

## COP28 PRIMER: The Dangers of Scaling up Bioenergy and Bioenergy with CCS

Growing biomass removes CO<sub>2</sub> from the air. Bioenergy plants with carbon capture and storage (BECCS) could bury that CO<sub>2</sub>. BECCS has become the most relied upon CO<sub>2</sub> removal strategy in climate models as annual global emissions have soared to 50 billion tons (Gt) of CO<sub>2</sub> equivalent. But **a growing body of research casts doubt on whether either bioenergy or BECCS are scalable solutions.**

New dynamic modeling by Climate Interactive has found:

1. **Policies to scale up bioenergy and BECCS would [increase CO<sub>2</sub> emissions and global warming](#) for several decades, with net cooling not occurring until 2100 or beyond.**
2. **Scaling up BECCS to 2 to 3 Gt CO<sub>2</sub>/year would require a land area the size of India.**
3. **The best bioenergy strategy right now would be to let bioenergy plants retire without replacement, rather than putting CCS systems on them.**

Treating bioenergy as inherently zero-CO<sub>2</sub> or carbon neutral will invariably lead to policies that harm the climate as is the case in Europe—where wood is “likely to remain the biomass fuel of choice for electricity generation and heat, at least for the next 10 years and probably longer,” as a [UK think tank noted in 2018](#). **Scaling up BECCS is not carbon removal, but more like deforestation.**

Both the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency have scaled back reliance on BECCS in the last few years—the latter from “almost 5 Gt CO<sub>2</sub>” removal by 2060 ([in 2017](#)) to only 1 Gt CO<sub>2</sub> a year by 2050 ([in 2023](#)). The 2900-page IPCC mitigation report explained [in 2022](#), “**BECCS is not projected to be widely implemented for several decades.**”

A 2022 review of BECCS by the “[collective voice of European science](#)” found “**substantial risks of it failing to achieve net removals at all, or that any removals are delayed**” beyond a useful timeframe. A [2021 analysis](#) found that after 20 years of operation, “**the uncaptured emissions from BECCS” are nearly equal to that of a coal plant.** So, scaling it up would increase U.S. emissions for decades: That’s how long it takes the replanted seedlings to grow and absorb enough CO<sub>2</sub> to make total BECCS life-cycle emissions negative compared to leaving the original trees alone and deploying low-carbon alternatives.

**As the IPCC wrote in 2022, “In the case of BECCS, it should be noted that bio-energy typically is associated with early-on positive CO<sub>2</sub> emissions and net-negative effects are only achieved in time (carbon debt), and its potential is limited.”** This carbon debt doesn’t even start to decline until biomass harvesting stops scaling up. Net negative would occur post-2100 if at all.

**Scaling up BECCS requires massive land use, 800 million acres or more.** But “without a social justice lens, any attempt to fulfil the many land-based climate pledges is likely to perpetuate injustices” against indigenous people, [a 2020 report](#) found. At the same time, the [European Academies’ Science Advisory Council](#) noted, “**the area of land required to generate energy from biomass is 50–100 times larger than for solar and wind** and thus land usage for bioenergy is inefficient.”

In 2021, the [UN reported](#) “agricultural systems [are] breaking down.” So, “**there is little room for expanding the area of productive land.**” A [study by](#) the World Bank and UN on how to feed the world in 2050 found “the proportion of plant material diverted from food and fiber to energy would be unacceptably high—and that **hopes of climate benefits are misplaced. We recommend phasing out bioenergy targets.**”

Neither bioenergy nor BECCS can be relied on as a scalable climate solution.