TIGHTENING THE NET

Net zero climate targets – implications for land and food equity

OXFAM

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Many governments and companies are adopting net zero climate targets as they recognize the urgency of the climate crisis. Without clear definition, however, these targets risk being reliant on using vast swathes of land in low-income countries to capture carbon emissions, allowing the biggest emitters to avoid making significant cuts in their own emissions. 'Net zero' could end up being a dangerous distraction that could delay the rapid reductions in emissions that high-emitting countries and companies need to make if we are to avoid catastrophic climate breakdown. It could also lead to an explosion in demand for land which, if not subject to careful safeguards, might risk increasing hunger and fuelling land inequality. Net zero should be a pathway to real and transformative climate action and not greenwash. Carbon emissions need to be reduced now, and land-based climate solutions must centre 'food-first' approaches that help achieve both zero emissions and zero hunger.

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Cover photo: Soubo village, Ouahigouya commune, Burkina Faso. Aguiratou Ouedraogo is a farmer. She is 39 years old and a mother of seven children. She fetches water from a well to water her market garden crops, with the help of a female farmer with whom she shares the agricultural plot. © Matias Tellez/Oxfam.

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GLOSSARY

Avoided emissions are emission reductions that occur outside of a product's life cycle or value chain, but as a result of the use of that product. Products that may have significant avoided emissions include low-temperature detergents and teleconferencing services. Avoided emissions also result from projects that reduce deforestation and forest degradation.

Agroecology is the science of applying ecological concepts and principles to the design and management of sustainable agriculture. By building synergies, agroecology can support food production and food security and nutrition while restoring the ecosystem services and biodiversity that are essential for sustainable agriculture. Agroecology can play an important role in building community resilience and adapting to climate change.

A buffer pool is an approach for addressing non-permanence that requires projects to maintain adequate buffer reserves of non-tradable carbon offsets to cover unforeseen losses in carbon stocks. These non-tradable carbon offsets are pooled into a commingled 'buffer pool', with each project having its own buffer pool account.

Carbon capture and storage (CCS) is a process in which a relatively pure stream of carbon dioxide (CO2) from industrial and energy-related sources is separated (captured), conditioned, compressed and transported to a storage location for long-term isolation from the atmosphere.

Carbon farming covers a variety of agricultural methods to sequester carbon in the soil that would otherwise end up as CO2 in our atmosphere, causing climate change.

Carbon removal refers to efforts to remove carbon from the atmosphere and capture and store it, which could limit climate change but is not a substitute for direct emissions reduction.

A carbon sink is any process or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.

Carbon sequestration is the process of storing carbon in a carbon pool.

Cropland is land used for the cultivation of crops, both temporary (annuals) and permanent (perennials), and may include areas periodically left fallow or used as temporary pasture.

Direct air capture and storage (DACS) refers to a chemical process by which CO2 is captured directly from the ambient air, with subsequent storage.

Mitigation (of climate change) refers to human intervention to reduce emissions or enhance the sinks of greenhouse gases.

Nationally determined contributions (NDCs) is a term used under the United Nations Framework Convention on Climate Change (UNFCCC) whereby a country that has joined the Paris Agreement outlines its plans for reducing its emissions. Some countries' NDCs also address how they will adapt to climate change impacts, and what support they need from, or will provide to, other countries to adopt low-carbon pathways and to build climate resilience.

Negative emissions are removals of greenhouse gases (GHGs) from the atmosphere by deliberate human activities, i.e. in addition to the removal that would occur via natural carbon cycle processes.

Net negative emissions are achieved when, as result of human activities, more greenhouse gases are removed from the atmosphere than are emitted into it.

Net zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period.

Offsets are tradeable credits for any kind of mitigation effort – direct emissions reduction, carbon removal or sequestration, or avoided emissions, that are sold to a buyer who is not actually reducing emissions – just offsetting emissions by paying a seller for reductions or removals elsewhere. Offsets do not create an absolute mitigation benefit from a global carbon budget perspective.

Reducing emissions from deforestation and forest degradation (REDD+) is a mechanism developed by Parties to the UNFCCC. It creates a financial value for the carbon stored in forests by offering incentives for low and middle-income countries to reduce emissions from forested lands and invest in low-carbon pathways to sustainable development. Low- and middle-income countries would receive results-based payments for results-based actions. REDD+ goes beyond simply deforestation and forest degradation and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

The Science Based Target Initiative (SBTi) is a partnership between CDP, the United Nations Global Compact, the World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) that sets standards for climate action in the private sector by enabling companies to set science-based emissions reduction targets.

Scope 1, 2 and 3 emissions:

- Scope 1: All direct GHG emissions.
- Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.
- Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities (e.g. T&D losses) not covered in Scope 2, outsourced activities, waste disposal, etc.

SUMMARY

Lucy Njeri lives in the Rift Valley in Kenya. In late May her seeds began to germinate when the rains arrived. But instead of remaining for the long rainy season as they should, the rains stopped after a week. Since then, each day she scans the horizon looking for rain. The bean crop is already ruined. She has some faint hopes for the maize, but only if the rains come soon. If not they will not be able to plant again until next year, and there will be widespread hunger.

'CLIMATE CHANGE FOR US IS REAL. IT IS ALREADY HERE. IT IS CAUSING GREAT HUNGER.'

Lucy Njeri

Every week a new country or corporation announces a target to achieve 'net zero' carbon emissions as their contribution to stopping climate breakdown. While these sound good and are often reported uncritically in the media, without clear definition, they risk being dangerous distractions that gamble with the planet's future.

The UK government was the first among the G7 to make such a commitment, in 2019, and it is using its presidency of COP26 in Glasgow to leverage similar commitments from others. Currently more than 120 countries, including those in the EU, the USA, China and Japan, have pledged to reach net zero by mid-century.[1] There has also been a wave of corporate net zero climate commitments from a range of companies and investors, including British Airways, Mars, Unilever, Citigroup, BlackRock, Shell and BP.

While in theory achieving net zero emissions is a worthy North Star and limiting warming to below 1.5°C will require a combination of emission reductions and removals, it is striking how much that one small word 'net' can obscure. 'Net zero emissions' and 'zero emissions' do not mean the same thing. Instead, in many cases, net zero targets are a greenwashing exercise that enable business as usual.

Net zero targets have proliferated because they give government and corporate leaders what they are desperate for: a convenient way to look like they are taking dramatic action to stop climate catastrophe while largely failing to do so.

What is needed is an immediate, dramatic and irreversible reduction in the billions of tonnes of carbon these countries and corporations are pumping into the atmosphere on a daily basis.

To meet the Paris targets, the world collectively should be on track to have cut carbon emissions by almost half by 2030, with the sharpest cuts being made by the biggest emitters. On current plans, we are on track to only have reduced emissions by 1% compared to 2010 levels%.[2]

Later this year, governments will come together in Glasgow, Scotland, for the follow-up climate summit to the 2015 Paris meeting. If we are to save our planet, and prevent millions of lives being lost, it is critical that governments

and corporations are not permitted to get away with vague net zero targets. They must be asked continuously and relentlessly what their plans are to concretely cut their own carbon emissions. What they are going to do now, and in the next year? What deep and profound cuts in their carbon emissions will we see by 2025 and by 2030? How and when will they shift away from fossil fuels?

Net zero targets are also risky because instead of focusing primarily on the hard work of cutting carbon emissions, for example by rapidly ending the use of coal, oil and gas for electricity and oil for cars, they rely instead on using other methods to remove carbon from the atmosphere. This can allow countries and corporations to continue to pollute, as the millions of tonnes of carbon emissions their factories and powerplants produce will somehow then be removed from the atmosphere, cancelling out their pollution and supposedly achieving 'net' zero.

The problem is this removal of carbon either relies on virtually unproven new technologies, or on a level of land use that is completely impossible and would lead to mass hunger and displacement of people across the world.

NET ZERO TARGETS ARE ALSO RISKY BECAUSE INSTEAD OF FOCUSING PRIMARILY ON THE HARD WORK OF CUTTING CARBON EMISSIONS, THEY RELY INSTEAD ON USING OTHER METHODS TO REMOVE CARBON FROM THE ATMOSPHERE.

Despite the buzz devoted to new technologies that will somehow rescue us from the need to stop belching CO2 into the atmosphere, none have yet proven possible to use at scale.[3] The only proven way to remove carbon from the atmosphere is to use land to do so by growing billions of trees and storing carbon in trees and soil.

While stopping deforestation and sustainably restoring and managing lands wherever possible is of course a good thing to do and brings enormous environmental and social benefits, it is mathematically impossible to plant enough trees to meet the combined net zero targets announced by governments and corporations, as there is simply not enough land to do this.

Land is a finite resource that is a vital lifeline for growing food. It is central to the lives and livelihoods of millions of small farmers and local communities around the world.

- Oxfam has calculated that the total amount of land required for planned carbon removal could potentially be five times the size of India, or the equivalent of all the farmland on the planet.[4]

- Oxfam's analysis shows that several countries and companies are banking on land and natural sinks to meet net zero targets. The EU's plans rely on forests and nature to remove 225 Mt CO2e of emissions, which could require a maximum of 90m ha of land if EU countries were to rely solely on afforestation to meet this target.[5]

- Oxfam has analysed the net zero targets of just four of the big oil and gas producers (Shell, BP, TotalEnergies and ENI).[6] Their plans alone could require an area of land twice the size of the UK. If the oil and gas sector as a whole adopted similar net zero targets, it could end up requiring land that is nearly half the size of the United States, or one-third of the world's farmland.[7]

There is a very real risk that the explosion in net zero commitments will fuel a new surge in demand for land, particularly in low- and middle-income countries, which would lead to mass displacement and hunger.

In India, for example, as part of an afforestation drive, traditional lands have been fenced off, and communities who have rights to use this land have been forcibly evicted and left homeless. These conflicts are impacting nearly half a million tribal and forest-dwelling people.[8]

Instead of using land as a carbon farm that helps big emitters sound good while sidestepping the actual hard work required to cut emissions, we need to manage land in ways that tackle climate change and hunger together and strengthen the rights and resilience of communities. The success of agroecological approaches such as agroforestry in the Sahel show us it is possible to get to zero emissions and zero hunger.[9]

It is clear to us all that climate change has already begun, and unless drastic action is taken now a future of terrible hunger, extreme temperatures, floods, storms and droughts is a certainty.[10]

Yet we can still stop this. At the Glasgow Climate Summit, real, transparent, concrete and timebound cuts to carbon can be agreed for 2030. A forest of flimsy net zero commitments for 2050 and beyond risks letting governments and corporations off the hook, substituting the illusion of action for the hard work that must be done immediately if we are to avert climate disaster.

A FOREST OF FLIMSY NET ZERO COMMITMENTS FOR 2050 AND BEYOND RISKS LETTING GOVERNMENTS AND CORPORATIONS OFF THE HOOK, SUBSTITUTING THE ILLUSION OF ACTION FOR THE HARD WORK THAT MUST BE DONE IMMEDIATELY IF WE ARE TO AVERT CLIMATE DISASTER.

Oxfam is demanding:

- **A much stronger focus on cutting carbon emissions in the near term (by 2030).** Unless the biggest emitters of carbon dioxide take urgent action to cut emissions by about half by the end of the decade, runaway climate breakdown will become inevitable.

- That the **G20 prioritizes ambitious climate action** in the run-up to COP26 in Glasgow to ensure that global heating is kept below 1.5°C.

- **That companies cut emissions in their own operations and supply chains first and foremost**. Ambitious action to cut emissions by 2030 requires **phasing out support for new fossil fuel production**. The fossil fuel industry cannot use net zero as a prop for continuing business as usual.

- **Transparent targets** that distinguish between reducing and removing carbon, instead of blurring the boundaries with short-term (2030), medium- (2040) and long-term targets.

- **That land use must ensure zero hunger.** Land and nature are important parts of the climate solution, but where we do use land for climate mitigation, it must prioritize food security and build the resilience of small-scale farmers who rely on land. Nature-based solutions must strengthen the rights and livelihoods of local communities and protect ecosystems, and be subject to strong social and environmental safeguards that ensure that local communities, Indigenous people and frontline defenders have a seat at the table.

1 INTRODUCTION

Over the past year, a growing number of governments and corporations have committed to long-term net zero climate targets, and many more are likely to announce net zero commitments ahead of COP26 in November. In many ways, net zero climate targets can offer an opportunity for supporting the kind of truly systemic transformation that is needed across sectors to tackle the climate crisis. However, the proliferation of net zero targets also presents several risks and could potentially end up being a dangerous distraction that delays real climate action.

The UK government was the first among the G7 to make such a commitment, in 2019, and it is using its presidency of COP26 in Glasgow to leverage similar commitments from others. Currently more than 120 countries, including those in the EU, the USA, China and Japan, have pledged to reach net zero by mid-century.[11] There has also been a wave of corporate net zero climate commitments from a range of companies and investors, including a number of the world's largest companies, such as British Airways, Microsoft, Unilever, Citigroup, BlackRock, Shell and BP.[12] Currently, 61% of countries, 9% of states and regions within the highest-emitting countries, and 13% of cities with a population of 500,000 or more have committed to net zero. Of the world's 2,000 largest public companies, representing annual sales of nearly $14 trillion, at least one-fifth now have net zero commitments.[13] New net zero climate commitments are being announced every week as citizens and consumers demand climate action. However, while some of these commitments are focused on pushing real and transformative climate action, many are simply attempts to burnish green credentials while continuing with business as usual.

THE PROLIFERATION OF NET ZERO TARGETS PRESENTS SEVERAL RISKS AND COULD POTENTIALLY END UP BEING A DANGEROUS DISTRACTION THAT DELAYS REAL CLIMATE ACTION.

Net zero commitments are meant to align with the latest science from the Intergovernmental Panel on Climate Change (IPCC), which suggests that the world needs to reach net zero emissions by the second half of this century if we are to limit global warming to 1.5°C above pre-industrial levels, as set out in the Paris Agreement. In practice, a net zero climate target means reducing greenhouse gas (GHG) emissions and 'netting' those emissions that cannot be reduced through the removal of CO2, also known as carbon dioxide removal (CDR). CDR technologies typically entail absorbing or capturing carbon through either natural or land-based solutions, such as planting trees, or through technological solutions that involve carbon capture and storage (CCS). The carbon removal that has happened to date has been almost exclusively through natural or land-based solutions. Although there is growing interest in technological removal methods such as direct air capture (DAC), most of these technologies are still untested and currently unviable at scale.

This means that the explosion of net zero commitments, many of which lack clarity and transparency, could lead to a surge in demand for land, particularly in low- and middle-income countries – which, if not subject to robust safeguards, could pose increasing risks to the right to land and the right to food, especially for people and communities whose livelihoods

depend on land. In addition, in the absence of near-term and significant reductions in emissions, especially in the energy and fossil fuel sector, the emphasis on longer-term net zero commitments risks delaying action to reduce emissions now and might shift the burden of mitigation from the biggest emitters towards land-based mitigation in lower-income countries, as well as onto future generations.

This paper unpacks what net zero climate commitments mean for achieving the climate ambition needed to keep warming below 1.5°C and the extent to which these commitments rely on land for carbon removal. Given that land is a finite resource that is crucial to the lives and livelihoods of millions of small-scale farmers and Indigenous and rural communities across the world, the paper highlights the risks to the rights to food and land associated with the recent wave of net zero commitments. It puts forward an alternative vision that would not exacerbate inequality by deploying land specifically for carbon removal, but instead would advance holistic land-based climate solutions that could help achieve not just zero emissions, but also zero hunger. Such 'food first' approaches build resilience and food and nutrition security, and strengthen the rights and livelihoods of small-scale farmers, women, Indigenous Peoples and local communities who rely on land, while also supporting climate mitigation.

2 THE RACE TO NET ZERO: OPPORTUNITIES AND RISKS

Limiting further warming to below 1.5°C or even 2°C, the targets set by the Paris Agreement, requires the world to reach net zero emissions by between 2040 and 2050. In this context, the fact that many countries and companies are adopting net zero climate targets that aim to reach net zero emissions by 2050 is a step in the right direction, and establishes a foundation for the scale of climate action needed over the next few decades.

Implicit in the 'net zero' goal enshrined in the Paris Agreement is the notion that a certain level of carbon removal will be needed together with reductions in emissions to achieve net zero emissions by between 2040 and 2050, if we are to keep warming below 1.5°C. The world has already warmed, on average, by just over 1°C since pre-industrial times.[14] Limiting further warming to below 1.5°C or even 2°C, the targets set by the Paris Agreement in 2015, will without doubt require some level of carbon removal. In the 1.5°C pathways set out by the IPCC, estimates of the amount of carbon removal required range from a low of about 5 gigatonnes of carbon dioxide equivalent (Gt CO2e) per year to a high of about 40 Gt CO2e per year.[15]

WITHOUT URGENT ACTION TO CURB EMISSIONS, THE CLIMATE CRISIS WILL PUSH MILLIONS OF PEOPLE INTO POVERTY.

However, these net zero climate commitments will not be enough to avert catastrophic climate breakdown. According to the United Nations Environment Programme (UNEP), even if the current net zero commitments were fully implemented, our world would still see 2.7°C of warming by the end of the century. Even if the USA were included in the analysis, it would still result in 2.5°C of warming.[16] This would have profound consequences for people and vulnerable communities, increasing the likelihood of them facing more frequent and more intense droughts and flooding, while many might be forced to leave their homes as sea levels rise. Climate change is already wreaking havoc across the globe, and it is the poorest communities and women who are paying the heaviest price. Without urgent action to curb emissions, the climate crisis will push millions of people into poverty.

More concerning is that while net zero commitments appear promising on paper, many of these plans are far less ambitious in practice. Many of the net zero targets are vague and poorly defined, which means that they can be used as a way for countries and companies to 'greenwash' their activities as they go about business as usual. Despite the proliferation of net zero targets, there are no clear benchmarks or binding laws to achieve them, and information on how these targets are to be reached remains scarce. A recent global assessment of net zero targets shows how countries and companies are doing against a number of key benchmarks (Table 1).[17]

Table 1: How net zero targets measure up

Status	The vast majority of net zero commitments – over 80% – are no further advanced than the proposal or strategy stage.
Timing	Most targets are by 2050 (though China has a 2060 target.) A smaller number of companies, countries or cities specify near-term 2030 targets.
GHG coverage	Most countries, states and cities cover only CO2 emissions, while only 27% of companies cover Scope 1, 2 and 3 emissions (as defined by the Greenhouse Gas Protocol) in their targets.
Offsetting	Across the board, there is little clarity in net zero targets on the extent to which countries or companies are relying on offsetting – i.e. the practice of purchasing credits based on mitigation efforts elsewhere, often by implication in low-income nations – to meet their own targets. Offsetting projects can involve emissions reduction activities (e.g. funding renewable energy installations), emissions avoidance (e.g. forest preservation) or removal of CO2 from the atmosphere (e.g. planting more trees). It is important to note that avoided emissions do not provide a net mitigation benefit in terms of the global carbon budget. Also, very few entities specify any conditions on the use of offsets.
Equity	Even though the Paris Agreement stipulates the need to consider equity in net zero targets, only about 10% of entities do so.

Source: Energy & Climate Intelligence Unit (ECIU) and Oxford Net Zero. (2021). *Taking Stock: A global assessment of net zero targets*. https://cal-eci.edcdn.com/reports/ECIU-Oxford_Taking_Stock.pdf?mtime=20210323005817&focal=none

Long-term net zero targets distract attention from delivering near-term and tangible climate action. The most recent estimates from the UN suggest that by 2030, emissions are currently likely to be just 0.5% below 2010 levels, compared with the 45% needed to achieve net zero emissions by 2050.[18] Tackling the climate crisis means aggressively reducing emissions now and achieving a rapid decline over the current decade. Yet most countries and companies are not setting ambitious near-term targets.

Another consequence of net zero pledges is that they have shifted the framework for climate commitments from a focus on reducing emissions to a scenario that involves a mix of emissions reductions and removals. This blurs the boundaries between the two, making it impossible to tell whether a target meaningfully advances real climate action or is simply a cover for business as usual.

A major risk that is often overlooked in many net zero targets, as well as in climate conversations around net zero, is that such targets may end up being reliant on large-scale removal of emissions, which would require substantial amounts of land. Existing technology for large-scale carbon removal relies largely on natural systems for storing carbon and, in the absence of aggressive and sustained domestic action to reduce emissions, net zero commitments could dramatically increase demand for land to be used for carbon sequestration, jeopardizing people's rights to food and to land, especially those whose livelihoods depend on land. This would have the effect of shifting the burden of mitigation onto those who have done the

LONG-TERM NET ZERO TARGETS DISTRACT ATTENTION FROM DELIVERING NEAR-TERM AND TANGIBLE CLIMATE ACTION.

least to contribute to the climate crisis and yet are bearing the brunt of its impacts – small-scale farmers, Indigenous communities, women and youth. Utilizing land for large-scale carbon removal could create trade-offs with food security and land rights, and could potentially displace rural communities from their land.

BOX 1: LAND-BASED CARBON REMOVAL METHODS

Currently, the most viable options for absorbing carbon out of the atmosphere are nature-based solutions or land-based removal methods, which means that all of these methods require changes in how land – whether forestland, cropland or pastureland – is used or managed. This includes the following techniques.

Enhancing carbon sequestration in forests: Trees hold massive amounts of carbon, and continued forest loss contributes to the release of that carbon into the atmosphere. Protecting existing natural forests, restoring degraded forests and improving forest management can help remove and store carbon, while maximizing ecosystem integrity and protection of biodiversity.

Afforestation/reforestation: Afforestation means planting forests on lands where they did not previously grow, and reforestation refers to planting forests in areas that previously had forests, both with the assumption that the trees will absorb carbon as they grow. However, this typically results in large-scale tree plantations. At its worst, this can mean scaling up fast-growing, commercial monoculture plantations as functional carbon removal factories – with all the problems of input-heavy, intensive agriculture and with corresponding implications for biodiversity, water demand and land rights.

Enhancing soil carbon: Soil carbon sequestration includes land management techniques that lock more carbon into soils: for example, switching to no-till agriculture, where farmers avoid ploughing soils and instead drill seeds into the soil; the use of cover crops, which are grown to cover the soil after farmers have harvested the main crop; and using species or varieties of plants with greater root mass. Agroforestry – growing trees within farming plots – is one technique which increases the amount of carbon stored below ground (as well as above ground). However, the extent to which soils store carbon is highly location-specific and is often hard to quantify.

Biochar is another way of getting carbon into soils. Biochar is a kind of charcoal created by incinerating biomass at extremely high temperatures. It can then be buried or ploughed into fields, where it can remain as a carbon store for decades or centuries depending on soil type, management and environmental conditions.

Bioenergy with carbon capture and storage (BECCS) is the process of burning biomass for energy and then capturing and storing the carbon before it is released back into the atmosphere. In integrated assessment models (IAMs), BECCS involves plantations of fast-growing trees or grasses to be burned in power plants to generate electricity, with the carbon emissions captured via CCS technology and stored underground.

Land-based removal methods, however, are not foolproof ways of removing carbon, and they come with a number of risks and uncertainties. First, there is the issue of permanence: the carbon stored in trees and in soils can easily be lost when trees are cut down or destroyed by fires or pests, and addressing the risk of reversal may end up requiring large amounts of 'buffer pools' – which again requires more land. Second, there is the issue of saturation: trees do not absorb carbon indefinitely, and their ability to do so decreases as they reach full growth. Finally, land-based carbon removal can be quite tricky to measure and quantify; this is especially true for soil carbon sequestration, where estimates vary significantly and are often subject to local factors.[19]

3 LIMITS AND TRADE-OFFS OF LAND-BASED CARBON REMOVAL

Land is a finite resource that is already subject to fierce competition for many purposes, not least growing food. Land is a common good, providing water, food and natural resources that sustain all life. It is the guarantor of biodiversity, health, resilience and equitable and sustainable livelihoods. It is immovable, non-renewable and inextricably connected to people and societies.

Yet land inequality is pervasive and growing, and it directly threatens the livelihoods of an estimated 2.5 billion people involved in smallholder agriculture who depend on land as a source of income, food and identity. As corporate and financial investments in land have grown, ownership and control of land have become more concentrated and more opaque. As a result, conflicts over land have been growing and, in many cases, have led to violent and deadly attacks against communities seeking to protect their territories.[20]

The data shows that land inequality has been increasing over the past 40 years, and the largest 1% of farms already operate more than 70% of the world's farmland; yet recent research shows these figures significantly underestimate inequality levels.[21] Land inequality is embedded alongside economic, social, political, environmental and territorial inequalities that are fuelling today's global crises and trends. As the pace and scale of large-scale land acquisitions increase, many communities are being pushed off their land. The Land Matrix has documented that over the past decade, more than 42m hectares (ha) of land worldwide have been sold off to mostly foreign investors in large-scale agricultural land deals, half of which had been owned by communities.[22] Many of these deals have occurred without the free, prior and informed consent (FPIC) of affected communities or have entirely excluded local communities from negotiations, often resulting in farmers being forced from their homes and families being deprived of their livelihoods and left hungry. Africa is the most affected continent, but countries across all regions are similarly affected.

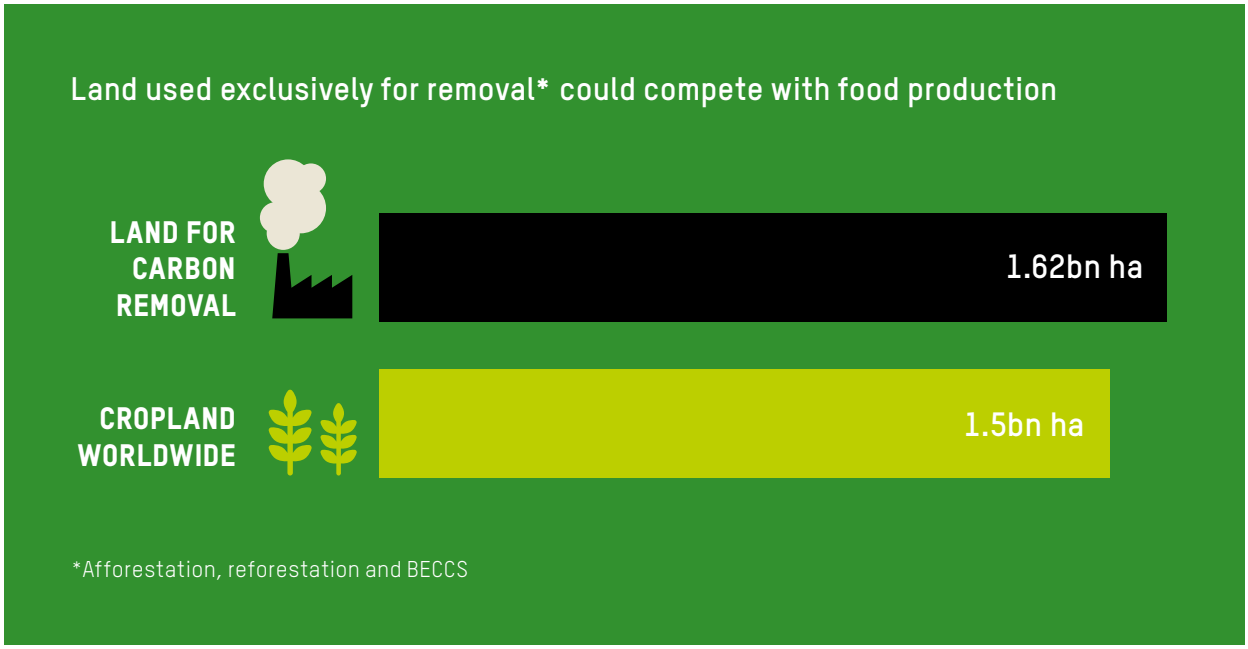
In the face of increasing land inequality and unabated land grabbing globally, and in a context of growing competition and conflict over land, banking on the use of land to remove large volumes of carbon from the atmosphere will only exacerbate land inequality and conflict, once again shifting the burden of the climate crisis onto those least responsible for it.

Using land for carbon removal, or 'carbon farming', at scale would inevitably result in trade-offs with food production and food security. Every IPCC pathway to 1.5°C assumes significant amounts of carbon removal, from 5 Gt to 40 Gt CO2e equivalent per year. The amount of land available simply does not allow for removal at the higher end of this estimate. Currently, roughly

IN THE FACE OF INCREASING LAND INEQUALITY AND UNABATED LAND GRABBING GLOBALLY, AND IN A CONTEXT OF GROWING COMPETITION AND CONFLICT OVER LAND, BANKING ON THE USE OF LAND TO REMOVE LARGE VOLUMES OF CARBON FROM THE ATMOSPHERE WILL ONLY EXACERBATE LAND INEQUALITY AND CONFLICT, ONCE AGAIN SHIFTING THE BURDEN OF THE CLIMATE CRISIS ONTO THOSE LEAST RESPONSIBLE FOR IT.

1.57bn ha of land is cropland (1.4bn ha is arable land and another 0.2bn ha is permanent crops).[23] Removing 40Gt CO2e per year would require roughly 3.8bn hectares of land – more than two times the total amount of land that is currently cultivated in the world. The IPCC estimates that land-based carbon removal methods, including afforestation, reforestation and BECCS, could yield a maximum of about 30 Gt CO2e per year, but even that could require up to 1.62bn ha and would compete with food production.[24] BECCs alone, which the IPCC estimates to have the highest mitigation potential, would require large swathes of land. For example, the IPCC estimates that BECCS could remove 11 Gt CO2e per year, but that would mean devoting between 380m and 700m ha of arable land – an area up to twice the size of India – to growing bioenergy crops.[25] Land used exclusively for carbon removal that could compete with food production could range up to 1.62bn ha, which is more than the total existing cropland.

Figure 1: How much land will carbon removal require?



Large-scale carbon farming or carbon removal would result in land conversion towards monoculture plantation forests or bioenergy crops and would have adverse effects on food production and food prices, worsening food security for many communities who are already struggling to feed themselves. Of course, there are food-secure solutions that are effective for mitigation, primarily through agroforestry and agroecological approaches – but if incentives are geared towards the commodification of carbon, then the land management regime will be repurposed accordingly.

For example, tree planting is commonly seen as an effective and readily available option for climate change mitigation, but often this does not factor in the consideration that afforestation requires a significant amount of land, potentially leading to large reductions in the amount of land available for agriculture. Increased competition for land could lead to higher food prices and a larger population at risk of hunger. Some estimates suggest that

large-scale afforestation could increase food prices by about 80% by 2050, which would push millions more people in vulnerable communities into hunger.[26] Similarly, large-scale tree-planting efforts, even when well intentioned, can often worsen land degradation and water scarcity, making it harder for small-scale farmers to farm their land.[27] Using massive amounts of land for carbon removal could also put the land rights of millions of small-scale farmers, Indigenous communities and women at risk, increasing the likelihood of them being pushed off their land. As a result of weak territorial rights and land governance systems, there have been numerous instances where communities have lost access to their land and have been subject to forced evictions to make way for forest conservation and plantations.[28]

BOX 2: VIOLATION OF COMMUNITY CONSENT IN AFFORESTATION PLANTATIONS

India has undertaken plantation drives across the country, through state forest departments, to increase the country's green cover.[29] These afforestation projects are, in part, supposed to help meet India's commitments under the Paris Agreement on Climate Change. As part of the agreement, India has pledged to increase its forest cover by 5m ha by 2030.

However, recent research by Oxfam partner Land Conflict Watch[30] suggests many of these drives are being carried out in community forestlands that are used by forest dwellers who have rights over these lands, often without the consent of local communities. Most of these plantations have been taken up under the Compensatory Afforestation Fund Act, according to which projects that use forestland are required to plant trees to make up for the loss of forests. Often, these plantations do not survive; they comprise monoculture tree species that do not make up for the loss of the biodiversity of natural forests, and they take away communities' access to traditional forests.

Conflicts have been recorded in several states covering over 100,000 ha of land. These lands were home to 56,480 forest dwellers who have traditional rights over these land parcels. In many cases, the state forest department did not obtain consent from the communities. Instead, traditional lands were fenced off, even though communities had received land titles under the Forest Rights Act (FRA), which is meant to strengthen the customary land rights of tribal communities and requires the government to recognize these rights.

In their testimony, affected people, activists and lawyers have claimed that the state forest departments have strategically used afforestation as a tool to gain control over tribes' community lands.

Similar land conflicts have emerged in protected areas where the government's effort to create protected areas without human habitation by fencing off forests has rendered tribal families living near and in these protected areas homeless. These conflicts impact close to 500,000 tribal and forest-dwelling people, and many communities have faced forcible eviction in the process.

As already noted, land is a finite natural resource with multiple uses, ranging from forests to cropland and grazing land, and built infrastructure. Over the past few decades, there has been rapid change in land use, and today, close to 70% of the world's ice-free land is subject to human use and hence pressure.[31] Banking on using land for the removal of large volumes of carbon will only exacerbate this pressure. So, while in theory land has the potential to remove up to 30 Gt CO2e per year,[32] experts warn that when uncertainties around the potential of carbon sequestration and concerns about food security, land rights and biodiversity are factored in, the higher end of these estimates is not feasible, either socially or ecologically. While estimates for how much land is available for carbon removal vary, the Climate Land Ambition and Rights Alliance (CLARA) estimates the sequestration potential of multifunctional land use to be close to 9.7 Gt CO2e per year. CLARA estimates that there is roughly 350m ha of land that would not compete with food production –this would not entail using land specifically for carbon removal but instead would rely largely on enhancing the potential for carbon removal in existing forests, ecosystems and croplands.[33] It is important to recognize that this does not mean that this land is necessarily freely or readily available for companies or investors to use. Small-scale farmers and local and Indigenous communities may have rights over it, and there is a risk that these rights might be violated in large-scale land transfers if robust safeguards are not put in place.

THE TRADE-OFFS BETWEEN LAND FOR FOOD AND COMMUNITIES AND LAND FOR CARBON FARMING WILL WORSEN IF URGENT ACTION IS NOT TAKEN TO TRANSFORM THE CURRENT TRAJECTORY OF EMISSIONS-INTENSIVE ECONOMIC AND ENERGY MODELS AND CARBON-INTENSIVE LIFESTYLES.

The trade-offs between land for food and communities and land for carbon farming will worsen if urgent action is not taken to transform the current trajectory of emissions-intensive economic and energy models and carbon-intensive lifestyles. The longer we delay action on reducing emissions, the more removals will be needed – emissions are cumulative. Conversely, shifting away from energy that is dependent on fossil fuels and moving towards more sustainable lifestyles could help to minimize the trade-offs required.

4 THE LAND IMPLICATIONS OF NET ZERO COMMITMENTS MADE TO DATE

Corporate commitments

A growing number of corporations have announced net zero climate commitments. This includes companies across a range of sectors – food and beverages, finance, technology, aviation and fossil fuels. Unfortunately, the quality of voluntary pledges of this kind varies widely, and many are very difficult to scrutinize because they lack transparency. The result is a kind of 'Wild West': while some commitments appear to be robust and science-based, others are likely to be empty promises which rely on offsets as a means to continue business as usual.

Nature-based solutions (NBS) often feature prominently in several corporate strategies for reaching net zero climate targets. These solutions rely on removal and storage of carbon dioxide through land and ecosystems. While investments in protecting and enhancing natural ecosystems can yield multiple benefits that support climate resilience and biodiversity outcomes, without ambitious decarbonization they could also end up being a convenient greenwashing guise for perpetuating business as usual practices. The reliance on carbon removal through NBS offsets for achieving net zero targets may also fuel increased demand for land. In this section, we look at corporate climate commitments, specifically of companies in the oil and gas sector, and we find that most companies risk banking on a great deal of land to meet their net zero targets – more than is sustainable given what is available at the global level.

IF THE WORLD IS TO AVOID CLIMATE BREAKDOWN, THE OIL AND GAS SECTOR MUST REDUCE PRODUCTION OF FOSSIL FUELS AND SET NEAR-TERM TARGETS THAT LEAD TO DIRECT AND DEEP REDUCTIONS IN EMISSIONS AND ARE COMPATIBLE WITH LIMITING GLOBAL WARMING TO NO MORE THAN 1.5°C.

Net zero climate pledges in the oil and gas sector

Given the disproportionate role the fossil fuel sector plays in perpetuating the climate crisis, we look at what oil and gas companies are doing to meet their net zero targets and the extent to which companies that have these targets rely on land-based carbon removal. Emissions from fossil fuels are the dominant cause of global warming. If the world is to avoid climate breakdown, the oil and gas sector must reduce production of fossil fuels and set near-term targets that lead to direct and deep reductions in emissions and are compatible with limiting global warming to no more than 1.5°C.

We have analysed the policies of the four biggest fossil fuel companies to have made net zero pledges to date – Shell, BP, TotalEnergies and Eni. These four companies are among the more progressive companies when it comes

to addressing the climate challenge and are beginning to take steps to reduce direct emissions in operations and value chains. However, none of the climate plans or pledges made by the oil majors are geared towards achieving a level of decarbonization that is aligned with the Paris Agreement's goal of keeping warming below 1.5°C. Recent analysis of climate commitments made by the big fossil fuel companies shows that virtually none of them has meaningful plans to phase out new production.[34] Some of the biggest players in the sector, from state-owned Saudi Aramco to ExxonMobil and Chevron, have so far declined to set any targets, effectively burying their heads in the sand, and abdicating their climate responsibility.

Focusing on the companies that are serious about tackling the issue, this section assesses the extent to which they rely on land-based carbon removals, based on publicly available data. Given that the availability of data is limited, some key assumptions have been made to arrive at these estimates (see Annex for the methodology used in the analysis).

Table 2: Energy companies' planned and estimated emissions reductions through land-based removals to meet net zero targets

Company	2030 absolute emissions reductions from land-based removals	Absolute emissions reductions stated or estimated from land-based removals (tonnes CO2)	Area stated or estimated as needed to achieve land-based removals target (ha)	Area per tonne of CO2 captured (ha/tonne)
TOTALENERGIES	7%	5,000,000 (2030) *23,800,000 (2050)*	*476,000 (2030)* *2,600,000 (2050)*	*0.10*
SHELL	35%	120,000,000 (2030) 300,000,000 (2050)*	*11,400,000 (2030)* *28,600,000 (2050)*	*0.10*
ENI	23%	20,000,000 (2030) *40,000,000 (2050)*	*8,000,000 (2030)* *16,000,000 (2050)*	*0.40*
BP**	15%*	18,960,000 (2030) *54,150,000 (2050)*	*1,800,000–7,900,00(2030)* *5,000,000–22,500,000 (2050)*	*0.10*

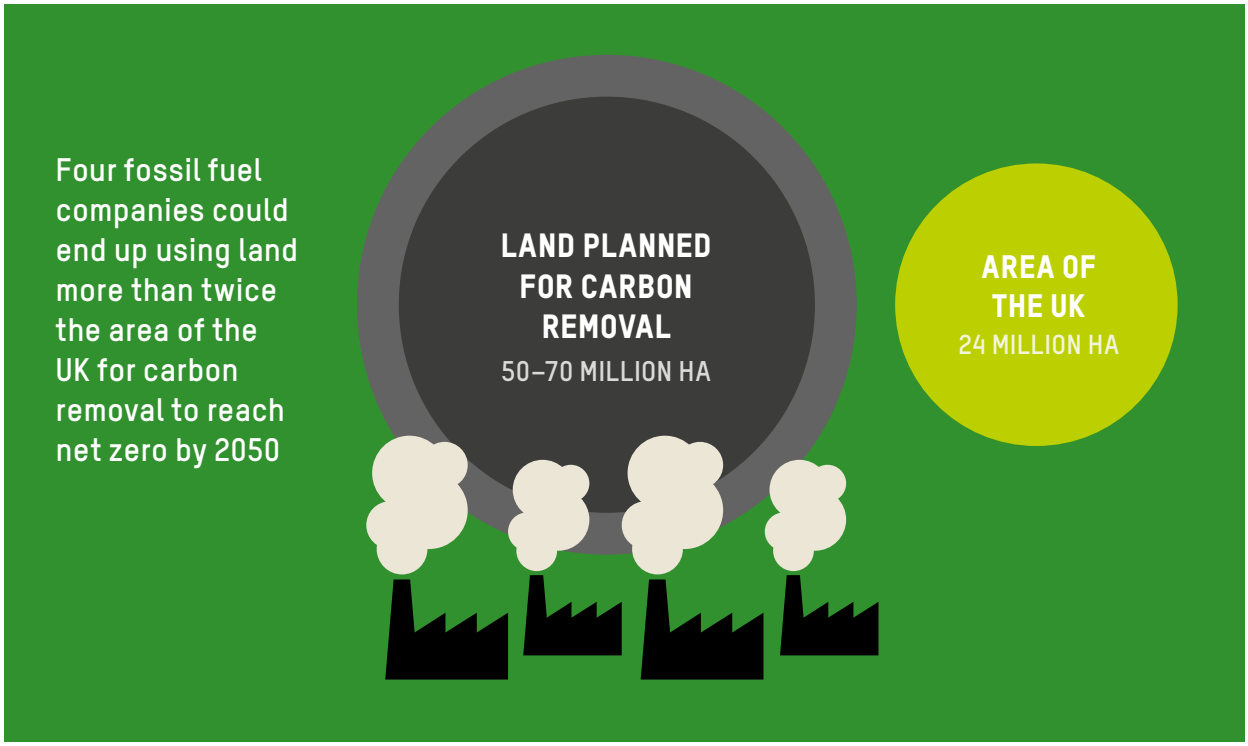
* These are estimates[35] (Italicized figures are derived from estimates - see Annex for the methodology used in the analysis).

** BP has indicated that it will not use land based removals to meet its 2030 net zero aims – this analysis is based on estimates based on projected scenarios.

This analysis finds that the four biggest 'net zero' oil majors are planning to remove carbon through nature-based solutions while continuing to make space for more fossil fuel production. Even a conservative estimate indicates that the plans of these four companies alone to remove carbon by planting new forests could require a huge amount of land. Among these four companies, the land area needed in 2030 to contribute reported and estimated land-based removals is between 21,676,000 ha and 27,776,000 ha (an area the size of the UK). Among these four companies, the land area needed in 2050 to contribute reported and estimated land-based removals is between 50,362,000 ha and 69,400,000 ha (an area double the size of the UK).

COMPANIES COULD BE BANKING ON MASSIVE AMOUNTS OF LAND TO MEET NET ZERO TARGETS.

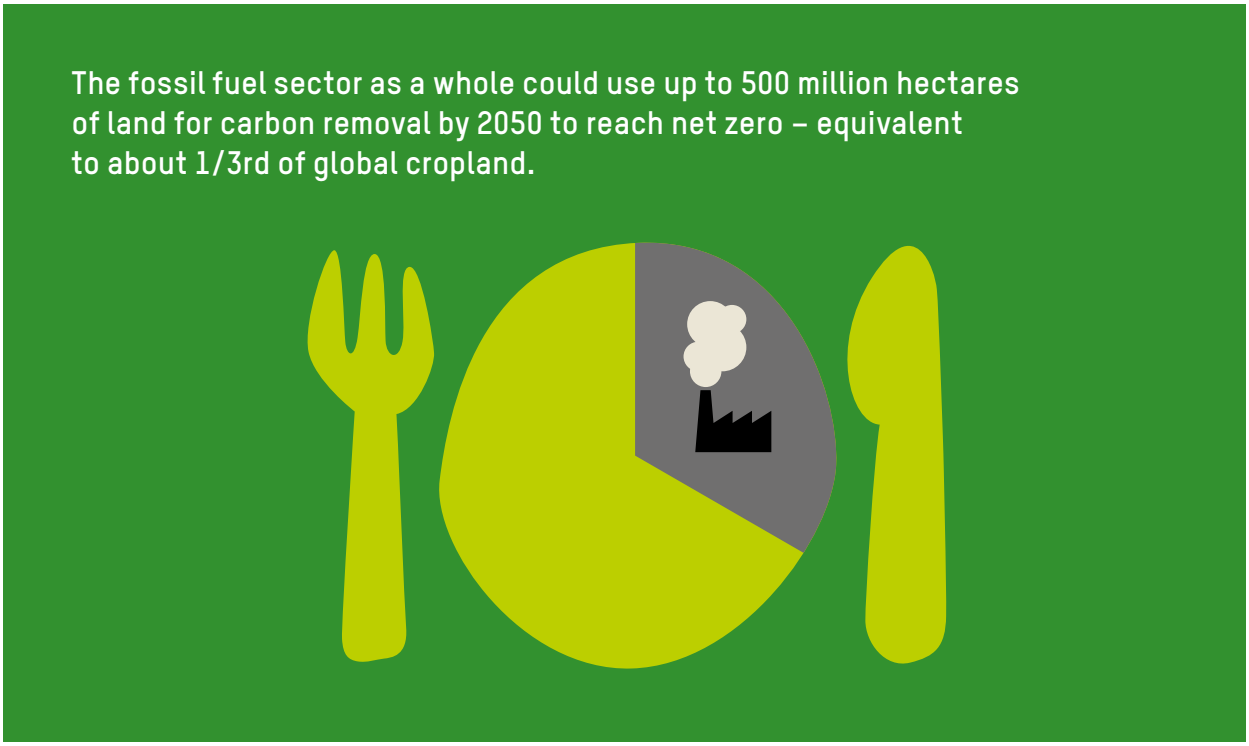
Figure 2: Estimated land needed for carbon removals by four energy companies to meet net zero targets



If all energy companies were to set similar net zero targets by 2050, and even if 15% of that was met through land-based removals, the energy sector could end up using 500m ha of land by 2050 to meet net zero goals – an area that is roughly half the size of the United States and significantly more than the land available for carbon removal that would not compete with crop production.

Fossil fuel companies cannot rely on land-based offsets to meet their climate targets. Exploitation and development of new oil and gas fields must stop now for the world to limit warming to 1.5°C and stay within the safe limit of global heating. In its latest report, the International Energy Agency (IEA) has also warned that there is no place for fossil fuels if the world is to reach net zero emissions by 2050.[36]

Figure 3: Estimated land needed by the energy sector for carbon removals to meet net zero targets



BOX 3: NET ZERO TARGETS IN OTHER SECTORS

A growing number of companies across sectors have adopted net zero targets. These include major food and beverage companies such as Unilever, Nestlé, General Mills, Mars and PepsiCo, but encouragingly, they have also adopted robust science-based targets aligned with the 1.5°C goal for reducing emissions across their operations and value chains. These companies have set targets to reduce the all-important Scope 3 emissions associated with supply chains and the sourcing of agricultural ingredients, since the vast majority of the food sector's emissions come from agriculture and land use.[37] For example, 75% of Mars' emissions come from agriculture and land use change activities within the company's supply chain. By and large, Mars is expected to meet its climate targets through stopping deforestation and reducing agricultural emissions in its supply chain.[38] While companies like Mars have also included some removals in their targets, the removals are linked to investments within their own value chains – for example, through supporting farmers to adopt better farming practices and establishing agroforestry systems.

Several aviation and technology companies have also adopted net zero targets, and many of these companies rely on nature-based solutions to achieve their targets. For example, Apple, which has committed to achieving net zero emissions by 2030,[39] recently announced the launch of a $200m fund that aims to remove at least 1m tonnes of CO_2 annually. The company plans to directly eliminate 75% of emissions from its supply chain and products by 2030, and the fund is intended to help address the remaining 25% of emissions by removing carbon through forestry projects.[40] Similarly, Delta, which has also announced a plan to become climate neutral, is planning on investing in nature-based offsets to achieve its climate target.[41]

Country commitments

Many countries, both high- and low-income, are banking on land to meet their climate targets as part of the net zero commitments they have made. The first thing to say is that this is a positive step – land is an important source and sink of GHG emissions and it needs to be part of countries' climate plans. Robust targets for land (i.e. forests and agriculture) should be a part of any country's climate plans or nationally determined contributions (NDCs), as set out in the Paris Agreement. That said, there are questions that need to be addressed around exactly how land-based mitigation targets are being achieved. To what extent do such targets include a conversion of land from food or forests to carbon farming, and are the mitigation estimates realistic? To what extent do the targets of higher-income countries rely on land-based mitigation in lower-income countries? Most importantly, do the land-based mitigation pathways also support and strengthen the rights and livelihoods of small-scale farmers, Indigenous Peoples and local communities who rely on land?

MANY COUNTRIES, BOTH HIGH- AND LOW-INCOME, ARE BANKING ON LAND TO MEET THEIR CLIMATE TARGETS AS PART OF THE NET ZERO COMMITMENTS THEY HAVE MADE.

This section looks at a number of countries in different parts of the world that have committed to net zero and assesses the extent to which their climate plans depend on land. Since information on how NDCs are to be achieved is still quite scarce, it also outlines some questions around which countries need to provide more clarity as they further develop their plans to achieve net zero targets.

Colombia

Colombia's updated NDC, submitted in December 2020, is based on a vision of the country becoming climate-neutral by 2050. The updated NDC, which plans a 51% reduction in emissions by 2030 compared with the business-as-usual scenario, relies heavily on the land sector. One of the mitigation measures it proposes with the highest estimated potential is reducing the rate of deforestation to 50,000 hectares per year by 2030, which corresponds to mitigation of almost 60m tonnes of CO2 equivalent (Mt CO2e) in 2030.[42] Colombia has also pledged to move forward with plans to undertake massive reforestation and landscape restoration projects as part of its NDC, including a commitment to reforest 1m ha of land by 2030, which could sequester 10.5 Mt CO2e, or roughly 6% of its total emissions reduction.[43]

Questions: Deforestation rates have continued to rise in the post-conflict period, and Colombia's target is not aligned with existing national plans, which indicate increasing deforestation in the coming years.[44] So how is the country going to stem the tide of deforestation, especially when the government's plans indicate a reduction of the budget allocated for environmental and forest protection?[45] Equally important, what processes will ensure that the voices of local communities can be heard and prioritized in forest protection and restoration efforts, particularly when there are ongoing concerns about a lack of transparency and a lack of participation by local communities and Indigenous Peoples in national forest protection and restoration plans?[46] There are also further questions about the government's plans to ensure engagement of peasant communities, who have often been criminalized.[47]

Ethiopia

Ethiopia is a country with very low levels of emissions and yet it has made a commitment to become carbon-neutral, and unlike many high-emitting countries it is doing its fair share in terms of tackling the climate crisis. Ethiopia intends to reduce its GHG emissions in 2030 by 64%, which constitutes a reduction of 255 Mt CO2e.[48] A big part of this reduction comes from land and includes 90 Mt CO2e from agriculture and 130 Mt CO2e from forestry. As part of this plan, Ethiopia intends to increase its ambition by expanding its forest cover beyond its initial target for afforestation and reforestation of 7m ha.[49] In fact, Ethiopia has embarked on one of the most ambitious tree-planting campaigns anywhere as part of its Green Legacy initiative, with the aim of planting 20bn trees over the four years between 2020 and 2024.[50] Combining the land area needed in the best- and worst-case scenarios for agricultural land-based removals with the area needed for forestland-based removals, roughly 50–60% of Ethiopia's total land area is projected to be used for NDC-related land-based removal activities.

ETHIOPIA HAS EMBARKED ON ONE OF THE MOST AMBITIOUS TREE-PLANTING CAMPAIGNS ANYWHERE AS PART OF ITS GREEN LEGACY INITIATIVE.

Questions: There is no doubt significant potential in mitigation in the land sector in Ethiopia, but the country will need large amounts of financing to achieve its targets. What strategies will be put in place to ensure that mitigation in the land sector holistically incorporates opportunities to strengthen adaptation, resilience and food security through the adoption of food-first approaches, and puts at its centre the rights and livelihoods of rural communities, and in particular women and youth? The issue of climate finance, however, raises another question as to whether Ethiopia will use the finance to achieve its own already ambitious NDC, or to make land available to support 'net zero' commitments elsewhere.

Switzerland

Switzerland plans to reduce its GHG emissions by 50% from 1990 levels by 2030 and by 70–85% from 1990 levels by 2050. It aims to achieve 12.5% of its near-term target through financing climate protection projects abroad.[51] It has already signed carbon credit agreements with Peru and Ghana, with the aim of earning credits towards its national emissions target while supporting lower-income countries to embark on a sustainable development path. Through this scheme, Switzerland plans to offset an estimated 3.3m tonnes of carbon to reach its 2030 target.[52] This could require between 416,406 and 832,812 ha of land, with the lower estimate being equivalent to more than 250 times the size of Geneva (or 50 times the size of Zurich). This demonstrates how even a small country like Switzerland is depending on land and other nature-based solutions to achieve its emissions reductions targets.

Questions: Switzerland plans to use international offsets, for instance through forests in Peru and Ghana, to reduce its emissions. Low-income countries like Peru and Ghana also plan to rely on land and other nature-based solutions. Will there be enough land to help reduce national emissions and also offset Switzerland's emissions without compromising sustainable development and communities' rights to land and food? In addition, what measures will be put in place to avoid double-counting of reductions in emissions?

European Union (EU)

The EU's updated NDC commits to an overall 55% net reduction in emissions by 2030 compared with 1990 levels, and to climate neutrality by 2050. However, despite its updated target, from 40% to 55%, the EU's climate plan is insufficient. If other countries adopted similar targets with comparable ambition, global heating would range between 3°C and 4°C. Based on fair share principles, the EU needs to reduce its emissions by 65% from 1990 levels by 2030 to be in line with the 1.5°C target.

The bloc has been criticized for relying in part on land-based 'carbon sinks' to soak up carbon and to achieve its stated 55% emissions reduction. According to the EU Climate Law, an estimated 2.2% of emissions reduction, which amounts to 225 Mt CO2e, will be achieved through forests and other natural sinks.[53] If the EU relies on afforestation for carbon removal, this will require a minimum of 30m ha and a maximum of 90m ha of land.[54]

THE BLOC HAS BEEN CRITICIZED FOR RELYING IN PART ON LAND-BASED 'CARBON SINKS' TO SOAK UP CARBON AND TO ACHIEVE ITS STATED 55% EMISSIONS REDUCTION.

Questions: The EU is the third biggest emitter in the world, with a huge historical responsibility for global emissions. Furthermore, EU policies on the import of agricultural commodities and biofuels have implications for deforestation and the rights of communities where these commodities are produced. In terms of equity and climate justice, what is the bloc's plan to increase ambition for for addressing the climate crisis? At the minimum, it should reduce emissions by 65% from 1990 levels by 2030. It should also account for the climate footprint of its policies on biofuels and agricultural imports.

BOX 4: THE IMPACTS OF THE EU'S BIOFUEL POLICY

The EU's biofuel policy to meet its energy demand and reduce emissions has often led to adverse land and human rights impacts in low- and middle-income countries. Since 2003, the bloc has set a series of biofuel-related targets and incentives to increase the share of renewables in its energy mix, which has led to an increase of biofuels production in countries such as Brazil, Peru and Tanzania. In many instances this has fueled environmental destruction, including deforestation, land conflict and violations of indigenous and labour rights. For instance, an ethanol operation in Chira Valley in Peru has had negative environmental and social impacts on local communities. Spurred by the increase in demand for biofuels in the EU and investments from European countries such as Belgium, in 2006 Maple Ethanol acquired over 10,000 ha of land at a price far below the market value in Chira Valley, and a few years later started growing sugarcane for ethanol export to EU countries. Local communities who used to rely on the land for their food and livelihoods lost their rights. Furthermore, the local government gave away access to water rights to the company. Some community members who used to live on the land were forcibly displaced. Local people's health was also impacted by company operations, including sugarcane field burning activities. Communities in Chira valley have seen different companies come and go, but to this day they are left with the environmental and social costs. Currently, at least three countries in the EU – Belgium, the Netherlands and Germany – as well as the UK, buy bioethanol from Peru.

It is important, therefore, to ensure that net emission reduction targets such as the EU's 55% reduction target for 2030 are not used as a strategy to continue harmful mandates for promoting unsustainable bioenergy, which have been proven to have adverse impacts on communities, their lands and the environment, without delivering any meaningful climate benefits.

Source: Oxfam België-Belgique, 2021. Fuelling human rights violations: *Consequences of EU and Belgian biofuel policies in northern Peru*. https://www.oxfamsol.be/

5 FOOD FIRST APPROACHES TO LAND-BASED CLIMATE ACTION

Relying excessively on land-based carbon removal methods to meet net zero targets is not realistic and involves significant trade-offs that risk worsening poverty and hunger; however, land remains central to the fight against climate change and hunger. Land-based mitigation actions are vital for keeping global heating below 1.5°C, but this must be done in ways that holistically respond to the interlinked challenges of climate change and food security. 'Food first' approaches do not entail converting land specifically for carbon removal and minimize trade-offs, but instead enable synergies to help achieve both zero emissions and zero hunger.

A food first response needs to start with a recognition that the way we use land and grow our food is itself fuelling the climate and hunger crises. Land, agriculture and food systems more broadly are responsible for close to 30% of global emissions, driven largely by industrial agriculture and growing demand for commodities such as palm oil, soy and meat; this typically leads to deforestation on a massive scale and to increases in emissions from the use of fertilizer and methane emissions from livestock and rice paddies. At the same time, climate change is having severe impacts on the land on which people rely to feed their families. Extreme weather events such as droughts and floods, changing rainfall patterns and rising temperatures mean drier and less fertile lands where fewer crops survive each planting season, poorer soil health, increased water scarcity and a less nutritious harvest overall. Currently, over 820 million people experience hunger, with climate change being a key driver of food insecurity.[55] What is more, many millions live in rural areas and rely on land and agriculture for their livelihoods, making them susceptible to climate impacts on land. For instance, an estimated 3.2 billion people worldwide – about two-fifths of the global population – are directly affected by land degradation.[56] As the impacts of climate change intensify, more communities could face food insecurity and farmers and rural communities could be forced to migrate to find food.

A FOOD FIRST RESPONSE NEEDS TO START WITH A RECOGNITION THAT THE WAY WE USE LAND AND GROW OUR FOOD IS ITSELF FUELLING THE CLIMATE AND HUNGER CRISES.

Food first approaches build on the clear need to shift away from the conventional models of large-scale and monoculture industrial agriculture that we know are worsening the climate crisis. Profound changes are needed in the way we grow food to address the urgency of the climate crisis, as well as to enhance food security and nutrition and build resilience in the face of the impacts of climate change on farmers. Agroecological approaches and innovations can help transform food systems by applying ecological principles to agriculture and ensuring a regenerative use of natural resources and ecosystem services, while also addressing the need for socially just and equitable food systems within which communities' rights and choices are respected.

So, what do food first approaches look like?

Protecting and restoring natural forests and ecosystems

Standing forests, in particular tropical forests, are by far the most important means of mitigating climate change. Yet the world is losing forests at an alarming rate: in 2020 alone, over 12m ha of primary forest disappeared.[57] The Amazon River basin, which stretches across nine countries in South America, is still a net carbon sink but it will be teetering on the edge of becoming a net source of carbon if forest loss continues at current rates.[58] Globally, deforestation and peatland degradation contribute to about 12% of global emissions. This is why curbing deforestation, which is driven mainly by large-scale agriculture for commodities like palm oil and soy, must be a priority. Not only do protecting intact forests and restoring natural forests, as well as grasslands and wetlands, play an essential role in climate mitigation, but healthy forests also have the potential to contribute to the protection of biodiversity and to equity, through the provision of ecosystem services that can enhance the food security and resilience of local communities.[59]

Recognizing Indigenous Peoples and local communities as owners and stewards of their forests and lands and protecting their rights

There is growing evidence that strengthening land rights is one of the most effective strategies for reducing deforestation. Lands held by Indigenous Peoples are better protected from environmental destruction than other areas of forest. For example, a recent study shows that deforestation rates in Brazil's Amazon were two-thirds lower on titled Indigenous land.[60] Indigenous and community lands are a globally important carbon sink, holding at least 22% of the carbon stored in tropical and subtropical forests and at least 17% of the total carbon (including soil carbon) stored in forests.[61] There is considerable potential for more carbon to be stored on degraded Indigenous and community lands if such lands were secured, better protected and restored.[62] Unfortunately, while over 50% of land is inhabited by Indigenous Peoples and rural communities, only about 10% is legally recognized as legally belonging to those communities.[63] Strengthening land tenure and protecting rights would not only protect critical carbon sinks but would also build the ability of farmers, communities and organizations to make changes to land that could advance adaptation and mitigation.

THERE IS GROWING EVIDENCE THAT STRENGTHENING LAND RIGHTS IS ONE OF THE MOST EFFECTIVE STRATEGIES FOR REDUCING DEFORESTATION.

Improving cropland and pastureland management to increase carbon storage in soils

Switching to more ecologically sustainable farming and grazing practices such as the use of cover crops, crop rotation, reduced tillage, improved water and nutrient management, and improved grass varieties on grazing land can help to build resilience and agricultural productivity while reducing land degradation and sequestering carbon in the soil. For example, soil management in croplands through practices such as cover cropping not only improve yields but could also offer a significant mitigation dividend. Cover crops, for example, could sequester one-twelfth of the total emissions from agricultural production if they were cultivated on a quarter of global croplands.[64]

Agroforestry systems

Agroforestry can help to address soil degradation and improve yields and productivity, while also storing carbon. Studies show a consistently positive relationship between agroforestry and food security.[65] Its impacts come largely from the co-benefits to soil and water quality of incorporating tree cover into cropping and rotational systems. Because of the increases in yield and productivity associated with agroforestry systems, this method of cultivation can also enhance livelihoods by diversifying sources of income.[66] Recent evidence suggests that, within cropping and pastureland systems, agroforestry systems can sequester 10–20% more soil carbon than lands that do not have trees.[67]

BOX 5: REGREENING THE SAHEL THROUGH AGROECOLOGICAL APPROACHES TO COMMUNITY RESILIENCE AND CLIMATE MITIGATION

Across large areas of the Sahel region of West Africa, one of the poorest and most environmentally precarious areas of the continent, a decades-long revolution in agroecology has produced remarkable results in terms of improving food security and reversing environmental degradation. Once-denuded landscapes are now home to abundant trees, crops and livestock.

Sahelian farmers, driven to desperation by the severe droughts of the early 1970s and the 1980s, have ingeniously modified traditional agroforestry, water and soil management practices to restore the fertility of their land. In Niger, farmers have developed innovative ways to regenerate and propagate valuable trees whose roots already lay under their land. This 'farmer-managed natural regeneration' (FMNR) system was first pioneered by outside actors but was spread rapidly by farmers once they observed its success. Changes to forestry laws and reforms of government structures that enable greater decentralization and local control of natural resources have also been significant enablers of change.

In Burkina Faso, local farmers – of whom Yacouba Sawadogo, winner of a Right Livelihood Award in 2018 (considered 'the Alternative Nobel Prizes'), is perhaps the most famous – experimented with zaï, which are planting pits containing manure to retain moisture and nutrients, and with stone bunds known as diguettes to hold back rainwater and allow it to soak into the soil. Farmers like Sawadogo deliberately set about encouraging the spread of successful techniques to their neighbours, and then further afield, by creating farmer-to-farmer spaces, schools and networks, supported in their efforts by a wide range of international non-governmental organizations (INGOs).

The results have been improved food security for some three million people; increases in household gross incomes, by an average of 18–24%; the reversal of environmental degradation and desertification across some 6m hectares of land (an area three times the size of Wales); and around 200m new trees being grown, with a production value of over $260m. Improvements in nutrition may, in turn, help build resilience to future health pandemics. Climatically, the changes have meant decreased soil erosion, reduced wind speed, decreases in local temperatures and increases in rainfall, along with greater biodiversity.

Source: J. Magrath. (2020). *Regreening the Sahel: A quiet agroecology revolution*. Oxfam GB. https://policy-practice.oxfam.org/resources/regreening-the-sahel-a-quiet-agroecological-evolution-621091/

Table 3: Comparative evidence on land-based climate action that supports zero hunger and zero emissions[68]

Land-based climate change mitigation strategies	GHG emissions* ($GtCO_2eq$/year)	Food security (People)
Bioenergy (BECCS)	5.85 (0.4–11.3)	–150 million
Afforestation	4.7 (0.5–8.9)	–100 million**
Reforestation	5.75 (1.5–10)	
Forest management (avoided degradation and deforestration, active management)	5.78 (1.48–10.08)	100 million
Agroforestry	2.90 (0.11–5.68)	1.3 billion
Soil management in croplands (tilage, cover, and fertilizer)	3.885 (0.28–7.49)	60–225 million
Pasture management (soils and manure)	1.58 (0.33–2.82)	1 billion

Positive impact: High Medium Low
Negative impact:

Note: Minus sign indicates the number of individuals estimated to potentially be harmed by the strategy.
* Median estimate (range of estimates). ** Pooled estimate for afforestation and reforestation activities.

Land use choices that recognize the multifunctional nature of land and prioritize food security and community rights can deliver a significant climate mitigation dividend. Estimates by CLARA suggest that nature- and people-friendly land use choices that provide multiple benefits could shift land from being a net source of emissions to a net sink that would remove roughly 10 Gt CO2e per year by 2050.[69] Built into this analysis is limiting the maximum area of land for reforestation to about 350m ha.[70] A food first approach also yields a significant mitigation potential of about 13 Gt CO2e per year, primarily from avoided emissions and reduced emissions from the protection of existing forests and ecosystems. The combined mitigation potential of food first land use approaches (avoided emissions, reductions and removals) is estimated to be about 23 Gt CO2e per year.[71] Lifestyle and dietary shifts can also play an important role in this context. Reducing meat consumption and cutting down on food waste and loss, for example, could go a long way towards reducing

LAND USE CHOICES THAT RECOGNIZE THE MULTIFUNCTIONAL NATURE OF LAND AND PRIORITIZE FOOD SECURITY AND COMMUNITY RIGHTS CAN DELIVER A SIGNIFICANT CLIMATE MITIGATION DIVIDEND.

emissions from food systems and land use while also providing other co-benefits. For example, shifts in diets could potentially yield 0.7–0.8 Gt CO2e per year in mitigation potential.[72]

Agriculture and land use climate policies must not focus solely on mitigation but must also provide a pathway for scaling up investments in adaptation and resilience. Climate change is already having a disproportionate impact on small-scale farmers in vulnerable communities. Their dependence on rain-fed and marginal lands puts them on the front line of managing climate impacts such as extreme weather events like drought and floods, and they are seeing a direct impact on agricultural productivity as climate change intensifies land degradation, desertification, and water scarcity. In this context, women farmers face two compounding layers of exclusion – as smallholder farmers and as women. The devastating impacts of the climate crisis on small-scale farmers is one of the major drivers of hunger and food insecurity. These impacts are likely to become increasingly severe by 2030 and beyond, putting global food security and the livelihoods of hundreds of millions of people at risk. Climate investments and action on land and agriculture must prioritize support for adaptation and resilience by small-scale farmers and must identify mitigation opportunities that enhance their resilience. Countries' climate plans or NDCs can be an important vehicle for delivering on mitigation and adaptation in tandem.

THE DEVASTATING IMPACTS OF THE CLIMATE CRISIS ON SMALL-SCALE FARMERS IS ONE OF THE MAJOR DRIVERS OF HUNGER AND FOOD INSECURITY.

6 POLICY RECOMMENDATIONS

According to the IPCC, all pathways that will limit global warming to 1.5°C, with no or limited overshoot, require rapid and far-reaching changes in energy, land, urban areas and infrastructure (including transport and buildings) and industrial systems. The changes required are unprecedented in scale and imply sharp reductions in emissions in all sectors. Done right, net zero targets provide a guiding principle for climate actions that could spur massive decarbonization and a just transition away from unequal and carbon-dependent economic models towards more equitable and sustainable models that secure the future and livelihoods of workers and their communities. However, vague net zero targets risk being a dangerous distraction that could exacerbate the climate crisis as well as inequality.

VAGUE NET ZERO TARGETS RISK BEING A DANGEROUS DISTRACTION THAT COULD EXACERBATE THE CLIMATE CRISIS AS WELL AS INEQUALITY.

To drive real and equitable climate action forward, net zero targets should be based on clearly defined criteria that build on the following foundational principles.

Net zero targets must prioritize ambitious emissions reductions to align with the goal of limiting warming to below 1.5°C and ensure rapid decarbonization by 2030.

- The wealthy, and historically the largest emitting countries, who are responsible for a disproportionate share of the current output of greenhouse gases, can – and should – make the sharpest cuts in emissions to ensure an equitable distribution of the remaining global carbon budget.
- Given the urgency and scale of the transition needed away from fossil-based energy sources, it is critical that any net zero commitments made by G20 countries are not used as a fig leaf to allow unsustainable ongoing fossil fuel emissions. This requires tackling harmful subsidies and tax breaks that continue to prop up the fossil fuel industry.
- Net zero targets must be achieved by focusing on domestic emission reductions. Limiting global temperature increases to well below 1.5°C requires global emissions to be slashed by nearly half by 2030, which is why it is important that countries' net zero targets are anchored in 2030 targets that are based on ambitious domestic reductions in emissions and not on offsets.
- Removals will be needed but should be accounted for separately and used to draw down residual emissions that are hard to abate, and should not be used to continue avoidable emissions.

- While international cooperation can be an important tool to enhance mitigation efforts globally, international offsets should not be used as a substitute for ambitious domestic emissions reductions. Where international partnerships are pursued, they must promote equitable and sustainable development, ensure environmental integrity and be subject to robust oversight, and put in place social and environmental safeguards that protect the rights of communities and ecosystems.

For companies, it is important that long-term net zero targets are based on robust science-based targets aligned with the goal of limiting warming to below 1.5°C.

- Companies should commit to deep and sustained emissions reductions in the near term, to choosing a path with the least cumulative emissions and to reaching net zero by 2050 or earlier.

- Companies should disclose and commit to reducing emissions across all scopes (Scopes 1, 2 and 3) in accordance with the Science Based Targets initiative (SBTi).

- While land-based removals could be necessary for companies whose value chains are based on land use and agriculture, companies should account for them separately.

- Companies should not include the use of offsets as part of their efforts to reduce emissions and meet their science-based targets. SBTi requires that companies set targets based on emission reductions through direct action within their own operations and/or their value chains.[73] Where companies want to scale up their ambitions and efforts beyond reducing their own emissions in line with their science-based targets, they can help finance the transition to net zero by mid-century or earlier through high quality offsets that provide environmental and social value and have the right safeguards in place.

- Given the outsized role of the fossil fuel sector in contributing to the climate crisis, companies in the sector must commit to phasing out investments in expanding fossil fuel production as part of their net zero targets. Companies are welcome to support community ecosystem-based solutions, but they cannot count the carbon removed to meet their net zero targets.

Net zero commitments must be backed by meaningful transparency and disclosure.

- Net zero commitments must include a clear road map for achieving net zero emissions with near-term (2030), medium-term (2040) and long-term (2050) targets.

- Commitments must be broken down into distinct targets for reductions and removals.

- Commitments should cover all key sectors and include sector-specific targets, including separate targets for energy and the agriculture, forestry and land use sector. Targets should include non-CO2 GHG emissions such as methane.

- There should be mechanisms for ongoing reporting and tracking of progress towards the implementation of net zero commitments.

Land-based climate action must be anchored in food first, rights-based approaches that help to achieve zero hunger and zero emissions.

- Land is an important part of the climate solution. However, the use of land-based removal methods as offsets must be limited in net zero targets. Given that land is scarce and necessary for the food and livelihoods of the vast majority of those living in poverty, large-scale use of land-based removal technologies such as afforestation and BECCS would set unacceptably high trade-offs with land rights and food security and must be avoided. Land-based climate action should instead advance a holistic response to climate and food security and nutrition goals through investments in food-first approaches that drive forward not just mitigation but also adaptation and resilience. Such approaches facilitate a shift towards more equitable and sustainable food and land use systems that put small-scale farmers, Indigenous Peoples, women and communities at the centre of solutions and strengthen their rights and livelihoods, while protecting biodiversity and ecosystems.

LAND IS AN IMPORTANT PART OF THE CLIMATE SOLUTION. HOWEVER, THE USE OF LAND BASED REMOVAL METHODS AS OFFSETS MUST BE LIMITED IN NET ZERO TARGETS.

- Where land-based mitigation strategies are used to meet net zero targets, it will be essential to apply robust safeguards and to promote equitable and inclusive approaches that strengthen respect for the rights of indigenous communities and the livelihoods of small-scale farmers, women and local communities. This should include the following considerations:
    - Strengthening land governance must be a prerequisite to any land- or nature-based climate solution.
    - Participatory land use planning that supports inclusive and multifunctional landscape approaches should be promoted.
    - Governments and companies must ensure that the land rights of communities and Indigenous Peoples are protected as part of land-based mitigation efforts.
    - Any land acquisitions must be subject to careful due diligence and must not result in forced evictions. They must adhere to the principles set out in the Voluntary Guidelines on the Responsible Governance of Land, Fisheries and Forests (VGGT) and mechanisms to ensure robust implementation of the principle of free, prior and informed consent (FPIC).
    - UNFCCC and REDD+ safeguards for Indigenous and tribal peoples, local communities and small-scale farmers must be implemented and expanded.
    - Communities must have mechanisms for effective public participation and redress of grievances where their rights have been violated.
    - Equitable and transparent benefit-sharing arrangements must ensure that all stakeholders, including Indigenous Peoples and communities, are recognized and rewarded for their role in reducing and removing emissions, including through forest conservation and sustainable forest management.

ANNEX: METHODOLOGY

Note on methodology and calculations for net zero targets of fossil fuel companies

The focus of this project has been to estimate the amount of land required to meet the specific portion of company net zero targets that rely on any land-based sequestration activities. It should be noted that we are not estimating the area used to reduce emissions via avoided emissions, so forest management, avoided deforestation and avoided land conversion are not included in our estimates. While several companies are using offsets generated through REDD+, avoided emissions do not neutralize or draw down existing emissions and were therefore not counted towards a company's net zero target.

Assumptions

First, we assume that sequestration activities, whether within a company's own value chain or through the purchase of credits, will come from afforestation and reforestation activities. That is because the majority of sequestration activities rely on trees, not soils, especially for generating carbon credits. Second, we need to estimate the amount of CO2 that one ha of land can sequester when planted with trees.[74] We take an average across three estimates of tropical forest carbon capture from Pan et al. (2011)[75] and estimate that tropical forest regrowth activities, as the most dominant type of land-based removal activity that provides carbon offsets, on average sequester 2.87 tonnes carbon/ha. Converting carbon to CO2 (using a conversion rate of 1 tonne of carbon = 3.67 tonnes of CO2), we estimate that one ha of tropical forest regrowth captures 10.5 tonnes of CO2/ha/year. These figures are similar to those in Goodman and Herald (2014)[76] and Harris et al. (2021).[77] This means that sequestering one tonne of CO2 requires 0.1 ha of tropical forest. This is the equivalent of one tonne of carbon sequestration requiring 0.35 ha of tropical forest. Similarly, one tonne of CO2 sequestration requires 0.4 ha of temperate forests, which is the equivalent of one tonne of carbon sequestration requiring 1.5 ha of temperate forest.

The analysis is based on a combination of reported figures, and where information was not available, on estimated figures. Data has been based on publicly available information as of April 30, 2021.

Among these four companies, the land area needed in 2030 to contribute reported and estimated land-based removals is between 21,676,000 ha and 27,776,000 ha (an area the size of the UK). Among these four companies, the land area needed in 2050 to contribute reported and estimated land-based removals is between 50,362,000 ha and 69,400,000 ha (an area double the size of the UK).

Table 1: Reported and estimated figures (estimated figures in italics)

Company	2030 Absolute emissions reductions from land-based removals	Absolute emissions reductions stated or estimated from land-based removals (tonnes co2)	Area stated or estimated as needed to achieve land-based removals target (ha)	Area per tonne of CO_2 captured (ha/tonne)
TOTALENERGIES	7%	5,000,000 (2030) 23,800,000 (2050)	476,000 (2030) 2,600,000 (2050)*	0.10
SHELL	35%	120,000,000 (2030) 300,000,000 (2050)*	11,400,000 (2030) 28,600,000 (2050)*	0.10
ENI	23%	20,000,000 (2030) 40,000,000 (2050)*	8,000,000 (2030) 16,000,000 (2050)*	0.40
BP	15%*	18,960,000 (2030)* 54,150,000 (2050)*	1,800,000–7,900,00 (2030)* 5,000,000–22,500,000 (2050)*	0.10

* Estimates

The methodology for this analysis was peer reviewed and Oxfam provided an opportunity to comment to all companies. and Their responses are summarized below alongside the publicly available information that this analysis is based on.

TotalEnergies

TotalEnergies' 2020 annual report included the estimate of sequestering 5 Mt of CO2/year by 2030 and mentions an agroforestry project in sub-Saharan Africa that could sequester 10Mt of CO2 over 35 years, or roughly 286,000 tonnes of CO2/year.[78] In March 2021, TotalEnergies did report a new partnership with Microsoft to jointly support each other in reaching their net zero targets.[79] TotalEnergies reports a reduction in energy intensity of 15% per megajoule of energy produced in 2030 when compared to 2015.[80] Taking into account a 15% increase in energy demand by 2030[81] and reducing energy intensity by 15% leads to an estimated emissions reduction of 85 Mt. The company has stated that it will remove 5 Mt through land-based strategies, or 7% of their total reductions. Applying these same calculations to its 2050 target of a 60% drop in intensity per unit of energy, and assuming 7% of their total emissions reductions still comes from land-based mitigation, leads to our high-end 2050 estimates.

TotalEnergies' response: The company's 2030 targets for oil & gas operations worldwide include reducing GHG emissions (Scopes 1 & 2) on the Group's operated oil & gas facilities of 46 Mt CO2e in 2015 to less than 40 Mt CO2e

by 2025 (a 15% decrease). By 2030, the target is a reduction of at least 40% of the net emissions compared to 2015 for its operated oil & gas activities; reduce the average carbon intensity of the energy products used by customers worldwide by more than 20% between 2015 and 2030 (Scopes 1, 2, 3). Total aims to develop NBS projects that create environmental and societal co-benefits (e.g. looking for multiple land credits: carbon but also food, biodiversity, jobs, livelihood...) in line with the recent statement: 'The Group is acting on the principle that, in order to be viable over time, natural carbon sinks must be connected to an agricultural or forestry value chain that is local and sustainable. Regional issues related to carbon sink management can then be comprehensively addressed.' More information can be found at: https://www.totalenergies.com/commitment/climate-change/climate-our-vision

Shell

Shell's net zero targets include an intention to sequester 120 Mt of CO2 per year by 2030, all to offset Scope 3 emissions,[82],[83],[84] which would translate to needing 11,400,000 ha. The 2050 figure is based on an estimate since Shell does not provide figures for how much CO2 it intends to offset by 2050. It does note that it intends to mitigate remaining Scope 1 and 2 emissions with offsets, and to offer its customers offset credits in a variety of ways. The Shell 2021 Energy Transition Strategy also notes that in 2020 it acquired a stake in an Australian carbon farming company that 'runs more than 70 carbon farming projects that span an area of around 10 million hectares.

Shell's response: Shell's 2050 goal does not rely on 22m ha of reforestation. We are implementing the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) in our reporting. We are also engaging with others including the investor group Climate Action 100+ and the Science Based Targets initiative as they develop new reporting, accounting and target-setting frameworks for the oil and gas industry. More information about Shell's climate plan can be found at: https://www.shell.com/energy-and-innovation/the-energy-future/our-climate-target.html#iframe=L3dlYmFwcHMvY2xpbWF0ZV9hbWJpdGlvbi8

ENI

Eni's new strategy[85] states that 6 Mt of CO2/year will be sequestered through forestry activities by 2024, which would require 600,000 ha. It had already announced a plan to sequester 20 Mt on 8m ha through activities by 2030. Extrapolating to its 2050 target of 40 Mt of CO2/year would suggest it will need 16,000,000 ha by 2050. Eni's estimate for the area needed per tonne of CO2 captured is less optimistic, at 2.5 tonnes CO2/ha. However, their projects are likely to be more in dryland and temperate forests in southern Africa, where sequestration rates will be lower than in tropical forests.

Eni's response: In 2021, Eni further strengthened its commitment and it is now aiming at being carbon neutral by 2050, considering Scope 1, 2 and 3, both in terms of absolute emissions and carbon intensity. Eni's progress towards its carbon neutrality long-term target is monitored through a set of life cycle GHG emissions indicators, whose results are published annually in Eni's annual report and verified by an independent auditor (Eni for 2020 - Carbon Neutrality by 2050). Acknowledging the important role of Natural Climate Solutions (NCS)

in limiting global warming to 1.5°C, as envisaged by the more ambitious goals of the Paris Agreement, Eni considers as crucial the inclusion of such solutions in its strategy to achieve global carbon neutrality goals in the long term.

BP

BP released details on its net zero strategy in August 2020.[86] Given that very little information is provided on its intended use of offsets, this analysis has used certain conservative assumptions to arrive at estimates. Although BP has not set any target for use of offsets in meeting net zero commitments, we estimate here the impact of BP offsetting 15% of total emissions with land-based removals to get the estimates for tonnes of CO2 removed by 2030 and 2050 (15% is the median proportion of reductions achieved through offsets of other progressive energy companies). BP does say in its 2020 sustainability report that it does not intend to rely on offsets to meet Scopes 1 and 2 net zero targets to 2030, and that it will work to be net zero in part of its Scope 3 emissions by 2050, which would require reducing or offsetting 361 Mt of CO2/year (it will reduce by 30–40% by 2030, which would mean reducing or offsetting 126.4 Mt/year of CO2.[87] Further, BP has indicated support for nature-based solutions as a means to achieving net zero emissions on numerous occasions.[88] In December 2020, BP announced that it had gained a majority stake in Finite Carbon, a US-based carbon offset developer focused on forest carbon offsets.[89] If we estimate that 15% of BP's offsets will come from land-based removals, then we get the estimates for tonnes of CO2 removed by 2030 and 2050. A wide range of land area needed reflects the variation in using tropical versus temperate forests. BP's investment in Finite Carbon suggests that some offsets will be in temperate forests, and thus the estimates of the high end of the area needed might be more likely.

BP's response: We do not intend to rely on offsets to meet our own 2030 emission reduction targets or aims, we see offsets potentially helping us to go beyond them if possible. Details of our absolute emission reduction targets across Scopes 1, 2 and 3 are included in https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/investors/bp-annual-report-and-form-20f-2020.pdf

Estimating land required for carbon removal

Currently, roughly 1.6bn ha of land is cropland (1.4bn ha is arable land and another 0.2bn ha is permanent crops),[90] and another 3.2bn is used for grazing. Any combination of these lands could theoretically be used for land-based climate mitigation strategies, and specifically for planting trees/forests. Figures from the IPCC Special Report on Climate Change and Land,[91] CLARA,[92] and Griscom et al. (2017)[93] suggest the following potential:

- Removal on existing forest land: with 1.2-2.7bn ha (30–80% of the existing 3.3bn ha of forest land), 2.9 to 3.8 Gt CO2e/year could be removed.
- Removal on multifunctional cropland: with 300–770mha (20–50% of the 1.6bn ha current cropland) 1.0 to 2.8 Gt CO2e/year could be removed.
- Removal on multifunctional grazing land: 786m ha (25% of the current 3.2bn ha of grazing land) could remove 0.3 Gt CO2e/year

- Soil carbon: 0.4–8.6 Gt CO2e
- Afforestation/reforestation: 0.5–10.1 Gt CO2e, 48–962m ha
- BECCS: 0.5–5 Gt CO2e, 380–700m ha

Land used exclusively for removal that could compete with food production could range from 428m ha to 1.62bn ha (afforestation, reforestation and BECCS), which would remove 1–15 Gt CO2e/year. Total multifunctional land use with removal activities could remove 4.6–15 Gt CO2e/year. CLARA estimates that there are roughly 350m ha available for land-based removals that would not compete with crop production. Griscom et al. (2017) estimate that there are roughly 687m ha available for land-based removals in total.

Methodology for assessing zero hunger, zero emission approaches to land-based mitigation

The research draws on the synthesis provided in the two IPCC reports released in 2018 and 2019 (IPCC 2018,[94] 2019a[95]) and focuses on the gaps left by these and other similar global analyses of the relationships between climate, land use and land management, and multidimensional equity outcomes. The numbers in the figure all come from the IPCC special report on Climate Change and Land (Shukla et al. (2019).[96] We used a modified systematic review process to gather relevant recent empirical literature focused on the observed and predicted impacts of land-based climate change mitigation strategies on food security, gender equity, economic equity and climate equity. We developed a list of search terms associated with each mitigation strategy and each dimension of equity and used them in combination in both open-access search engines (Google and Google Scholar) and proprietary search engines (Web of Science). We defined recent as anything from 2010 onwards, and we conducted a separate search of the period 2018–19 to ensure that key findings from recent research were not lost in the search algorithms that prioritize citation numbers and thus privilege work that has been available for longer. This process is considered a modified systematic review because we did not review every paper returned with the above-defined search criteria. Instead, we included in our review those papers with a large number of citations, those supported by global research institutions, and those that cover under-studied aspects of climate change mitigation or equity. A full description of the underlying research is available in Oxfam's research backgrounder Zero Hunger, Zero Emissions: Land-based climate change mitigation, food security, and equity.[97]

NOTES

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5 Factors for calculation: temperate forest has the capacity to remove between 2.5 and 7.5 tonnes of CO2 per hectare.

6 Shell, TotalEnergies, Eni and BP will need an estimated 50,362,000 to 69,400,000 ha of land for carbon removal. This is twice the size of the UK (24m ha).

7 We estimate the oil and gas sector as a whole will likely require around 500m ha of land – half the size of the US (983m ha), or one-third of the world's farmland (1.62 bn ha).

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