BECCS: A Dangerous Distraction

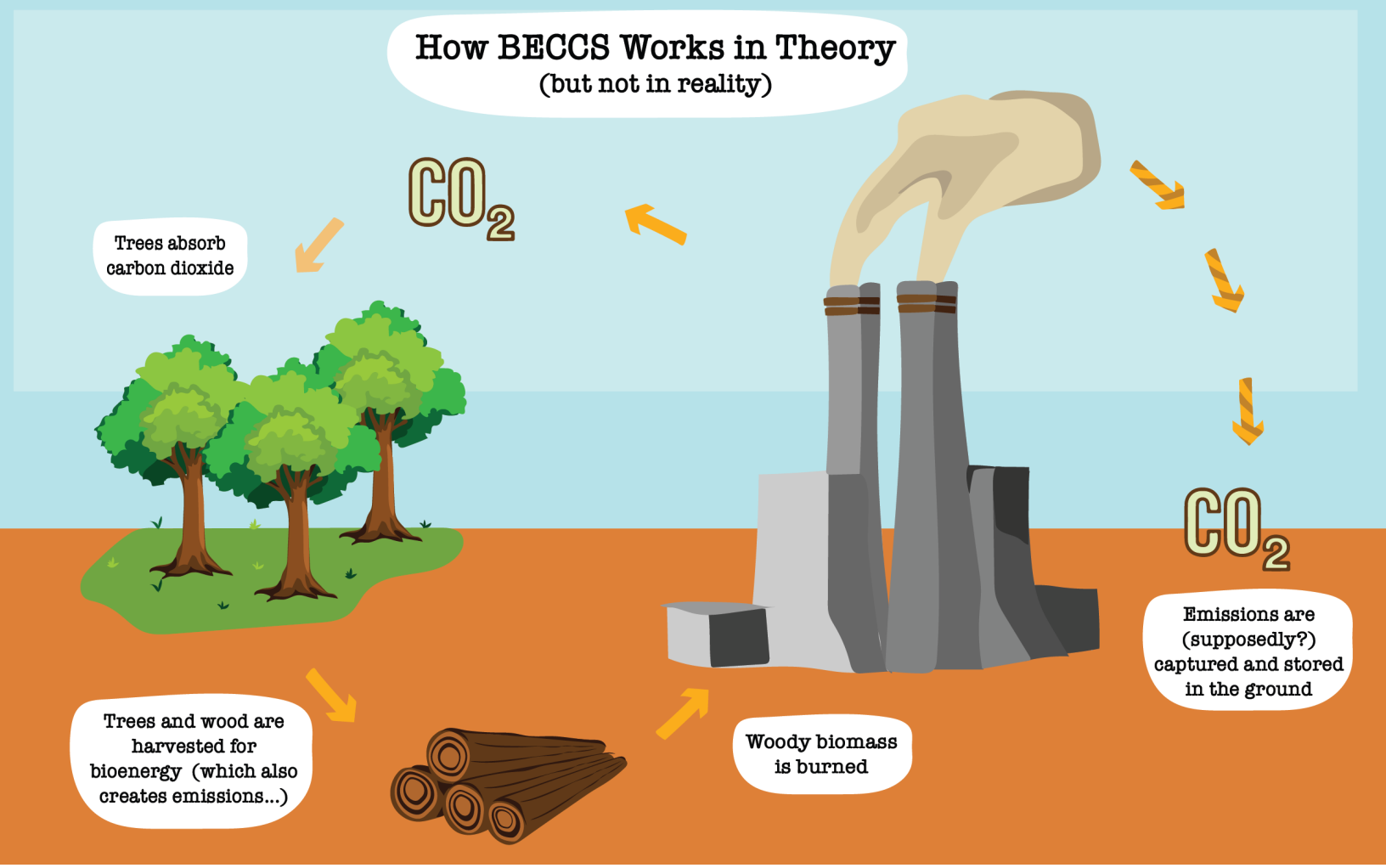
A new and largely hypothetical technology called Bioenergy with Carbon Capture and Storage (BECCS) has been getting a lot of attention in discussions on climate change.

While its proponents argue that BECCS is a necessary climate mitigation tool, in reality it is unlikely to work, and it also poses a major threat to human rights. *BECCS is nothing more than a dangerous distraction at a moment when the world needs real climate action.* Betting on BECCS sets up climate action to fail and violate the human rights of vulnerable communities globally.

Why are people talking about it?

Last year, the Intergovernmental Panel on Climate Change (IPCC) released a special report on the goal to limit global warming to 1.5°C. The climate mitigation pathways considered in the report all contain at least some "negative emissions," or "removals," to meet this critical goal. That means the world needs to remove some greenhouse gases (GHGs) already in the atmosphere in addition to a rapid phase-out of GHG emissions. Exactly how much negative emissions the world needs depends on the speed of global emissions reductions.

While several technologies and approaches are theorized to be able to achieve negative emissions, BECCS became one of the most prominent strategies included in the literature. BECCS has several theoretical advantages for the climate modelers on whose work the IPCC report was premised. First, it is built on an existing technology (bioenergy), making it easier to model than other negative emissions technologies that are not as developed. Second, in addition to removing emissions, it is an energy source, and therefore has an economic value attached to it beyond just CO_2 removals. For a model, this additional economic value makes BECCS an appealing choice that looks easy to scale up. Biomass was also assumed to be a carbon neutral source of energy (which is false, as explained below). Finally – especially early on in the discussions – scientists ignored the land requirements of BECCS, making it appear more scalable than natural climate solutions like restoring forests, delivering (in theory) huge amounts of negative emissions that make would slower fossil fuel phase-outs look feasible.



What is BECCS?

BECCS is, in theory, both a source of energy and a technology for pulling carbon dioxide (CO_2) out of the atmosphere. There are many different potential variations of BECCS, but fundamentally it is the combination of two types of technology, as indicated by its name: bioenergy and carbon capture and storage (CCS). A biomass feedstock – typically trees or an energy crop – is burned for energy, while emissions from the burning or processing of that feedstock are (supposedly) captured and stored underground. Proponents argue that this process is a negative or net-negative emissions technology, meaning it should remove more emissions from the atmosphere than it emits. This claim, however, is wrong.

Why BECCS Won't Work

Biomass is not carbon neutral

Burning biomass releases CO_2 into the atmosphere, just like burning fossil fuels. The entire premise of BECCS being a negative emissions technology, however, relies on the incorrect assumption that burning biomass is carbon neutral. If this assumption were true, then pairing CCS with bioenergy could result in more emissions removed from the atmosphere than emitted. **But in almost all cases burning bioenergy is not carbon neutral, certainly not on any timescale that matters for current climate change action.**

The idea that burning biomass is carbon neutral rests on two ideas: one, that all the released carbon will be re-sequestered in biomass growth and two, that there are no greenhouse gas emissions from the production and transport of the biomass. Take woody biomass for example: when a tree grows, it sequesters carbon. When the tree eventually dies, it decays and releases

that carbon back into the atmosphere as CO_2. On paper, then, it seems like burning that tree for energy is just a way to get energy out of emissions that are already inevitable. Planting a new tree would mean the sequestration would continue.

The timing matters, however. On a natural cycle, trees grow for hundreds of years and decay over a long time as well. Burning biomass releases the CO_2 immediately. New trees take decades to grow, and a forest may not ever be restored to its full carbon sequestration capacity if it is sufficiently impacted by biomass harvest. Decaying trees also contribute to carbon sequestered in the soil. In addition to undermining biodiversity and being less resilient, tree plantations sequester far less carbon than natural forests.

Study after study has found that the burning of woody biomass is **not carbon neutral,** including a recent report that found that to be the case **even over a 100-year time frame and under idealized conditions.**

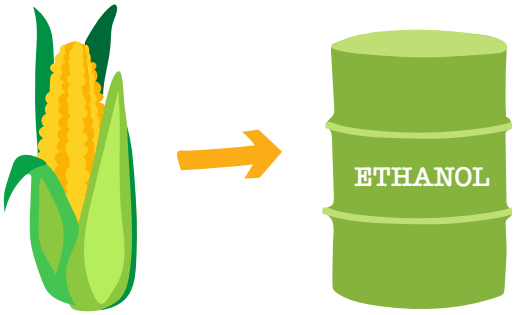
The experience with the current woody biomass industry (which does not use CCS) shows the profound harm this industry causes, as demand for woody biomass has been linked to deforestation and biodiversity loss. **The bottom line is that burning trees is harmful for the climate.**

Other forms of biomass are also concerning from a climate perspective. Growing energy crops requires arable land, which has often led to increased deforestation and ecosystem loss. There are also emissions associated with the production of these crops, as well as emissions from harvest and transportation. While different biomass types – from different crops to so-called waste and residues – will have different emission footprints, no biomass has been proven to be a climate solution. Since the assumption that burning biomass is carbon neutral is false, BECCS can at best reduce the climate harm of bioenergy, rather than providing a means of removing emissions from the atmosphere.

BECCS is a dangerous technology that should not be pursued for multiple reasons in addition to its unsuitability as a climate solution. But as a first point, it is important to emphasize that the carbon intensity of biomass means that BECCS cannot ever work as the negative emissions technology it was intended to be. **BECCS is not a real climate solution.**

Technology Barriers

There are no existing BECCS plants that claim to be net-negative emissions. Most of the existing BECCS technology is used at corn ethanol plants, where the CO_2 byproduct from turning corn into corn ethanol is captured, and typically sold for use in products like soda or to sell to oil companies for enhanced oil recovery.



Enhanced oil recovery has long been pushed by oil companies to help them extract more oil from the ground. This results in more oil production and the resulting emissions. Additionally, the CO_2 captured from ethanol fermentation is less than the CO_2 emitted from fossil fuels burned to power the refinery, not to mention the greenhouse gas emissions from indirect land use change, fertilizer use associated with corn ethanol production, and the eventual burning of the corn ethanol.

Capturing emissions from biomass heat and/or power plants is a different challenge, since many types of gases and particulate matter come out of the smokestack, making capturing the very diluted carbon dioxide more difficult and, far more energy intensive.

Only one very small carbon capture experiment from biomass combustion is being carried out worldwide, at Drax Power Station in the United Kingdom (UK). However, this is merely an experiment to test a new solvent for capturing carbon. **There is no attempt to store any of the captured carbon and the company is exploring possible usage opportunities.**

Drax Power Station has been condemned by environmental organizations in the UK and North America for **burning millions of tonnes of wood a year, much of it from the clearcutting of highly biodiverse and carbon-rich forests in the southern United States.**[8] Natural, biodiverse forests are crucial tools in the fight against climate change and cutting them down, as discussed previously, is never a climate solution.

Transporting and storing the CO_2 that is captured in the BECCS process is also a major challenge. Once the CO_2 has been captured, it needs to be permanently stored, typically in sedimentary geological formations, such as deep saline reservoirs or depleted oil and gas reserves. These formations are of course located in specific geographic areas, and the captured CO_2 would need to be transported from a BECCS plant to these formations. This will require an incredible amount of expensive new infrastructure, likely pipelines. Leaks, either during storage or transport, would carry a huge long-term cost, since they would result in captured CO_2 being released into the atmosphere, **exacerbating the climate crisis.** The certainty of the long-term storage and ability to ensure governance of storage sites remains concerning.[9]

Despite all this, many climate models call for BECCS deployment to start in the 2030s, with large-scale buildout by 2050.[10] Developing, commercializing and deploying this technology at that kind of scale would be a tremendous undertaking. **And while the climate crisis necessitates bold, ambitious action, why spend it on a dangerous and damaging technology that will never work due to the carbon intensity of biomass?**

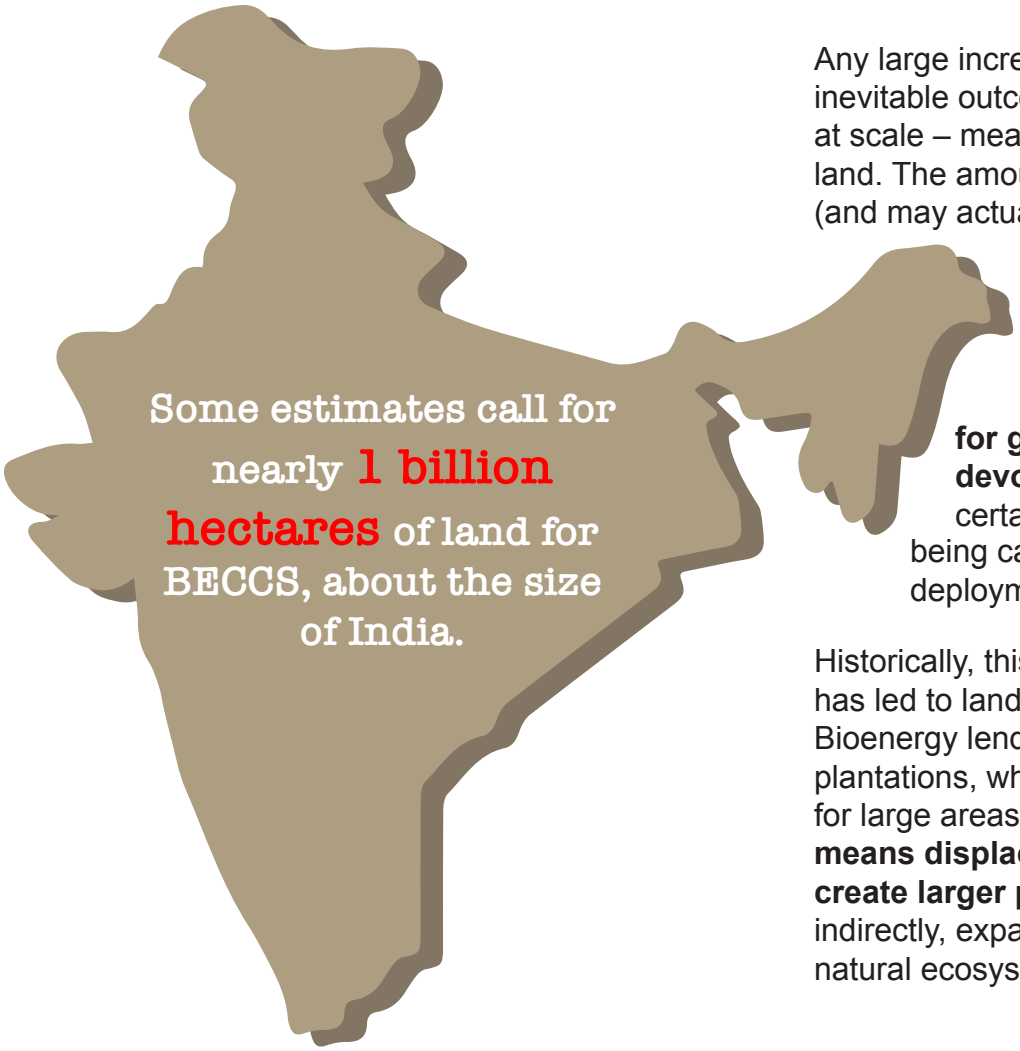
It would be far more sensible to focus that effort on strategies that will not only work, but also provide huge environmental, economic and social co-benefits, such as expanding clean renewable energy, protecting forests and promoting healthy diets.

Why BECCS is Dangerous

In addition to not delivering on the promised climate benefits, BECCS is actively dangerous to both human rights and the effort to stop climate change, as it puts food and land rights at risk while also making needed climate action in the land sector more difficult, if not impossible.

Threat to Human Rights

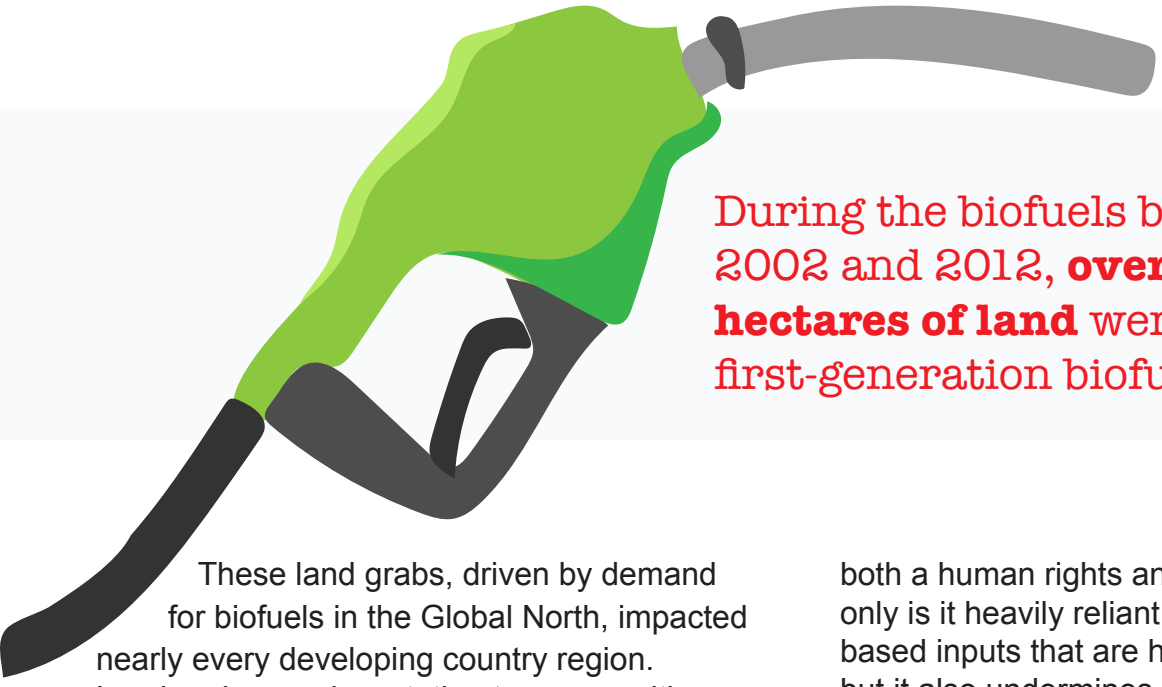
The threat to food and land rights stems from the sheer scale of the land requirements for BECCS. Producing biomass for burning requires land. Exactly how much land depends on the type of biomass and the scale of the expected negative emissions, **but the short answer is – a lot.** Just the average amount of BECCS called for in the climate pathways considered by the IPCC would require 25-46% of all global cropland, meaning between 375 and 675 million hectares. **Other estimates put the figure closer to a billion hectares, which is about the size of the land mass of India.**[11]



Devoting that amount of land to bioenergy production would profoundly limit available land for other uses and displace a great deal of current land use.

Any large increase in demand for land – an inevitable outcome of BECCS implementation at scale – means increased competition for land. The amount of land the world has is fixed (and may actually be decreasing due to sea level rise), and only so much that is habitable and suitable for agriculture. **There is no large area of unused land in the world that is suitable for growing plants that could be devoted to bioenergy production,** certainly not at the level of what is being called for in a large-scale BECCS deployment.

Historically, this kind of competition for land has led to land grabs and ecosystem losses. Bioenergy lends itself to large mono-cropped plantations, which means companies are looking for large areas of land they can farm easily. T**hat means displacing communities in order to create larger plantations** as well as, directly or indirectly, expanding agricultural production onto natural ecosystems.



During the biofuels boom between 2002 and 2012, **over 77 million hectares of land** were grabbed for first-generation biofuel production.[12]

These land grabs, driven by demand for biofuels in the Global North, impacted nearly every developing country region. Land grabs are devastating to communities, particularly because of the way they impact food security. **Access to food is one of the key pillars of food security, and for many families living in poverty in developing countries, that means producing it themselves.** Being forced off their land likely means losing their job and source of food all at once. In addition to food security, for many traditional and indigenous communities, the land they live on is tightly interwoven into their culture and identity, and displacement has severe impacts on the integrity of the community and the well-being of its people.

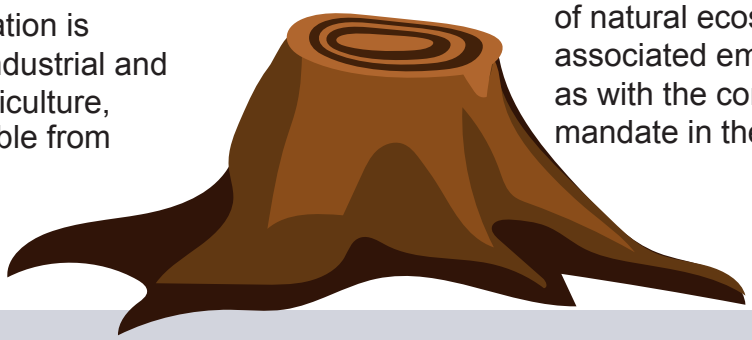
Nor are land grabs the only possible food-related impacts of BECCS deployment. As seen with the previous expansion of biofuel production, if enough land is devoted to biomass production and food production drops, food prices could increase, further increasing hunger. Many climate models involving BECCS did note this increase in food prices but dismissed it as something that could be solved with agricultural intensification – reducing land use but increasing yields to maintain production.

However, agricultural intensification is generally coded language for industrial and chemical-intensive forms of agriculture, which is completely unsustainable from both a human rights and climate perspective. Not only is it heavily reliant on expensive fossil fuel-based inputs that are highly emissions-intensive, but it also undermines smallholder farmers who cannot afford the cost of the inputs and are often forced off their land.

Undermining Climate Action

BECCS also represents a danger to proven solutions to remove CO_2 from the atmosphere: preserving forests and other intact ecosystems. **Stopping deforestation and restoring natural forests and ecosystems can have a huge climate impact by removing emissions from the atmosphere and sequestering the carbon.** Conservative estimates of what's feasible through these strategies suggest this would lead to hundreds of gigatons of CO_2 removed and stored this century.[13] Combined with an ambitious strategy to rapidly reduce emissions in all sectors, it could provide enough removals to keep the 1.5°C goal in reach.

But increasing the demand and competition for land, as would occur if BECCS were deployed at scale, would make these needed conservation and restoration efforts much harder, if not impossible. Bioenergy demand has led to increased conversion of natural ecosystems and associated emissions before, as with the corn ethanol mandate in the United States.[14]



Finally, **BECCS risks giving policymakers the false idea that there is an "undo button," where large amounts of emissions put into the atmosphere today could be removed in the future.** This could create a disincentive to making the hard choices necessary to transform the modern economy into a more equitable and sustainable one.

Furthermore, how quickly the world needs to phase out fossil fuel use and move towards near-zero emissions depends in part on how much negative emissions are achievable. If policymakers continue supporting a high-emissions economy under the assumption that BECCS could enable massive removals in the future, and then it fails to deliver, it will be far too late to undo today's emissions and the resulting climate impacts.

What We Need Instead

For all these reasons, BECCS is a dangerous distraction that the world cannot afford. In the first place, it simply will not work, due to the carbon intensity of bioenergy. But more than that, it would distract from the emission reductions that need to happen immediately; it would make real climate action in the land sector much more difficult; and it would put the most vulnerable to climate change at increased risk of having their food and land rights compromised.

BECCS is also, put simply, not necessary. There are climate pathways, including several in the IPCC Special Report on the 1.5°C goal, that do not rely on BECCS or large-scale negative emissions.

Make no mistake: this is no easy challenge, even without distractions like BECCS. In order to have any chance of meeting the 1.5°C goal in the Paris Agreement, global emissions need to be drastically and rapidly reduced; most climate models meeting this goal without relying on large amounts of negative emission show reductions of nearly 60% from 2010 levels by 2030, only 12 years from now.[15]

All governments need to do more than they are currently pledging, but if this effort is to be equitable, that would mean much deeper cuts in emissions than currently planned for rich countries in particular – as well as financial and technological support for poorer countries to make the transition themselves.

Instead of chasing risky, dangerous technologies, it's time to focus on what will work. For climate action in the land sector, "what works" includes:

- *Protecting forests;*
- *Promoting land rights, particularly the land rights of indigenous peoples;*
- *Restoring degraded forests and other ecosystems; and*
- *Changing our models of agriculture to be less emissions-intensive, and focusing on food rights and the rights of small-holder farmers.*

These solutions are proven to work, and through them it is possible to reach the Paris Agreement's 1.5°C goal. What the world cannot afford is more delay and distraction from governments and the industries pushing BECCS.

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