Emissions cuts alone will (almost certainly) not keep the global average temperature rise below 1.5°C. But some optimism remains. Alongside a rapid phase-out of fossil fuels, substantial deployment of carbon dioxide removal (CDR) techniques might avert – or at least limit – overshoot of 1.5°C. At COP 28 this week the US and several partners launched a ‘Carbon Management Challenge’ with an aim to collectively *store* 1.2 Gt of CO2 by 2030. However, it seems much of the carbon will come not from CDR, but from carbon capture on existing or new fossil fuel use.

The Sleipner field, Norway, home to a long running carbon storage project (Bair175, CC BY-SA 3.0 via Wikimedia Commons)

Carbon dioxide removal and Net Zero

Carbon dioxide removal (CDR) is a hugely uncertain and limited resource. It should only be an additional or supplementary climate measure, never a substitute for possible emissions cuts. Still less should it provide an excuse for continued fossil fuel use. ‘Net-zero’ goals, which promise to achieve a balance between residual emissions and carbon removal by a

certain date, often fudge these issues. Few governments have clearly specified the contributions expected from carbon removal, or the absolute level of emissions cuts expected. The Carbon Management Challenge makes the same mistake, lumping CDR (removals) and CCS (potential emissions cuts) in the same box.

Two recent articles – in Science and Nature – endorse the argument that governments should instead set explicit separate targets for emissions reduction and carbon removal. With separate targets we can hold policy makers accountable for any substitution. We can assess whether countries are promising a fair share of action. We can evaluate whether the promised levels of carbon removal are responsible and sustainable. And we can ensure that any residual emissions are legitimate – both socially necessary and genuinely hard-to-abate.

The Science piece is particularly relevant here. It suggests that given the uncertainties, over-reliance on carbon removal may prove not just irresponsible, but also legally challengeable. What might constitute over-reliance? Globally using carbon removal to counterbalance residual emissions reduced to 10% of current levels would imply a highly ambitious 5Gt pa of removals. For the highest per capita emitting countries even a 10% reliance on removal seems unfair.

Emerging policy

The EU has established separate targets for 2030, but faces industry pressure to allow substitution and trading in the post 2030 regime. Environmental NGOs are pressing for a clearer separation of targets after 2030. They want the EU not only to define (and limit) the contribution of carbon removal, but also to explicitly define (and limit) the role of biological carbon removal. Biological techniques typically threaten to undermine biodiversity goals, and can lead to unjust ‘land-grabs’.

In the US, by contrast, the latest national climate assessment exposes a clear failure to grapple with this challenge. It does put indicative figures on the 2050 net-balance, but these suggest a wholly irresponsible level of reliance on carbon removal, with only 75% emissions reduction foreseen.

The US also stakes claim to 800Mt pa of removals by existing forest and soil sinks. But these are already accounted for in the net-zero calculus: they are not available to offset residuals. And while enhancements of natural sinks might help with that role, it would be invidious to claim removals in one part of the natural system, while destruction and degradation continues elsewhere. Worse, much of the ‘enhanced sink’ claimed in carbon management

projects is ‘known not grown’. In other words the intervention did not create or enhance the carbon sink: it merely recategorised an existing sink. Turning it into an offset is therefore simply legitimating additional emissions.

Carbon management?

The ‘Carbon Management Challenge’ is described by the White House as aiming “to accelerate carbon capture, removal, use, and storage technologies so as to deal with emissions that can’t otherwise be avoided.” But this dangerously elides CDR with CCS.

This plays into the hands of those using the weasel words of ‘avoiding unabated fossil fuel use’ to sustain the fossil fuel industry from the threat of a phase out. It justifies use of expensive CCS for sources that could be abated much more cheaply by reducing fossil fuel production. And it discursively grabs scarce carbon removal capacity and harnesses it to claims that even expansion of fossil fuel extraction therefore remains acceptable.

The reason we need carbon removal is not to sustain the fossil fuel industry. It is to counterbalance the genuinely recalcitrant emissions of gases such as methane and nitrous oxide from agriculture. And to actively reduce atmospheric concentrations of CO2 from their already dangerous levels, as highlighted by UNEP’s latest emissions gap report.

The discourse of carbon management does highlight important questions about how best to (sustainably) maximise CDR availability. CDR techniques are at early stages of development. Some argue that the oil and gas sector has the skills and interests to deliver CDR learning by doing. CDR approaches might also share infrastructure and technical advances with CCS on emissions from point sources such as refineries. Both the US and UK are betting on the idea of shared infrastructure ‘hubs’ for carbon transport and storage.

Can ‘carbon management’ support CDR

So far, however, that CCS can support CDR seems more a pious hope, than a demonstrated proposition. The hub approach recognizes that transmission infrastructure might be limited (commercially, if not technically). Only the other hand, recognition that storage might be similarly limited, especially in critical locations, is largely absent. The prospect of competition – rather than synergy – between CCS and CDR for the use of infrastructure and storage is ignored.

In practice so far there is little evidence of competition, nor of synergy. Most bioenergy with

CCS (BECCS) schemes, however, have sent the carbon dioxide for use in enhanced oil recovery, which reduces any climate benefit. The Nowegian oil and gas sector has demonstrated geologic CO2 storage. But efforts to replicate this elsewhere have been less successful. Much of the new wave of innovative CDR – like Heirloom, Charm, and Climeworks – does not rely on conventional geologic storage. Yet even if competition for storage does not arise as CDR scale grows, there could be competition for scarce chemical feedstocks, and for input energy.

All this suggests that investments to support CCS won’t actually help deliver CDR, but will merely extend the life of the fossil economy. That wouldn’t be a good thing even if all CO2 emissions were eliminated – deadly particulate emissions would remain. And in practice, no demonstrated CCS system comes anywhere close to eliminating CO2 emissions.

Keeping CCS and CDR apart

Lumping CCS and CDR in a carbon management box exacerbates the moral hazard that CDR might be configured to support continued fossil fuel use. It’s easy to see why fossil industry interests would do this. CCS itself has shown no economies of learning in any respect. It seems, however, that the industry has learned from the failure of the coal power sector to defend itself with more simplistic promises of CCS alone.

However the elision of CCS and CDR is not just a product of industry interests: climate justice NGOs also typically lump the technologies together as ‘false solutions’. They are correct that neither gets to the real root of the problem. But there are sound reasons for developing CDR (and even CCS) for specific purposes.

CCS may yet prove critical in abating emissions in more technically challenging sectors such as cement production. But we can fully decarbonize both power generation, and hydrogen production without CCS. And CDR has critical roles which CCS cannot deliver. It can counterbalance residual non-CO2 emissions from agriculture. And it is essential to counter overshoot, by actively reducing atmospheric GHG concentrations.

Exaggerated expectations of CDR are already contributing to the likelihood of overshoot by enabling further delay in emissions cuts. But rejecting CDR on this count could be counter-productive. This is why we need clear, separate, accountable targets, so we can develop CDR in sustainable and responsible ways alongside accelerated mitigation. And it’s why we shouldn’t waste CDR capacity in sustaining fossil fuel production.

Going forward

Separate targets, rather than black-boxed ‘net’ targets hidden in promises of ‘carbon management’, would help make all these debates transparent. And this would contribute to good governance and responsible development of both CDR and CCS.

The ‘carbon management’ approach might be defensible. But only if it stimulated the effective sharing of skills and learning, and accelerated investment in technology development and infrastructure.

And we’ve been here before. Leaving the development of renewable energy to ‘experts’ in Shell and BP proved a decades-long disaster. It produced more PR greenwashing than sustained investment. Letting Occidental and Adnoc guide the development of CDR would be equally catastrophic for real climate action.