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GOING NEGATIVE

How carbon sinks could cost the Earth

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Credit: Sigit Deni Sasmito / Center for International Forestry Research (CIFOR) / Flickr.com/CC

Introduction

The 2015 Paris Agreement on climate change was a landmark the world rightly applauded. Its pledge, agreed by 196 nations, to limiting global warming to "well below 2 degrees Celsius – and preferably to 1.5 degrees" lays down for humanity one of its greatest challenges for the 21st century.[1] But how to achieve this goal?

The Agreement calls for "global peaking of greenhouse gas emissions as soon as possible… so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." This inevitably puts the use of land-based sinks such as forests at the heart of the global blueprint for stemming warming.

But climate scientists say that to restrict warming to 1.5 degrees, we will have to find ways of removing carbon dioxide from the atmosphere – "negative emissions", in the climate-change jargon. That, they say will require harnessing the natural processes of photosynthesis in plants to convert atmospheric carbon dioxide (CO2) into living tissue. Probably trees.

But at the scale likely to be needed to engineer a stable climate, that will require significant areas of land for carbon sequestration. It poses major threats to both natural biodiversity and rural livelihoods in forests and elsewhere. The warning bells should be sounding. In the name of negative emissions to halt climate change, the world may be on the verge of the biggest and most destructive "land grab" ever.

The push to lock up potentially hundreds of billions of tonnes of carbon on the land – most of it poor-world land locking up rich-world emissions – is set to emerge as a major issue in climate politics, potentially pitting the requirement to fight climate change against other world priorities, such as food security, biodiversity protection, human rights and ending poverty, all recently adopted by governments in the 2030 sustainable development goals (SDGs).

The push to lock up potentially hundreds of billions of tonnes of carbon on the land – most of it poor-world land locking up rich-world emissions – is set to emerge as a major issue in climate politics

1 UNFCCC 2015: http://unfccc.int/paris_agreement/items/9485.php

Pond dyke damaged by tidal surge, Sirajganj, Rajshahi, Bangladesh

Credit: WorldFish / Flickr.com/CC

+1.5°C

The carbon conundrum

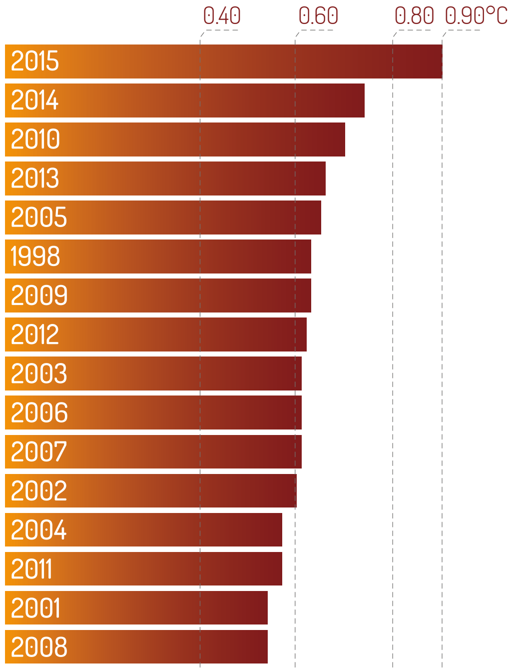
Our planet has a thermostat. The dial is the concentration in the atmosphere of carbon dioxide, the planet-warming greenhouse gas. Most scientists believe that concentration dictated our journey into and out of ice ages, and now threatens to push us into a world of super-warming.

The threat arises because the human hand is now on the dial. Till now global industrialisation has been fuelled by burning fossil fuels that contain carbon. As a result, billions of tonnes of CO_2 have been poured into the atmosphere. About half of those emissions are absorbed by oceans and vegetation, but the rest stays in the air – for centuries. As a result, the world is getting hotter, with warming at 1 degree and counting.

To stop this and meet the Paris pledges, we need drastic and urgent action. On current trends, we could have hit 1.5 degrees of warming within two decades, and 2 degrees by 2050. But there is hope. After two decades of record growth, global CO_2 emissions have stabilised since 2013, thanks mainly to better energy efficiency and massive investment in low-emissions energy sources like wind and solar power.[2] Now we need to go from stable emissions to a rapid decline.

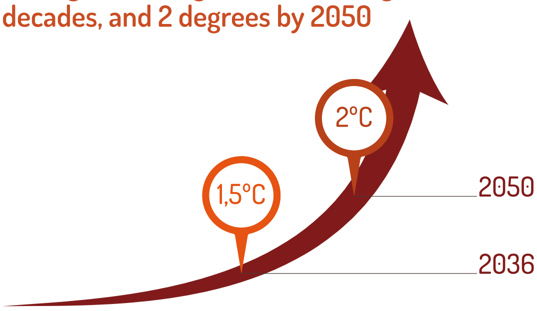
Intergovernmental Panel on Climate Change (IPCC) author Joeri Rogelj lays out the task by calculating how many more tonnes of CO_2 we can afford to add to the atmosphere.[3] The Paris Agreement promises to bring net emissions to zero by the second half of the century. He calculates that means limiting total emissions over that time to about 800 billion tonnes. While there are uncertainties about exactly how

15 hottest years since records began (in 1880) all happened this century



Source: https://www.ncdc.noaa.gov/sotc/global/201513

On current trend, we could hit a global average of 1.5 degrees of warming within two decades, and 2 degrees by 2050

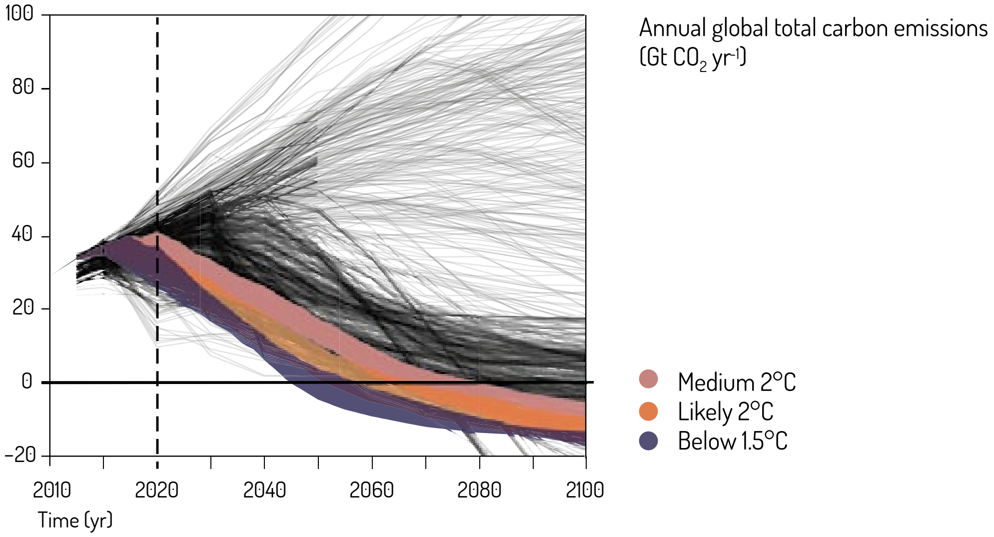


Source: https://www.ncdc.noaa.gov/sotc/global/201513

2 Jackson 2015: http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2892.html
3 Rogelj 2015: http://www.nature.com/nclimate/journal/v5/n6/full/nclimate2572.html

Carbon emission pathways for "2C°" and "1.5°C"

Each strand is a scenario showing emissions over time. The coloured strands are scenarios that limit warming to 2 degrees or 1.5 degrees, with varying degrees of probability



Source: Rogelj et al., 2015, Nature Climate Change. Based on 200 Message and Remind scenarios

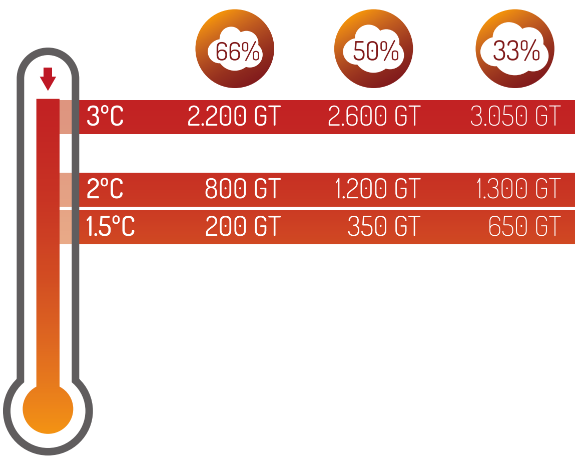
sensitive the thermostat is, achieving that should be enough to limit warming to 2 degrees, he says. But to achieve the Paris goal of 1.5 degrees would require limiting future emissions to less than 300 billion tonnes. That is probably less than a decade's worth at current rates, and is almost certainly impossible by only shutting down the fossil fuel business.[4]

Instead, we will need to combine zero emissions with sucking some CO_2 back out of the air – negative emissions. If we restrict our future emissions to 800 billion tonnes, then we will still have to remove roughly 500 billion tonnes to keep warming to 1.5 degrees.[5,6] Because there is a time lag of a few decades before atmospheric CO_2 concentrations are fully reflected in higher temperatures, scientists believe that provided the negative emissions are achieved by the end of the century, we can probably keep below 1.5 degrees.

The Paris Agreement said nothing about negative emissions. But if we are serious about its 1.5 degree target, that is the path we must embark on. So is it remotely possible?

There are several options for creating "negative emissions". They include

Our carbon budget in 2016



Carbon Brief, 2016 (Source: IPCC AR5, Synthesis Report)

4 Carbon Brief 2016: https://www.carbonbrief.org/analysis-only-five-years-left-before-one-point-five-c-budget-is-blown
5 Rogelj 2015: http://www.nature.com/nclimate/journal/v5/n6/full/nclimate2572.html
6 Pearce 2016a: https://www.newscientist.com/article/2077540-the-big-carbon-clean-up-2-steps-to-stop-global-warming-at-1-5-c/

Trees store carbon more densely than crops

Credit: Sigit Deni Sasmito for Center for International Forestry Research (CIFOR) / Flickr.com/CC

capturing it from the air using chemical factories; stimulating the erosion of rocks, which uses up CO_2; encouraging the oceans to absorb more of the gas by fertilising the growth of marine algae; pushing similar processes in the soil by burying charcoal, a technique sometimes called biochar; capturing the emissions from bioenergy and storing the carbon underground, and growing more vegetation on land, especially trees.[7]

But while climate researchers have assessed the potential of such ideas in climatic and cost terms, few have considered the implications for society or nature of the vast industries that would be created.[8]

Early studies suggest methods involving chemistry and geology would be wildly expensive, and fertilising the oceans might not work and involves incalculable risks for marine ecosystems. Burying charcoal has yet to be seriously investigated, but early studies show it is unrealistic. That leaves giving terrestrial plants such as trees or bioenergy crops a helping hand in photosynthesising more CO_2 from the air. Trees look much the most promising candidate for large-scale sequestration, because they store carbon more densely than crops.[9] But there are a number of ways of generating negative emissions: creating permanent sink forests to absorb and store carbon; allowing natural forests to regenerate; and growing bioenergy crops or forests that are combined with the capture and geological storage of the resulting power-station emissions.

7 Peters 2016: http://www.nature.com/nclimate/journal/vaop/ncurrent/abs/nclimate3000.html
8 Williamson 2016: http://www.nature.com/news/emissions-reduction-scrutinize-CO2-removal-methods-1.19318
9 Smith 2015: http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2870.html

2 degrees or 1.5?

The Paris climate conference confounded those who expected a watered down agreement. Given the world has already warmed by an average of 1 degree, the task of keeping "well below" 2 degrees and if possible to 1.5 degrees is tough. Especially as the Arctic is already approaching 3 degrees warmer than two centuries ago. And, just two months after the Paris agreement was signed, global average temperatures in February 2016 exceeded 1.3 degrees, inches away from the 1.5 degrees target.

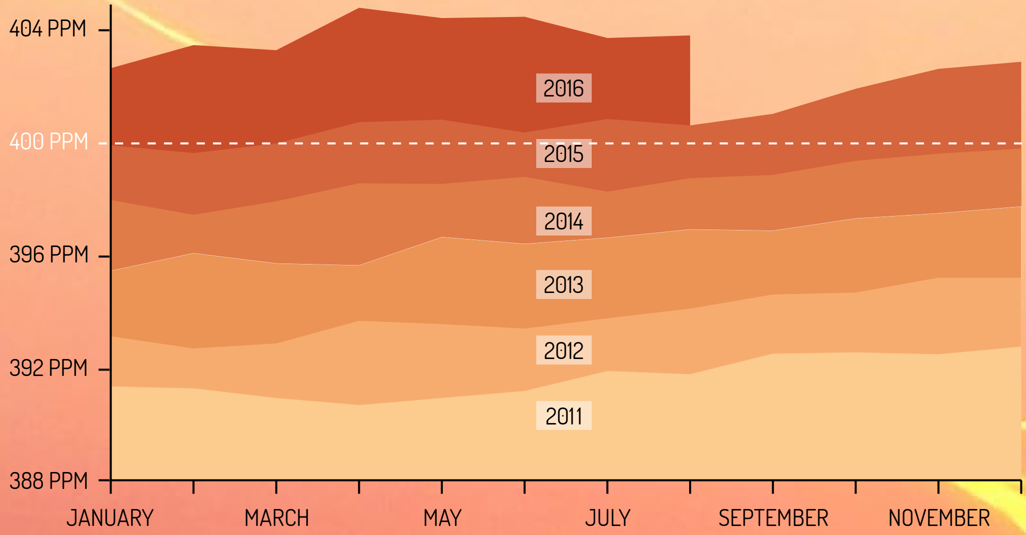
Evidently, the target for curbing average temperatures cannot be achieved in all places or at all times. So does the difference between an average global warming of 1.5 and 2 degrees actually matter? Half a degree doesn't sound a lot. And it isn't. But averages are not what matters. Even climate doesn't matter so much. What matters is the weather we experience. And the trouble is that a small, seemingly insignificant change in climate averages massively changes the risks of extreme and destructive weather events, like heatwaves, storms, droughts and floods.

It already is. The risk of "once in a thousand days" hot weather has already increased fivefold. It will double again at 1.5 degrees, and double once more in going to 2 degrees.[10]

Anything above 1.5 degrees warming "marks the difference between events at the upper end of present-day natural variability and a new climate regime," says Carl-

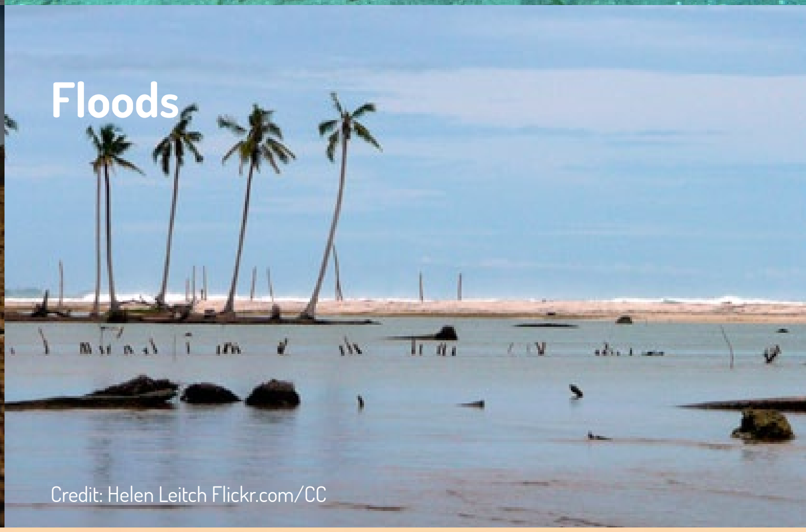
Carbon dioxide moves permanently above 400 ppm

At least in our lifetime



Source: Scripps Institute of Oceanography Mauna Loa Observatory

10 Fischer & Knutti 2015: http://www.nature.com/nclimate/journal/v5/n6/full/nclimate2617.html



Friedrich Schleussner of the Potsdam Institute for Climate Impact Research, whose modelling predicts much longer droughts in huge swathes of the world, from the Mediterranean to Central America, and the Amazon basin to southern Africa. Droughts harsh enough to cut river flows by 50 per cent.[11]

Other studies suggest that past 1.5 degrees, the Arctic will be ice-free, the Amazon rainforest will die and the Siberian tundra will melt. Ecosystems will take huge hits. As warming passes 1.5 degrees, "virtually all coral reefs are projected to be at risk of severe degradation due to temperature-induced bleaching", concludes Schleussner.

So will people. Parts of the Persian Gulf will become physiologically uninhabitable for humans without permanent air conditioning.[12] Going from 1.5 to 2 degrees could halve corn yields in parts of sub-Saharan Africa where corn is all that stands between life and death.[13]

Then there is sea-level rise. Just 1.5 degrees will deliver sea level rise of an alarming 1.5 metres by 2300; but 2 degrees would lock in 2.7 metres.[14] At the Paris talks, the countries that pressed most strongly for the inclusion of a 1.5 degree target were those most vulnerable to extreme climate or rising sea levels. Kiribati, the Pacific island nation that spoke up the loudest, would disappear from the map if the world fails to achieve it. Tell them the difference doesn't matter!

11 Schleussner 2015: https://www.researchgate.net/publication/284913268_Differential_climate_impacts_for_policy-relevant_limits_to_global_warming_the_case_of_15_C_and_2_C
12 Pal & Eltahir: http://www.nature.com/nclimate/journal/v6/n2/full/nclimate2833.html
13 Bruce Campbell http://www.huffingtonpost.com/bruce-campbell-phd/climate-change-half-a-deg_b_8756428.html
14 Schaeffer 2012: https://www.pik-potsdam.de/news/press-releases/archive/2012/erheblicher-anstieg-des-meeresspiegels-in-einer-welt-mit-zwei-grad-erwaermung Yale

Forests: threats and opportunities for negative emissions

Forests are one of the most promising natural places to engineer negative carbon emissions. Globally, they store around a trillion tonnes of CO_2. They once stored twice as much. But deforestation has halved their extent.

Deforestation and forest degradation have also been responsible for a third of global CO_2 emissions in the past 150 years, though the proportion now is only around 10 per cent and continues to fall as fossil-fuel emissions grow and many countries adopt targets for "zero deforestation".[15] If, as the Paris Agreement implies, the world wants to soak up 500 billion tonnes before the end of the century, then dramatically growing the current carbon storage of the world's forests would be an obvious place to start.

A number of approaches have been proposed. The first is creating new permanent "carbon sink" forests using monocultures of fast-growing trees designed to maximise carbon uptake – sometimes on former forest land, but sometimes elsewhere. A second is to create new bioenergy forests that would be harvested for timber and burned in new power stations to replace coal and other fossil fuels, with the land then regularly replanted to grow another crop and suck up more CO_2. This theoretically carbon-neutral form of bioenergy could also generate negative emissions with the addition of technology to capture the emissions resulting from burning the timber and burying them out of harm's way. The final option – which has so far been least discussed by the climate community – is to suck up CO_2 by restoring natural biologically diverse carbon-rich forest ecosystems to more like their previous extent.[16]

Sink forests: One method of removing CO_2 from the atmosphere is to augment nature's primary terrestrial carbon store, by creating giant "carbon sink" forests to permanently hold carbon in timber and soil. Calculations to date suggest that planting enough trees to soak up and store 500 billion tonnes of CO_2 before the end of the century would likely require around 10 million square kilometres of land.[17,18,19] That is an area the size of the Sahara or the US. While bioenergy crops can do the same thing, the density of carbon is much less and transport costs are correspondingly higher.

The danger is that these forests, designed specifically for measurable carbon capture, would comprise mostly dense monocultures of fast-growing species like eucalyptus and acacia. They would also be planted largely in the tropics where growth rates are fastest.

Such a programme would essentially be an extension of the carbon offset tree-planting programmes established under the Kyoto Protocol. Though this time the idea would not be to offset continuing CO_2 emissions, but to create global negative emissions. The Kyoto projects, however, have been bedevilled by claims of false carbon accounting, fears about their permanence and land grabbing.

15 Mackey 2013: http://www.nature.com/nclimate/journal/v3/n6/full/nclimate1804.html
16 Kartha &Dooley: https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2016-08-Negative-emissions.pdf
17 Smith 2015: http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2870.html
18 Williamson 2016: http://www.nature.com/news/emissions-reduction-scrutinize-CO2-removal-methods-1.19318
19 Houghton 2015: http://www.nature.com/nclimate/journal/v5/n12/full/nclimate2869.html

Scientists study on above-ground and below-ground biomass in mangrove ecosystems. Indonesia.

Credit: Kate Evans Center for International Forestry Research (CIFOR) Flickr.com/CC

To ensure these forests did their job, there would have to be a programme to maintain their carbon-holding power as they age and trees die. A critical question is how permanent these carbon sinks could be in the face of inevitable climate change. They could succumb to droughts or migrating pests, wildfires or land management decisions – potentially releasing their carbon stores into the atmosphere and turbocharging climate change.

Bioenergy forests with carbon capture: Rather than trying to create carbon-sink forests that hold carbon forever, an alternative approach is to make productive use of them, by harvesting the timber and burning it in power stations as a substitute for fossil fuels. If the emissions from burning the trees were also captured, the 500 billion tonnes of CO_2 we need to take out of the atmosphere could be pumped underground and stored there, to achieve negative emissions.

That's the theory, anyhow. As we show elsewhere, there are serious problems with it. But even on its own terms, the practice so far suggests major regulatory problems.

The European Union already incentivises biomass burning in power plants and heating systems in the belief that, provided the forest sources are sustainable, this is a low-carbon source of renewable energy. But it all depends on scale, what biomass is used and how it is burnt.[20] Almost half of harvested timber in the EU is now used for the generation of electricity or heating. It supplies five per cent of EU energy needs, and is becoming increasingly central to meeting the EU's renewable energy targets.

It has led to a boom in industrial forestry. Yet, worryingly, countries that rely most on biomass for energy – such as Slovakia and Romania – have the least credible systems for ensuring that harvested trees are replaced. Without that obligation, the idea that the fuel is renewable or carbon-neutral is a sham. "You could cut down the Amazon, turn it into a

20 Source (Fern, 2016 http://www.fern.org/climate%26bioenergy)

parking lot, ship the trees to Europe to replace coal, and Europe would claim a reduction in emissions," argues Tim Searchinger of Princeton University.[21] If the bioenergy is not carbon-neutral, then it also cannot be used to achieve negative emissions.

While in theory bioenergy forests could be planted on degraded former forest land, this has not happened much so far. Usually the first harvest is from old growth forest, often of great ecological value. In eastern Slovakia, the beech forests of the Carpathian Mountains are being clear-cut to generate electricity. The Poloniny National Park, which has the highest proportion of old-growth forest in the country, has been specially targeted. Access for logging trucks has been facilitated by EU-funded road improvements into the park. Claims that only low-grade timber is being burned are palpably false, with large logs piled up outside power plants.[22]

In Romania, where 250,000 hectares of forests have been lost or severely degraded in the past decade, much of the timber ends up at power stations there and across the border in Germany or Austria. "We have established a clear link between illegal logging in Romania and the EU wood pellet market," says Susanne Breitkopf of the Environmental Investigation Agency, which has studied the trade.[23]

An even larger scale operation is now under way in the American Deep South, where timber is being harvested on a huge scale to supply a single power station in Europe – Drax in northern England. In the backwoods of Louisiana, Mississippi and the Carolinas, forests are being felled, and their logs trucked in an unending stream to mills that turn them into dried and compressed pellet for shipping across the Atlantic. Drax emits more than 20 million tonnes of CO_2 into the atmosphere every year, mostly from burning the seven million tonnes of wood pellets it now ships from the US.

American environmentalists are horrified. The forests of the Deep South, like many round the world, are not pristine. The hand of man is everywhere. But they regenerate naturally. And they have been harvested and used by local businesses in a way that maintains both their extent and much of their biodiversity. "Green energy" is changing that. The dramatic intensification of forestry to supply wood pellets to power stations across the world is resulting in naturally regenerating forests being replaced by planted monocultures of genetically identical trees.

And in places vital wetland forest ecosystems are under threat. Investigators have revealed oak and sweetgum hardwood stands being clear-felled in places like the Urahaw Swamp in North Carolina. What appals them most is that all this is being done in the name of saving the planet and protecting us all from climate change.[24]

The holy grail for climate scientists is to turn bioenergy forests into a mechanism for negative emissions. This involves combining bioenergy forests (or other crops) with technology being developed for capturing CO_2 going up the power station stack and then burying it out of harm's way – for instance in old salt mines or abandoned oil wells. This is known as Carbon Capture and Storage. In the complete system, known as Bioenergy with Carbon Capture and Storage (BECCS), carbon is taken up by growing trees or energy crops, which are burned to generate energy, the emissions are captured from the smokestack and then buried. In theory, the more energy is generated, the more CO_2 is sucked out of the air.

21 LePage 2016: https://www.newscientist.com/article/mg23130922-600-revealed-the-renewable-energy-scam-making-global-warming-worse/
22 Pearce 2015: http://www.fern.org/sites/fern.org/files/upinflames_internet.pdf
23 EIA 2015: http://eia-global.org/images/uploads/EIA_2015_Romania_Report_Final_low_res.pdf
24 Macon 2015: https://www.dogwoodalliance.org/tag/urahaw-swamp/

Across Sweden monoculture plantations are replacing old growth and natural forests

Credit: Robert Svensson

BECCS is a better use of land than permanent carbon-sink forests, say its advocates, because harvested trees can be replaced with new trees. And it is better than normal bioenergy because it captures the emissions from power stations, and stores this more or less permanently underground. So every time the land set aside for trees and crops is replanted, more carbon can be captured, doubling up on the negative emissions. If two growing cycles of trees could be accomplished by the end of the century, then the amount of land needed to capture 500 billion tonnes by 2100 could be halved to maybe five million square kilometres.[25] Clearly it would be possible to grow many more cycles of annual biofuel crops, but the carbon capture of each cycle is much less.

No BECCS project is yet in operation. And while the basic technology is used on a small scale in the oil industry, the idea of doing it on a huge scale, as a continuous process that removes emissions from major power plants across the world, raises huge questions about its practicability and sustainability. It is decades away from full-scale development, but Drax has plans – currently suspended for want of funding – for a trial, to divert some of its CO_2 emissions for burial in former hydrocarbon fields beneath the North Sea.

Many climate scientists believe this should be a forerunner of thousands of giant power plants across the world using trees to suck CO_2 out of the atmosphere and bury it forever. Old coal-fired power stations took carbon from underground and generated energy by sending it into the air; but BECCS power stations would do the reverse, taking CO_2 from the air and putting it back underground. Some say it is the only way of fulfilling global climate pledges made in the Paris Agreement. Others believe that focussing on this unproven technology is a distraction what what we really need to do: stop emitting CO_2.[26]

25 Smith 2015: http://www.nature.com/nclimate/journal/vaop/ncurrent/full/nclimate2870.html

26 Source: Andersen and Peters, 2016. http://science.sciencemag.org/content/354/6309/182.full

Rethinking forests as carbon sinks

If using trees to take CO_2 out of the air and put it back underground sounds too good to be true, it is.

For one thing, the carbon prospectus for bioenergy forests is far from water-tight. The industrial production of biomass for fuel changes the ecology of woodland in ways that significantly reduce the amount of carbon they hold. If the average tree in the forest is younger than before, then the carbon content is less. Likewise if soils are drained or otherwise modified for more intensive cultivation, then their carbon content falls.

So there is a paradox. Planting young fast-growing trees may absorb more carbon than older or slow-growing trees, but the overall result will be less carbon in the forest than before.[27]

But whatever the carbon gains from negative-emissions technologies, they have to exist in a world of competing demand for – and rights to – land. Most will be grown in the tropics, where trees grow faster, but also where the need for land to grow food is most immediate.

The world does not have spare land. Very little is unused. Helmut Haberl of the Alpen-Adria University in Vienna identifies as the likely home for sink forests the world's "pasture lands, sparser woodlands, savannas and tundras". But most, particularly in the tropics, are already sources of wild food, fuelwood, construction materials or pasture for animals for rural communities. Converting such land to carbon-sink forests would involve a land grab on a scale never seen before.[28]

It would be a human rights calamity. And there would be major implications for food security, and biodiversity. If food farmers lose their land to bioenergy crops or carbon-sink forests, the most likely outcomes are that less food is grown or farmers invade the nearest rainforest or natural grassland.[29] Either people go hungry, or the supposed negative emissions are cancelled out by positive emissions from trashed forests.

Meanwhile, the new carbon-sink forests themselves would have massive impacts on biodiversity, replacing diverse ecosystems with monocultures. The resulting loss of primary forests and natural grassland could cause a loss of terrestrial species "perhaps worse" than the losses from the warming that was prevented, argues Phil Williamson of the University of East Anglia.[30] No wonder the Convention on Biological Diversity in 2010 adopted a moratorium on "any technologies that increase carbon sequestration from the atmosphere on a large scale that may affect biodiversity." Any attempt to establish carbon-sink plantations or large-scale energy crops would fall foul of that moratorium.

A new approach is required. An approach based not on creating a vast new industry for sucking CO_2 from the air, but on reinstating nature's ability to store carbon in a landscape also occupied by humans. We return to the last of our three options for creating carbon sinks.

27 Schulze 2012: http://onlinelibrary.wiley.com/doi/10.1111/j.1757-1707.2012.01169.x/abstract
28 Haberl 2013: http://iopscience.iop.org/article/10.1088/1748-9326/8/3/031004/meta
29 Searchinger 2015: http://science.sciencemag.org/content/347/6229/1420
30 Williamson 2016: http://www.nature.com/news/emissions-reduction-scrutinize-CO2-removal-methods-1.19318

Use of forests could be nurtured and customary land rights maintained.

Credit World Resource Institute (WRI)

Natural regeneration: Properly conceived, many argue, reinstating natural ecosystems could play a huge role in negative emissions, without riding roughshod over other global priorities. The Stockholm Environment Institute has concluded that simply allowing former natural forests and degraded forest areas to regrow could lock up some 330 billion tonnes of CO_2.[31] Moreover the longevity of their carbon storage will be much more assured, since the natural forests will be less vulnerable than monocultures to threats as varied as fire, pests and climate change itself.

And the collateral gains would be huge. A system for reviving nature's ability to store carbon using natural ecosystems could coincide with, rather than blight, other uses of forests. Restoring natural forests will restore their biological diversity.[32] Meanwhile, sustainable use of forests could be nurtured and customary land rights maintained.

This natural regeneration of forests could be augmented with the promotion of agro-ecology. More sustainable systems of food production based on making natural soils more fertile and less reliant of chemical fertiliser can enhance food security, are pro-poor and increase the capacity of agricultural soils to capture and store carbon.

31 Kartha &Dooley: https://www.sei-international.org/mediamanager/documents/Publications/Climate/SEI-WP-2016-08-Negative-emissions.pdf
32 Schulze 2012: http://onlinelibrary.wiley.com/doi/10.1111/j.1757-1707.2012.01169.x/abstract

Paris promises and land rights

Twenty-five years ago, Guatemala created the Maya Biosphere Reserve. The aim was to protect the largest remaining tropical rainforest in Central America. At the time, conservationists were angry that government officials set up a dozen zones inside the reserve where local communities could do small-scale logging.

Today that seems like a stroke of genius. The forests in the core protected areas of the reserve are rapidly being lost, as cattle ranchers invade. But the community forests, jealously guarded by locals, thrive. Their deforestation rates are only five per cent of those in the supposedly "protected" areas. On current trends, 40 per cent of the reserve will be stripped of forests by 2050, and most of what survives will be in the community-run areas.[33]

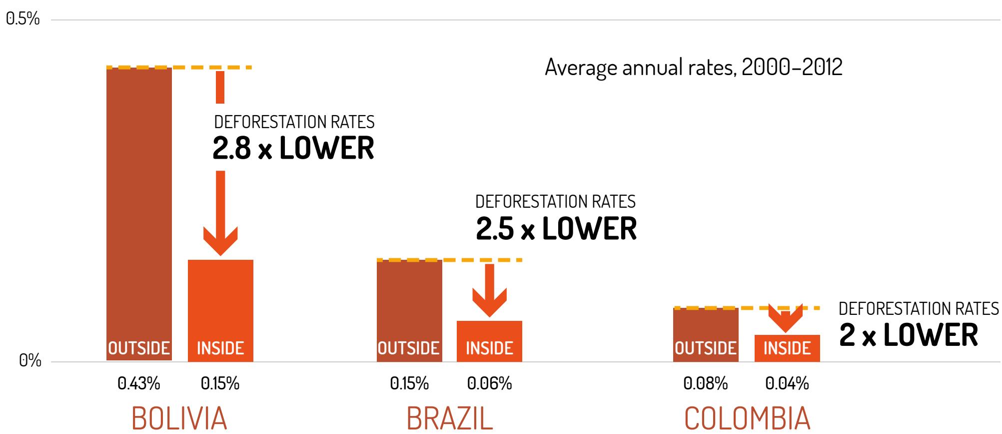
Communities don't just protect forests, they grow them. The Himalayan nation of Nepal has a successful tradition of community management of its forests. It has 20 per cent more forests than it had 25 years ago. Studies show that most of the gains have been in areas owned and managed by communities.[34]

Community consent is not just vital, it is the touchstone for success.

There is a lesson here for those who seek to commandeer the world's forests as carbon sinks. Community consent is not just vital, it is the touchstone for success. The temptation to grab land for large-scale afforestation to achieve negative emissions has to be resisted if the goal of enhanced and sustainable carbon sinks is to be achieved. Sustainability requires securing indigenous and local communities land rights rather than removing them.

Indigenous groups are good forest stewards

Deforestation rates inside legally-recognised indigenous lands are 2–3 times lower than in similar areas that are not registered to indigenous peoples.

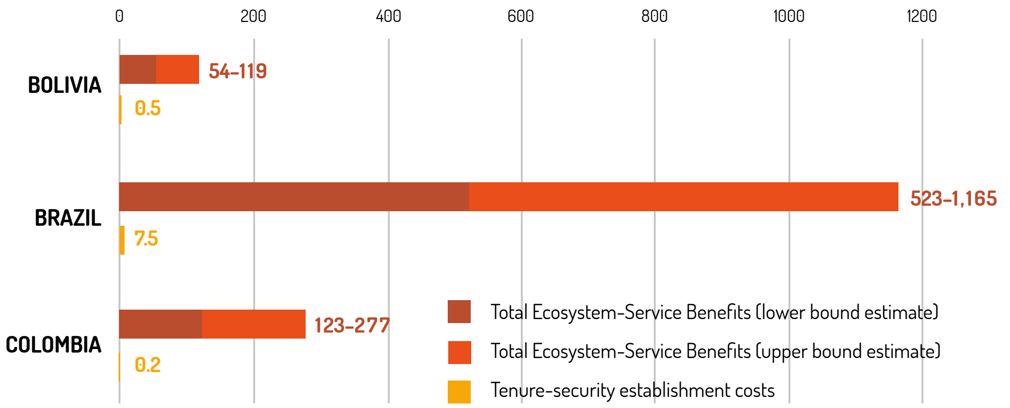


Credit World Resource Institute (WRI)

33 Hughell & Butterfield 2008: http://www.rainforest-alliance.org/forestry/documents/peten_study.pdf
34 Gautam 2004: http://www.bioone.org/doi/abs/10.1505/ifor.6.2.136.38397

Securing indigenous lands makes good economic sense

Indigenous lands in the Amazon sequester carbon, reduce pollution, control erosion and flooding, and more, providing billions and even trillions of dollars' worth of „ecosystem services". Government costs of securing this land is less than 1 percent of the total benefits provided.



Credit World Resource Institute (WRI)

This is no sideshow. Around half of the world's land area is claimed by local communities and indigenous peoples. Because the majority of those claims are customary and do not have formal legal title, they have come under sustained attack. Not just from agribusiness, mining or forestry interests, but also from conservationists. Around half of the planet's "protected" areas over-ride competing claims from indigenous peoples.[35]

This has happened even though there is growing evidence that traditional systems of land control and management are more effective at conserving forests. The case of the Maya Biosphere Reserve is typical. A review of 130 local studies in 14 countries in 2015 by the World Resources Institute found that community-run forests suffer less deforestation and store more carbon than other forests.[36] Another international study found that state-protected areas are deforested on average four times faster than neighbouring community forests.[37]

The Paris Agreement recognised that the "knowledge, technologies, practices and efforts of local communities and indigenous peoples" was vital in fighting climate change

The Paris Agreement recognised that the "knowledge, technologies, practices and efforts of local communities and indigenous peoples" was vital in fighting climate change.[38] Yet while many national climate pledges in Paris made reference to the potential of forests as carbon sinks, few mentioned the importance of community management in their successful protection, or set strategies for local land control. Nor, sad to say, does most of the literature by climate scientists exploring the potential for negative emissions.

The good news is that, done right, the needs of halting climate change can be reconciled with

35 Pearce 2016b: https://www.oxfam.org/en/research/common-ground
36 Stevens 2014: http://www.wri.org/publication/securing-rights-combating-climate-change
37 Porter-Bolland 2011: http://www.cifor.org/publications/pdf_files/articles/AGuariguata1101.pdf
38 UNFCCC 2015: http://unfccc.int/paris_agreement/items/9485.php

the production of food and the recognition of the land rights of indigenous and rural communities.

The task of fighting climate change is an urgent one. And negative emissions, using forests and soils, will be necessary to keeping warming to anywhere close to 1.5 degrees. But we believe the reassertion of community rights to land and other resources is essential to successful forest management, and so to creating and managing carbon sinks in a world of negative emissions.

The Paris conference, while strong on aspiration, lacked focus when it came to analysing the real task ahead. While the idea of zero industrial emissions was tentatively grasped, the path to negative emissions – which most climate scientists say will be essential to fulfilling the aspirations – was rarely discussed and appeared nowhere in the 32-page Paris Agreement.[39]

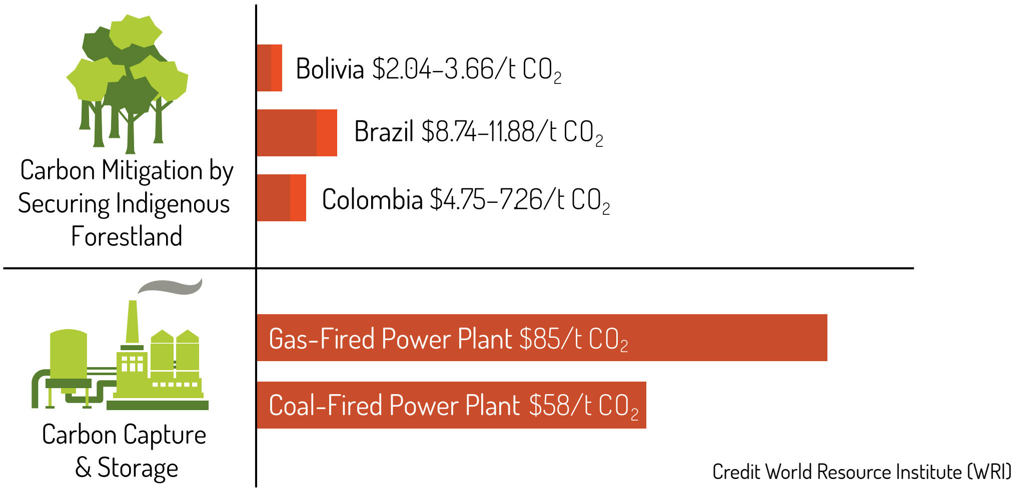
That gap led Kevin Anderson of Manchester University, one of the world's leading climate scientists, to declare at its close: "The world has just gambled its future on the appearance, in a puff of smoke, of a carbon-sucking fairy godmother."[40]

Negative emissions will be necessary to fighting climate change. But it is essential that enhancing carbon sinks does not become an excuse to delay driving down carbon emissions to zero as soon as possible. In this respect the EU's emissions reduction targets are far too low and do not put us on a pathway to limit warming to well below 2 degrees, let alone 1.5 degrees. The EU must urgently increase its 2030 emissions reduction target. And we must make clear choices about how negative emissions should be achieved. Any strategy that does not fully take account of the wide range of social, ecological, and indeed carbon, consequences would be dangerous: for forests, for feeding the planet, for rural communities, and for the sustainability of the endeavour itself.

Securing indigenous lands is a cost-effective carbon mitigation strategy

Securing indigenous lands can reduce emissions at costs far lower than carbon capture and storage measures.

Estimated costs of carbon mitigation



39 UNFCCC 2015: http://unfccc.int/paris_agreement/items/9485.php
40 Anderson 2016: http://www.nature.com/news/talks-in-the-city-of-light-generate-more-heat-1.19074

“The world has just gambled its future on the appearance, in a puff of smoke, of a carbon-sucking fairy godmother”

Kevin Anderson, Manchester University, 2016

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