while in the past it would have taken a thousand years for polar ice to melt, now it is happening in a hundred years.

The principal reason for this climate change event is the CO2 released in the last 200 years. As industrialisation allowed humans to harness natural resources – for food, energy and development – on a global scale, it released never before quantum of greenhouse gases (mainly CO2) into the Earth's atmosphere, heating it up.

But if we want to better understand how the Earth may respond to the rising levels of carbon dioxide (CO2) in the atmosphere that we're experiencing today, we should look to a particular event around 56 million years ago, says Professor Kristin Bergmann of the MIT Earth and Planetary Sciences Department. This is the "Paleocene-Eocene Thermal Maximum" (PETM), an era of high temperatures and acidifying oceans.

Evidence for climate change has been mounting for the last 50 years. Powerful lobbies in the fossil fuel industry, aided by apathy by governments across the world have, however, kept a lid on it for as long as they could.[2]

1 https://climate.mit.edu/ask-mit/has-there-been-climate-change
2 https://www.resilience.org/stories/2016-06-23/a-brief-history-of-climate-denial/

But no longer can the magnitude of this issue be kept under wraps. In the last decade, scientific proof and an accelerating cascade of climate disasters have forced the hand of climate sceptics into grudgingly accepting that the changes we are witnessing can no longer be classified as 'normal.'

The Rio summit[3], followed by Kyoto Protocol[4], the Paris Agreement[5] and now the COP26[6] in 2021 have set the new, although nascent, agenda where action can no longer be avoided. Humans just have less than 10 years to make a decisive turn away from the carbon intensive lifestyle they have been pursuing. If we don't do something drastic to address this problem, we will not be able to limit global temperature increase to 1.5 degree C. Beyond that limit is a minefield of uncharted climate collapse, changing the very composition of life on Earth.

Till now, our efforts to combat climate change have been meagre. Of the 43 Gigatons (billion tons) of CO2 we produced globally , only 2% is being offset by climate action.[7] While experiments in new technology, fuels and systems have taken off in the last decade, they still remain just that – experiments. Large scale deployment is just taking off and capital is forming as legislation and public opinion are coalescing around climate action. What we do in the next five years will determine the ultimate result of this race against time.

3 https://en.wikipedia.org/wiki/Earth_Summit
4 https://en.wikipedia.org/wiki/Kyoto_Protocol
5 https://en.wikipedia.org/wiki/Paris_Agreement
6 https://ukcop26.org/
7 https://blog.ucsusa.org/peter-frumhoff/global-warming-fact-co2-emissions-since-1988-764

2. Nature based solutions (NbS): Benefits beyond climate action

The global thirst for resources is not just stripping Earth of its critical, life-sustaining systems, it is also accelerating the change in the atmospheric chemistry. Large scale acidification of seas and a temperature rise above 2 degree C during this century will change the path of human civilisation. As temperate zones of the Earth are subjected to cycles of droughts and floods and the melting polar ice-caps lead to sea rises[8], poverty and starvation will drive large human migrations towards the North. Add to this the burden of feeding 10 billion people by 2100, and the next generations will be entering an age of uncertain consequences that even scientists cannot predict.

While the human costs of this flux are catastrophic, the financial costs will be crippling too. Large tracts of land that produce food for billions today will become barren, unable to sustain populations.[9] The cost of food, water and energy will rise beyond the reach of most sections of society, especially those that are already stressed. Governments, businesses and nations will have to re-caliber their revenues and expenses with changing realities.[10]

With this magnitude of a problem, any one single type of intervention will not suffice. Science and industry have been working on a multitude of interventions – from solar panels, which are now a global industry, to more cutting edge technologies that are still emerging. This is a highly capital intensive process.[11] From funding research to reaching industrial scale production, investors will have to bet on several lines of approach before cheap, effective ones materialise. The horizon for large scale deployment of these interventions are also at least a decade away.[12]

8 https://climate.nasa.gov/vital-signs/ice-sheets/
9 https://www.who.int/news-room/questions-and-answers/item/climate-change-land-degradation-and-desertification
10 https://www.epa.gov/arc-x/strategies-climate-change-adaptation
11 https://qz.com/2079657/us-climate-startups-got-most-vc-funding-since-paris-agreement/
12 https://climateactiontracker.org/

The natural systems of the Earth that regulate climate and sustain life are being irreparably damaged by human activity, which is leading to this crisis. It will be the restoration of these systems that will provide the most sustainable solution for this cluster of problems that include climate change, land and water degradation, lack of nutrition (which will be a more critical issue than dwindling food supplies), sea rises and habitat loss.

If we can use the next decade to start a virtuous cycle where regenerated forests begin to restore soil moisture and humus, capture carbon, and provide habitat and employment to stressed populations, we can put us far ahead in our fight against climate change by the time other technologies kick in.

Natural systems are also circular in nature. Large scale forestation can not only capture carbon at scale and at costs other technologies cannot yet match, they are self sustaining once set in motion. Planting a tree is the start of a chain of beneficial events. As the sapling grows, it gains in capacity to absorb carbon. It's roots burrow in the soil, making it habitable for microbes and insects that restore fertility and sequester carbon. Fertility and moisture content improves within 3 years. The falling leaves add to the humus.

It is estimated that globally, "about 25 percent of the total land area has been degraded. When land is degraded, soil carbon and nitrous oxide is released into the atmosphere, making land degradation one of the most important contributors to climate change. Scientists recently warned that 24 billion tons of fertile soil was being lost per year, largely due to unsustainable agriculture practices. If this trend continues, 95 percent of the Earth's land areas could become degraded by 2050."[13]

13 https://www.thegef.org/what-we-do/topics/land-degradation

A landscape restored with a new forest is very much like a stock in a growing company, which if judiciously utilised, can have immense recurring financial value, without having to ever sell any part of it.[14] As it gains a canopy and fruits, a new forest provides nutrition to animals and humans. It provides habitat for birds, animals and people and fuel and material for goods and services. And it continues to capture more and more carbon each year.

Lands reclaimed through planting new forests are more than just tools for climate restoration. They sustain livelihoods, provide food, water and energy, preserve biodiversity, and act as a bulwark against natural calamities like floods and droughts. As if this is not enough, they contribute hugely to individual health and well-being. Being in nature calms hyperactive and dyslexic children, regulates blood pressure and helps rejuvenate both physical and mental vigour.

And it is a virtuous cycle. Planting forests reclaims unusable land which provides the resources to reclaim more land. If the money a new forest generates – in terms of livelihoods, carbon capture and other goods and services – is pumped back into more forests, we can start an industry that is non-existent right now. Once kick-started, it will not need new money to grow – the financial benefits are built-in the natural systems of the Earth.

"The required funding for sustainable forest management is estimated to be between $70 billion and $160 billion per year globally while the formal timber sector itself contributes $600 billion to the global economy.[15] Mobilizing adequate financing for the forest sector remains a challenge. While private financing is promising, it is not yet distributed evenly across regions. In many developing countries it has yet to materialise."

14 https://www.worldbank.org/en/topic/forests/brief/forests-generate-jobs-and-incomes
15 https://www.worldbank.org/en/topic/forests/brief/forests-generate-jobs-and-incomes

There are two aspects to combating climate change: Capturing and locking away carbon – which forests are very good at doing – and reducing current emissions, which currently forests are not used for. Can we replace high-carbon emitting processes and energy systems with those grown in a forest? Can we make an efficient fuel from a forest, which reduces the use of fossil fuels? How can we capture the carbon in the atmosphere and power our cars with it? That is the perfect example of the carbon cycle that will create a sustainable carbon neutral process that does not put new CO2 into the atmosphere. This way, CO2 can become a financial commodity that forests can catch and supply, and do it again and again.

3. Retrofitting business models to nature-based climate action

We are today at the cusp of a new low carbon economy. It is nascent right now but the imperatives of climate change and resulting economic fallouts are forcing governments and policy makers to find new ways of livelihood generation while reducing atmospheric carbon. High emission "business as usual" is reaching the limits of its longevity and business leaders are starting to align their operations with a carbon neutral stance, although it is still very much aspirational.[16]

The key to the success of retrofitting financial models that work to restore natural systems will lie in how we approach this issue. As discussed before, saving old forests, afforestation and restoration of degraded forests are by themselves a critical need if we want basic resources for human survival – food, water, air and energy – to flow sustainably. There are, however, other goods and services that forests can supply and create new industries that can replace – or at least substitute - carbon emitting ones we currently use.

This substitution has to be an integral part of the decarbonation of Earth that needs to happen in the next 3 decades. Hundreds of millions of livelihoods are today attached to carbon emitting processes. From transport and manufacturing to construction, agriculture and energy, our dependence on a high-carbon lifestyle is complete. Unless we can make a gradual transition to low carbon livelihood opportunities for a significant section of the world's population, we will not be able to avoid avoid large scale human suffering and social turmoil, which will in turn weaken political will to take tough action against climate change.

For at least 2 decades, the urgency of this task has been apparent to the scientific

16 https://unfccc.int/sites/default/files/resource/Climate_Action_Support_Trends_2019.pdf

community, if not the governments of the world. From denial and obfuscation to outright blocking of measures that would negatively impact profit streams from 'business as usual', we have wasted precious time while the GHG load on the Earth's ecosystem has been increasing. At last, mainstream voices against climate science have fallen silent in acknowledgement of the mounting evidence of climate change. In the last decade, climate disasters have shown a dramatic increase and extreme weather events are becoming a norm[17], making the job of climate change deniers very hard.

Nature has already evolved the biosphere as a cheap, large scale carbon capture mechanism. The biosphere is virtually a closed system with regard to matter (including carbon) , with minimal inputs and outputs.[18] If we can plug into it, and utilise it to capture, use and store away carbon, we can kick-start a new industry that uses carbon as a commodity.

In this section, we will explore just 2 of these nature based business models that can substitute carbon intensive products with carbon neutral ones, but there are myriad opportunities for entrepreneurs to explore in this domain. As carbon use technologies advance and scale drives down costs, these fields will open up. At the moment, however, significant challenges remain.

The two most important issues facing the successful adoption of these business models are capital deployment and proofs of concept. This is where most of the entrepreneurial efforts are focused right now. Both are mutually interdependent – capital follows profits and profits are yet to be proven. However, there is now increasing appetite for risk and experimentation. In the very near future – say the next 5 to 10 years – these industries will boom.

17 https://www.nationalgeographic.org/article/influence-climate-change-extreme-environmental-events/
18 https://en.wikipedia.org/wiki/Biosphere

Producing energy from biomass:

Large scale forestation can capture a lot of carbon in the atmosphere and lock it in the soil and trees but forests also produce a lot of biomass that rots and releases GHG's in the atmosphere. According to estimates[19] the U.S. could sustainably produce—at $60 per dry ton—between 991 million dry tons per year (base-case assumptions) and 1,147 million dry tons per year (high-yield assumptions) by the year 2030.

This is while continuing to meet the demands for food, feed, and fibre. This quantity of biomass could be used to produce enough biofuels to amount to more than 25% of the country's current energy consumption.

Most of this biomass is wasted in forests, and adds to GHG emissions when it rots. If this waste can be utilised, bioenergy production from forest biomass offers a means to reduce wildfire hazard fuel levels, decrease insect and disease outbreaks, and reduce the incidence of invasive species while producing a useful source of renewable energy. Heat and mobility still are mainly based on fossil sources. For the future sustainable and environmentally compatible energy supply in these sectors, however, chemical energy carriers from renewable sources, such as biogas or SNG, are also suited, experts say.

Karlsruhe Institute of Technology (KIT) and the Research Centre of the German Technical and Scientific Association for Gas and Water (DVGW) succeeded in producing renewable methane from a biomass-based synthesis gas mixture in their pilot plant for honeycomb methanation. The quality of this synthetic natural gas (SNG) is comparable to that of fossil natural gas and can be used as fuel in co-generation and heating plants as well as in cars or trucks. [20]

19 https://www.energy.gov/sites/default/files/2016/12/f34/2016_billion_ton_report_12.2.16_0.pdf
20 https://phys.org/news/2018-10-production-renewable-gas-wood.html

Biogas facilities produce the renewable gas mainly by fermenting biological waste. In countries with a large forestry sector, such as Finland or Sweden, there is a high potential for the production of SNG from waste wood. By means of biomass gasification, a synthesis gas is produced, which mainly consists of hydrogen, carbon monoxide, and carbon dioxide. This mix can then be converted into high-quality methane by methanation. Researchers of KIT's Engler-Bunte Institute and the DVGW Research Centre have now successfully tested a highly efficient methanation process for a period of several weeks in the city of Köping, Sweden.

While the above is a good example of cutting edge technologies that are creating energy from biomass, these are still at least 5 years away from reaching the scale needed to make a real impact.

There are already cheaper to deploy solutions that can offset large fossil fuel usage by using renewable biomass. In India The Energy Research Institute (TERI) has developed a readily available biomass gasification plant that can provide biomass-based thermal and electrical energy for micro and medium sized businesses.[21] This is a proven model that saves money for the consumer as energy bills go down by as much as 35%. There are 750 of these plants already installed in India and the ecosystem is ready to be scaled. Just 3-4 kg of biomass can replace 1 litre of petroleum fuel.

There is, however, a limitation. As of now, these plants use waste wood from saw mills. Which means that there is limited supply for large scale deployment of biomass-based energy plants. Forests, however, produce large volume of biomass from leaf litter, fallen trees and shrubs.

21 https://www.teriin.org/technology/biomass-gasifier-for-thermal-and-power-applications

There is a compelling case for the removal of this forest waste too. If allowed to remain within the forests, this material rots and itself becomes the source of GHG's. If it is collected and processed onsite into biomass briquettes, it can start a whole industry based on sustainable fuel supply from forests. This is the perfect example of a circular economy where trees capture and supply carbon and we use it for our energy needs.

Even without gasification or methanation, biomass briquettes have a market of their own. As per the US Energy Information Administration (EIA), the total production of densified biomass fuel reached 11.84 million tons per year in 2019.[22] The growth is mainly driven by the increasing demand for clean energy. The massive need for cheap, locally available energy sources and the pressure to mitigate climate change are expected to fuel the market, especially in developing economies like India who need the energy to develop but cannot rely on expensive fossil fuels that are causing climate change.

Substituting bamboo for steel:

Steel production releases 7% of all GHG emissions globally.[23] A significant portion of this steel is used for RCC construction. There are ways in which the industry is trying to minimise the environmental impact – by pre-processing raw materials, for example, or by capturing waste gases, or by substituting coke as a raw material – but these are often more expensive than traditional methods, and require complicated changes to industrial infrastructure.

What about something as simple as natural bamboo, though? Could this abundant plant be a more sustainable alternative to steel? Till now, humans have used wood and bamboo extensively for making their habitats. Today's needs however have evolved and modern home construction uses concrete for both durability and strength.

22 https://www.fortunebusinessinsights.com/biomass-briquette-market-102750
23 https://www.weforum.org/agenda/2021/05/green-steel-forging-a-path-to-net-zero/

Scientists have developed a new type of "super wood" that is more than 10 times stronger and tougher than normal wood - and this innovation could potentially become a natural and inexpensive substitute for steel and other materials. [24] It could even take a turn in new armour plating – the researchers fired bullet-like projectiles at their new super wood and found they got lodged in the material rather than blasting their way through, as they did with standard-strength wood.

Key to the new wood's superpowers is a special chemical treatment followed by a heated compression process. The resulting chemical bonds make the wood strong enough to one day be used in buildings and vehicles. "It is as strong as steel, but six times lighter. It takes 10 times more energy to fracture than natural wood. It can even be bent and moulded at the beginning of the process." says senior researcher Liangbing Hu, from the University of Maryland. "This could be a competitor to steel or even titanium alloys, it is so strong and durable. It's also comparable to carbon fibre, but much less expensive."

Where bamboo really steals a march on steel, though, is in its abundance and sustainability. The plant is found across most of the planet's tropical and temperate regions, and certain species are among the fastest-growing plants in existence – growing almost a metre in a single day.[25] What's more, Liangbing says that "all large bamboo species" are suitable for his microwave enhancement process, from temperate woody bamboos such as phyllostachys edulis (also known as the moso bamboo), to tropical woody bamboos such as dendrocalamus giganteus (commonly known as giant bamboo).

India is uniquely placed to use the two key qualities of bamboo – fast carbon capture and economic utility – to fight climate change and provide livelihoods. Even without the treatment mentioned above, bamboo has a ready market.

24 https://www.nature.com/articles/nature25476
25 https://www.msamlin.com/en/chart-hub/english/bamboo-as-a-steel-replacement.html

At the moment, India imports US$ 100 million worth of bamboo every year.[26] That is INR 7000 crores of GDP lost, even if we don't consider the export potential India is missing. Reducing rural migration to cities for employment can only happen if people find employment locally. Bamboo mixed with natural forest can become the font of new sunrise industry in a matter of 5 years.

Bamboo also offers great hope in our fight against climate change. It's fast growing characteristics make it an ideal tool to capture atmospheric carbon.[27] In addition, once planted, it can be harvested for at least 50 years, which is when it flowers and dies. So for as long as 50 years, it does not need any carbon inputs through energy and material usage, like traditional agriculture does. This allows bamboo to capture large carbon volumes while expending very little of it (only through the energy used in irrigation).

For bamboo to thrive, it must be thinned periodically and fully grown culms should be removed. It also sheds a lot of leaf litter biomass. So a mixed forest with 50% bamboo is a highly feasible business idea with ready markets – both for bamboo itself as well as biomass briquettes made from leaf litter and pruning. Other produce from this forest – fruits, fodder and firewood – provide other livelihood services to communities living in the catchment.

26 https://connect2india.com/global/Bamboo-import-to-india/1
27 https://www.scidev.net/global/news/bamboo-can-capture-carbon-fast-says-report/

4. Key challenges: Intentions, Innovations, Investments

While the opportunities to utilise nature based solutions to combat climate change and create new business models are apparent to anyone looking for them, the commercialisation of these ideas has yet to happen at scale. As demonstrated in the above examples, scientists are discovering new applications that can complement forest restoration projects to start providing livelihoods – they need to be proven to take to market. The risk / reward calculation for the feasibility of these projects is quite favourable. So what is missing?

Good intentions don't solve problems, but clear, workable ideas do. If we define the problem clearly, the answers cannot be far behind. For any climate action project to succeed, two criteria must be met:

Fast carbon capture, without leaking any GHG's:

Solar power is now an established industry. But how many of us know that it is only in 2011 - 35 years after its inception in 1975 - that the industry was able to pay off its carbon debt, reaching carbon neutrality. Which means that the carbon emitted during the manufacture of equipment and its maintenance during those 3.5 decades was fully offset only in 2011. In spite of its long impact gestation, the business succeeded. Why?

The reason for the success of solar is simple: We commoditised it. Consumers were offered a product with clear benefits. People don't install solar because they are worried about climate change. They do it because it is financially beneficial for them.

Unfortunately, at the moment, we do not have so much time for technologies to make an impact. There are clear red lines now being drawn: Real action by 2030 and carbon neutrality by 2050. We therefore need instant deployment of solutions with exponential increase during the next few decades, with a healthy cost/benefit ratio.

Nature-based solutions offer the only feasible way out of this problem. Forests not just capture carbon, they continue to increase their capture capacity for 50 years, if managed sustainably. And they only need to be planted once and cared for 5 years.

Financial feasibility of the solutions we use:

Climate action will work only if it makes money, or at least pays for itself. Funding to kick-start projects can be generated if it is in the form of capital, but it is difficult to sustain projects on donations, either public or private. The solutions we deploy must create livelihoods at scale for people who work at them if the projects are to achieve scale.

Fortunately, forests can be wealth creators themselves. From food and clean water to financial stability for the communities that live around them, forests are the perfect examples of social wealth. Wherever forests exist and are managed sustainably by the community, we find social cohesion and economic prosperity.[28] The only precondition is the presence of a "Community of Practice" that links local people to external forest professionals for mutual learning, based on respect and trust, which makes a positive difference in terms of livelihoods and forest conditions.

Inclusion Vs Exclusion:

Restoration of degraded lands must not be seen in isolation, divorced from the people and communities living next to it. When a land degrades, it is put to use by marginal

28 https://www.sciencedirect.com/science/article/abs/pii/S0305750X17300761

communities where they harvest the few trees and shrubs for firewood and grazing.

Creating a protected, new forest excludes these communities and deprives them of a survival resource, which often causes social friction, especially in economically stressed places like India. New forests must therefore become a source of livelihood for these communities, rather than the reason for loss of resources. If we keep these three intentions in mind while designing nature based projects, we can create a domino effect across 3 sectors: Climate action, sustainable resources and livelihoods.

The second aspect that needs to be addressed concerns the kind of innovations needed to combat climate change. These too need to be tested on a few parameters:

How easy is it to take to market?

If carbon captured by forests is to be used to create products and services to create a circular economy, we have to start with the basics. Who needs these products and services? How critical is their need? Are there several complicated steps to bringing it to market or is there an existing demand for them? The success of the innovations we deploy will largely depend on their simplicity.

How capital intensive is it?

If the capital costs are a million dollars, those are a million reasons for entrepreneurs to not adopt an innovation. Cheap, simple technologies that can be installed at source will always work better than expensive innovations that need an engineering degree to operate and rely on a centralised model with high transportation costs – both financial as well as in terms of carbon we expend.

How scalable is it?

If our climate mitigation innovations are simple, cheap and have a ready market, they

will scale with the growth of the forests. Otherwise they will struggle to grow.

A 1,000 acre forest may support livelihoods for 100 families. A 10,000 acre forest will support ten times that. Similarly, a mature forest will produce more wealth than a young one. The availability of forests is the only limitation to scale for nature based solutions that meet the above two innovation criteria.

Investments are the final impediment to climate mitigation projects but that scenario is changing fast as private capital is forming in response to regulatory and social pressures.[29] As political imperatives of large scale livelihood generation through the clean economy gather more steam, public capital too will follow. But the projects that fulfil the triple bottomline of financial, social and environmental responsibility will be the first to attract investments.

29 https://www.undp.org/content/dam/undp/library/planet/climate-change/53154%20-%20Invest4Climate%20Document%202%20-%20web.pdf

5. Way forward:

As discussed in this paper, forestation projects on degraded lands offers a significant financial, social and environmental opportunity that can play a major part in our fight against the oncoming challenges of climate change. However, for them to be successful, their design and management needs to adhere to certain parameters.

Scale:

Projects less than a minimum threshold of acreage will not be sustainable over a period of time. This base minimum will vary from region to region and will depend on factors such as opportunities for livelihood generation that can offset maintenance costs, but any land parcel less than 100 acres will be difficult to sustain in perpetuity. Forests that are neglected tend to become degraded over time, especially in developing economies, where the pressure on land is significant.

Planting mix:

Large scale bamboo forests mixed with indigenous trees that provide sustenance to local wildlife are not just great for carbon capture and offsets, they are also micro enterprise generators. India, with its tropical and temperate climate is uniquely placed to reap this bounty. These resources, once established, can provide both climate change mitigation as well as act as bulwarks against extreme weather events as they continue to pay for their upkeep.

Sustainable harvesting:

Using forest produce to offset carbon intensive products and services like energy and materials amplifies the climate action impact of forests and it pays for their maintenance. More than that, if forests become livelihood generators for communities that live close to them, we can avoid the inevitable conflict between natural regeneration and human

thirst for resources. Trees and people can then become partners instead of adversaries which can remove a major threat to the survival of these ecosystems.

Commercial viability:

As demonstrated in this paper, there are several ways in which we can substitute carbon intensive systems with carbon neutral ones by using forests. A little foresight and ingenuity can open new opportunities that will allow the forests to pay for themselves. While designing these projects, we need to be cognisant of this reality.

- Ends -

About Carbon Negative:

Carbon Negative innovates nature-based models that capture, sequester and substitute large carbon volumes while creating a chain of sustainable development opportunities.

Our work encompasses:

- Learning: Research and domain expertise. Includes discovery and repository of new knowledge as well as training and dissemination.
- Modelling: A multi disciplinary approach that combines diverse domains to create new circular, carbon neutral business models for specific sectors.
- Proofing: Operations and execution which includes profit centres and data collection.
- Advocacy: Outreach arm that includes networking with industry, government, media and social sectors.