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Climate change ▪ Thomas E. Lovejoy, Tim Flannery and Achim Steiner

We did it, we can undo it

In the course of Earth's history, life collectively has had a strong influence on atmosphere and climate. It has helped shape both, and has been shaped by both. Today atmospheric and climate changes are driven by a single species — ourselves — and they are happening very rapidly.

One of the principal elements in this is carbon, the most basic of the building blocks of living organisms.

When we burn fossil fuels, we release solar energy captured by ancient green plants and carbon goes into the atmosphere as carbon dioxide. Similarly when current living matter is burned and degraded, as in tropical deforestation, it too converts into carbon dioxide.

Greenhouse gas emissions are central in the climate agenda. But the key question has always been, what is a "safe" concentration of atmospheric greenhouse gases. The pre-industrial concentration was 280 parts per million (ppm). Today the concentration is 389 ppm and emission rates have passed beyond the worst case scenario of the Intergovernmental Panel on Climate Change (IPCC).

Climate scientist James Hansen has suggested that 350 ppm was the concentration beyond which it was unsafe to go. The rapid retreat as well as thinning of the Arctic Ocean ice is consistent with that conclusion. So, too, Earth's ecosystems and biodiversity are sending multiple signals that essentially confirm 350 ppm as the limit. Unquestionably we are beyond where we should be.

Nature is on the move all over the planet, with species changing their natural history (e.g. earlier blooming) and their geographical location (e.g. often moving northward and up in altitude).

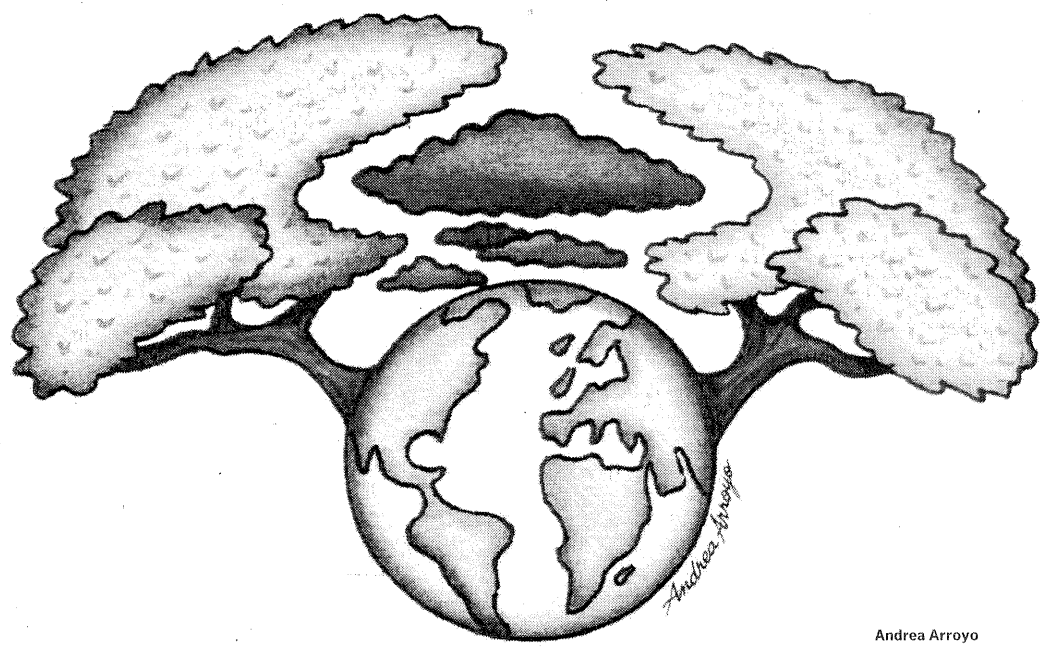
We have also begun to see abrupt threshold change in ecosystems. Coral reefs are being bleached all over the globe as the fundamental coral animal-alga partnership of reef systems breaks down at warmer temperatures. Evergreen forests in western North America and in Europe are experiencing major tree mortality as a longer summer tilts the balance against the trees in favor of bark beetles.

With major additional temperature increase due from current greenhouse concentrations, major ecosystem disruption is surely in store. In addition, the growing acidity of the oceans (as they absorb carbon dioxide) is already affecting some marine food chains. The outlook for the species and ecosystems so fundamental to human existence is truly grim at higher greenhouse gas concentrations and consequent climate change.

Clearly the imperative should be to peak at as low a concentration as possible and then come down to the safe level. Once in the atmosphere, a carbon dioxide molecule will stay there for 100 to 1,000 years. We need ways to remove it and reach the safe level more quickly.

Fortunately Earth's living systems can contribute to that goal in a significant way. That is why forests have been part of the climate change agenda from the outset. But the time has come to scale up to the planet's ecosystems as a whole.

In the last 300 years, the planet's ecosystems have released a staggering amount — between 200 and 250 billion tons — of carbon, as landscapes have been converted for human uses such as agriculture and cities. Were some of that to be recovered, with each billion tons restored to ecosystems the atmospheric concentration would be reduced by one part per million.



Andrea Arroyo

It is more complicated than that because of the equilibrium between atmospheric

CO_2 and that which has been taken up by the oceans, but the potential to remove

CO_2 from the atmosphere by restoring biodiversity and carbon is clearly of major consequence.

Recent studies suggest that restoring degraded grazing lands worldwide could take up billions of tons of carbon, maybe even as much as the difference between current greenhouse gas concentrations and the "safe" 350. Reforesting degraded rain forest lands has enormous potential also. Both would have biodiversity conservation benefits as well. Restored grazing lands actually would provide improved grazing and there is no reason the forest couldn't be used for forest products. Peat lands would have an important role to play.

There are complications: The climate is still changing and affecting ecosystems, human population is growing, and demands for food and biofuels will command their part of the landscapes. Those are huge factors that could work against the role ecosystems can play in reducing the greenhouse gas climate change threat, but increasing carbon retention by agricultural ecosystems can make a contribution in its own right.

Charcoal from plant waste is a relatively long-term way to add carbon to soils and could conceivably remove a significant fraction of the

CO_2 from the atmosphere we add annually. In addition, it is essential to integrate concerns for equity in land use and tenure, rights of indigenous peoples and local communities, and livelihoods of farmers and herders.

This in no sense reduces the imperative to redesign the energy base of human societies. It is as urgent as ever. The scale of the change needed is not beyond our abilities. Together the ecosystem and energy approaches both help reduce the peak amount of gases in the atmosphere (and consequent climate change) and can get us back to the safe level as fast as possible.

Nations are already preparing for the upcoming meetings in Poland and then Denmark of the UN Framework Convention on Climate Change. The time has come to look at this as a whole, and at the scale of the problem — namely the entire planet.

Notions of planetary engineering abound, but this is the only one essentially free of potential unintended environmental consequences. We need to turn to the rest of the living planet to influence atmosphere and climate as it has done in the past.

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