

AVIDly seeking carbon offsets

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As the urgency of the climate crisis grows, governments, firms, nonprofits, and citizens increasingly seek ways to cut their greenhouse gas (GHG) emissions and especially to offset the emissions they don't believe they can cut in the short run, or that are viewed as too expensive, for example, emissions from aviation. More and more companies, universities and other organizations are announcing plans to become carbon neutral by 2040 or 2050, through a bundle of actions that often include carbon offsets. These are welcome developments. The idea is that a nation, firm, organization, or individual can continue to burn fossil fuels, emitting CO₂ and other GHGs that contribute to global warming and climate change, while cutting an equivalent amount of emissions elsewhere. By offsetting their emissions they hope to render their continued use of fossil fuels carbon neutral. But do offsets work? What kinds of offsets actually help reduce global emissions? Can planting trees really offset the emissions from your flights? Here are some guidelines.

First, the impact of offsets should be considered relative to the urgency of the climate crisis:

- The world has already warmed [about 1°C above preindustrial levels](#), half way to the 2°C limit essentially all nations agreed to in the Paris accord of 2015.
- We are [not on track to limit warming to 2°C](#). Full implementation of the Paris accord would lead to warming well above 3°C. Essentially all nations are [falling short of their pledges](#), including the US.
- The IPCC finds that [at 3°C or more](#), and [even at 2°C](#), there will be high risks of [severe or irreversible impacts](#) with limited ability to adapt for many ecosystems critical for our prosperity, welfare and lives.
- To have even a roughly 50% chance of limiting warming to 1.5-2°C global emissions must fall about 50% by 2030, about 80% by 2050, and then fall to zero, or become net negative, [for the rest of the century](#).

[We are in the decisive decade](#). Large, rapid reductions in global greenhouse gas emissions are urgently needed, as soon as possible. What kind of offsets can help?

Meaningful offsets need to be what I call “**AVID+**”

Additional: Offsets must reduce emissions that would not otherwise have been cut. Protecting a stand of old growth forest isn't additional if loggers or poachers just cut others. Investing in a solar farm that's nearly completed isn't additional since such a project will easily find buyers and will soon start generating clean power without the need for your offset. Preventing the construction of a planned plant that would emit GHGs isn't additional if the plant was only planned to gain the offsets and wouldn't otherwise have been built. An offset that isn't additional offsets nothing.

Verifiable: it must be possible to verify that the emissions reductions actually occur. No loopholes, no cheating. Trust but verify. Verification not only means ensuring that the offset activity actually occurred, but that the emissions reductions from the offset don't erode over time—that any carbon sequestered by the offset remains sequestered (see Durable). If you are planting trees, you must ensure the trees aren't cut, burned, or die, releasing their carbon back into the atmosphere. If you are capturing carbon from a fossil power plant and injecting it into the Earth, you must be sure it remains there.

Immediate: The emissions you seek to offset from a flight or power plant or building or factory happen now, with certainty. An offset that only provides benefits in the future, or is subject to risk, does not compensate for the emissions you add to the atmosphere now. Planting trees is great, but most of the CO₂ they remove from the atmosphere comes many decades from now, while the CO₂ you add to the atmosphere from that flight worsens warming from today on. And the trees you plant might be cut (legally or illegally), or burn, or die from insect pests or disease, so the CO₂ you hope to sequester isn't certain.

Durable: The CO₂ and other GHGs you seek to offset go into the atmosphere today and remain there for decades or longer. Any offset must keep an equivalent amount of CO₂ and other GHGs out of the air for at least that long. Sequestering CO₂ underground isn't durable if it can migrate into subsurface water and then into the atmosphere.

⊕: Offsets should, where possible, contribute to [multisolving](#): helping achieve important economic and social goals besides emissions reductions, including (in no particular order, and not an exclusive list): job creation, better health, poverty reduction, social and economic justice for disadvantaged individuals and communities, community resilience, and so on. Multisolving not only cuts emissions but contributes to other vital [sustainable development goals](#).

Consider a few examples, beginning with offsets to promote afforestation. Planting trees is a wonderful thing to do. But as offsets, many tree planting programs are not AVID. They are

- Not **A**dditional: to be additional, tree planting must occur on land that no one would choose to reforest or plant on the basis of market forces or existing government policies, that is, in the absence of the offset. Such land is likely to be unsuited for reforestation, increasing the risk of tree death, or very expensive due to its value in other uses such as agriculture, where converting to forest might cut global food production. The cheapest offsets for tree planting are therefore likely to be the least additional; genuine additionality is likely to be very expensive because it requires planting on land that would not otherwise be planted or have limited carbon sequestration potential, requiring many more hectares by acquired, planted, nurtured and protected.
- Not **V**erifiable: Verification would require expensive monitoring for many decades to ensure the trees in fact are planted, grow, remain healthy, and are not cut, burned, or die.
- Not **I**mmEDIATE: it takes decades for trees to grow and remove significant CO₂ from the atmosphere.
- Not **D**urable: eventually the trees will be harvested, or burned, or die from disease or pests or weather or other factors. Worse, climate change is increasing many of these risks. In contrast, the CO₂ from the fossil emissions you keep generating in the belief you have offset them with trees continues to contribute to global warming for centuries, and the climate change it causes “[is largely irreversible for 1,000 years after emissions stop](#).” To be a meaningful offset, the CO₂ sequestered by forests would have to remain out of the atmosphere a century or more.
- Not “**+**”: The cheapest and fastest way to remove CO₂ through afforestation is to establish plantations comprised of a fast-growing species, not a ‘natural’ forest. But compared to natural forest, plantations are monocultures that are more vulnerable to disease, offer less diverse habitat for other species, reducing biodiversity, and generate fewer co-benefits than natural forests such as jobs in recreation, hunting and fishing, and other forms of tourism, or supporting traditional ways of life for indigenous people. Plantations of, e.g., loblolly pine, widely planted in the southern US to supply the pulp and paper and bioenergy industries, typically require the periodic application of fertilizers, pesticides and herbicides, potentially increasing other forms of pollution that harm water quality and biodiversity.

So what kind of offsets are likely to be AVID+? Consider energy efficiency retrofits for low-income rental housing. Such programs are likely to be:

- Additional:** many low income and poor households simply do not have the funds, or access to credit, to undertake energy efficiency retrofits without the assistance offsets (or other policies) could provide. Most low income, and many moderate income people live in rental housing and pay the utility bills. In such cases the landlord has no incentive to insulate, install efficient windows, appliances, and heating systems. Deep energy retrofit programs for low income housing, funded by offset revenue, can overcome these barriers, yielding emissions reductions that would not otherwise occur.
- Verifiable:** it is relatively simple to verify that a retrofit took place and to assess their energy use and emissions reductions from utility bills, HERS ratings, and from certification programs like Energy Star and LEED.
- Immediate:** retrofits cut energy use and emissions immediately on completion; projects take about a year so are essentially contemporaneous with the emissions you seek to offset.
- Durable:** a well-done deep energy retrofit can extend the life of buildings by decades. The risks of loss due to fire are low.
- “+”:** Every winter many low-income individuals and their families face the awful choice of heating or eating. Deep energy retrofits mean homes become warmer, improving occupant health and reducing health care costs by reducing cases of pneumonia, bronchitis, COPD, other illnesses; better nutrition) while reducing utility bills (so improving disposable income), generating jobs and building community resilience. Programs in [England](#) and [New Zealand](#) indicate that these benefits substantially [outweigh the costs](#).

The AVID+ framework does not mean afforestation is unimportant. Afforestation programs, started now, can eventually contribute to the “negative emissions” that will be needed to avoid the worst impacts of climate change. But tree planting, even if additional and verifiable, does not immediately emissions reductions and offers only questionable durability.

Worse, large-scale investments in tree planting, paid for by revenue from carbon offsets, may harm the quest to cut global GHG emissions: corporations and individuals naturally seek to purchase the least expensive offsets available to them. But genuinely AVID offsets will be more expensive than those that aren't. Without the ability to ensure an offset program is genuinely AVID, the offset market is likely to be flooded with cheap offsets that actually don't cut emissions, can't be verified, aren't immediate and aren't durable. Cheap but ineffective offsets make it appear that the cost of cutting emissions is lower than it actually is, weakening the incentive companies and individuals have to actually cut their fossil fuel emissions. Certification schemes have been developed in other domains, e.g., the Marine Stewardship Council and programs designed to verify that what we consume is sustainable, and that the producers pay living wages, offer safe working conditions, and respect human rights. They remain controversial and suffer from their own [verification challenges](#). We should work to overcome these problems for programs to plant trees and prevent deforestation. But even if we could be sure such offsets were additional and verifiable, they will still not be immediate or durable. There is no substitute for programs and policies that actually cut the fossil fuel emissions that constitute the vast majority of the global warming pollution that threatens our prosperity, health and lives. Fortunately, some offsets can help, verifiably, immediately, and durably, while helping with other pressing human needs. We should AVIDly deploy them, as soon as possible.