Anthropocene or not, it is our current epoch that we should be fighting for

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Has the Holocene epoch of the past 11,700 years been supplanted by the proposed Anthropocene epoch of today? Although it's broadly accepted that planetary systems have changed as a result of human influence, a panel of experts at the International Union of Geological Sciences answered a firm "no" when they recently voted down recognizing the start of the new epoch.

Does this mean that humans haven't actually changed the planet? Not at all and while we may not officially be in a geological Anthropocene, the term will likely persist in reference to human environmental interference in years to come. As such, the wake of this vote is perhaps the best moment to consider a more essential question: what will we do next?

Can we take the official rejection on an Anthropocene epoch as an implicit vote of confidence in our ability to return the planet to Holocene-like conditions? Is climate change reversible?

As a limnologist, I can share insights from long-term research on lakes. And as one Canadian lake, Crawford Lake, had been selected as the candidate "golden spike" of the Anthropocene epoch, what lakes tell us of human impacts, and recoveries from those impacts, may be worth considering.

Atomic age?

There are elements of our future which cannot be undone. Although we can reduce future extinction rates, there is no coming back for the countless species that have disappeared due to human actions. Likewise, a global human-caused redistribution of species is a permanent symptom of (and evidence for) the Anthropocene. On the other hand, some measures of the Anthropocene seem inherently more ephemeral.

The residues of widespread nuclear weapons testing through the 1950s into the 1960s have generally been seen as a particularly strong indicator of the Anthropocene. Scientists find evidence of this in lakes around the world in the form of trace amounts of Plutonium and Cesium in the sediments deposited during this period.

A rapid drop in atmospheric bomb testing in 1963—upon the signing of the Nuclear Test Ban Treaty—has created a unique "bomb pulse" which represents a global, unequivocally human, fingerprint. The bomb pulse was considered evidence for a 1950 Anthropocene epoch start date and was likely the most critical factor in defining the Anthropocene.

However, which global human signal is more important for us to consider today: the fact that humans created and tested nuclear weapons, or that this was just a "pulse" as nuclear-armed states came together globally to change behavior?

Tipping points

The most useful insights from lakes may come from how they experience tipping point dynamics, particularly as it relates to eutrophication (the excess growth of plants and algae in a body of water).

The widespread synthesis and application of fertilizers has caused eutrophication on a massive scale and has taken a huge toll around the globe, particularly on aquatic ecosystems. Past a critical tipping point, eutrophication can fundamentally alter lakes, replacing clear waters with turbid (cloudy), algae-dominated conditions and impaired ecosystem functions and services.

When seen in this light, it becomes clear that eutrophication is a defining characteristic of the Anthropocene. However, it is a characteristic that

can be reversed—although restoration is not always straightforward.

Lakes, along with other ecosystems that feature tipping point dynamics, can be hard to flip back once they've passed the critical turbidity threshold. Reducing the loading of nutrients into waterways can effectively improve water quality and there is evidence these efforts are effective. However, it might take decades to re-establish desirable conditions in impacted systems.

In some cases, it might take over a century, or even millennia, for watersheds to recover from human nutrient pollution.

Although the process of full recovery may sometimes be lengthy (at least in human, not geological, timescales), rapid partial recoveries are possible, as is the potential for intermediate lake conditions that fall outside of a simplified clear or turbid binary.

Understanding the role of tipping point dynamics in lakes can provide a useful framework for management and restoration strategies, and at least bring us back to something perhaps similar to what was originally lost.

Essential Indigenous knowledge—alongside natural history museums around the world—can play a key role in retaining knowledge of how things were to help understand how our systems are changing, and what target conditions we might aim for in the near future.

All is not lost

This brings us back to our original question. To what degree is climate change reversible? Most world economies have committed to achieve net zero greenhouse gas (GHG) emissions. To date, 2023 featured the highest global carbon dioxide emissions yet, but these emissions likely would have been lower than those in 2022 if not for droughts dampening

hydroelectricity generation.

To return to and stabilize ourselves within a desired Holocene-like climatic range, we will not only need to achieve net zero, but establish regenerative socio-economic systems that reduce atmospheric GHG concentrations in a sustainably just manner.

However, timing is crucial, as globally connected tipping points may accelerate the natural release of GHGs from oceans, on land and in inland waters.

Put simply, while humans absolutely can stop burning fossil fuels, we cannot guarantee how quickly our planet will cool. Moreover, we cannot even guarantee that GHGs will decline with these actions—particularly once our warming exceeds 1.5 C.

If there is anything to glean from the study of lakes, it might be that remediation is most effective before critical tipping points have been crossed. However, even beyond such tipping points, active remediation efforts are always worthwhile, if not outright necessary.

Systems governed by tipping point dynamics might not automatically bounce back, but they can substantially improve in the short term. Indeed, many affected systems can likely even eventually recover fully over decades to centuries if the appropriate rapid actions are taken.

Although none of this changes the recent outcome of the Anthropocene epoch being voted down, it may weigh on how we interpret that decision. The vote in no way implies that our species has not changed the world dramatically. Rather, it can remind us that the epoch we're in, although perhaps unrecognizable, is not a lost one, and that we should muster all available resources and knowledge to return our planet to Holocene-like conditions as much as possible.

The challenge lying ahead of us will be to work actively to ensure that our planet remains welcoming, for not just humans but all biodiversity. It is time we abandon any sense of defeatism that might be associated with the Anthropocene and focus on what really matters: saving this epoch before it is too late.

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