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## Existential Risk due to Ecosystem Collapse: Nature Strikes Back

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### *Highlights*

- Climate change, the altered hydrological cycle, and ocean acidification are threats to civilization.
- Positive feedback loops in the climate system are especially worrisome.
- Unexpected interactions among seemingly unrelated environmental stressors and processes are challenging to address with either environmental policies or technological innovation.
- It is our scientific ignorance, specifically what we do not know about positive feedbacks and surprising interactions, that is the greatest source of our existential risk.
- Resilience theory provides guidance on countering existential risk, but is hard to implement given opposing global trends.

### **Abstract**

Epic tales of existential catastrophe have been written down for thousands of years, and in Christian traditions were linked to the punishment of humanity for its sins. We are still imagining new storylines for the end-of-civilization, with a rich genre of Hollywood films depicting either the struggles of remnant humans in a post-apocalyptic world, or some event that threatens the very survival of our species. Instead of a spiritual reckoning imposed by God, Hollywood's Armageddon is usually the result of technology run amok, or mindless industrialization and population growth causing an environmental collapse. While dramatization of an environmental Armageddon might seem fanciful, existential risk warrants serious consideration even though the probability of an apocalypse is vanishingly small. If we are to avoid the unthinkable and unimaginable, then we need to ask what might be the most plausible pathways to an environmental apocalypse? We review the major environmental concepts pertinent to apocalyptic events, and conclude that positive feedback loops and multiplicative stresses represent the gravest existential risks, and the risks society is least likely to foresee. Zombies created by a misbegotten genetically engineered virus might make for a great movie, but it is the hubris of technical experts who are blind to surprising interaction networks, or who are unaware of positive feedback loops that will be our undoing.

### **Keywords**

Existential risks; ecosystem collapse; planetary boundaries; positive feedbacks; multiplicative stresses

## **1. Introduction: ancient apocalyptic narratives**

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