

The Anthropocene

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For the first time in the evolution of life on planet Earth a single species has become so numerous, so widely distributed, so rapacious, and so unresponsive to ecosystem feedback as to seriously disrupt the biosphere's critical life support systems.

We humans are now the dominant force for Earth system change. We have become a force of Nature.

"The great environmental predicament of the early 20th century is not primarily an ecological crisis, though its ramifications are far-reaching within ecological systems. Rather it is a crisis of culture." Steven Hartman

A Perfect Storm Brewing

The arrival of the Anthropocene — human dominance of the biological, chemical and geological processes on Earth — is already an undeniable reality.

There are now so many of us, using so many resources, that we're disrupting the great cycles of biology, chemistry and geology by which elements like carbon and nitrogen circulate between land, sea and atmosphere. We're changing the way water moves around the globe as never before and through mining activities alone, humans move more sediment than all the world's rivers combined. Almost all the planet's ecosystems bear the marks of our presence. As Oxford University geographer Professor Andrew Barry says, our "impacts are now connected, and systemic".

For decades scientists have been warning of the danger of **human induced climate disruption**. This is one of the greatest threats to the continuing viability of our species.

But climate change is just one symptom of a bigger planetary malaise that presents humanity with unprecedented challenges.

Other symptoms include:

- **Environmental stress** from accelerating degradation of soils, water, forests, and fisheries, ocean warming and acidification, and dangerously increasing ecosystem fragility due to biodiversity loss.
- **Energy stress** as declining access to abundant cheap oil and increasing restrictions on coal burning are driving risky and invasive "non-conventional" fossil fuel exploitation which threatens local aquifers, water catchments and ecosystems, endangers fragile wilderness environments, and compounds the risk of severe climate disruption.
- **Economic stress** from our dependence on continuous growth in output and consumption to maintain economic, social and political stability while in the process widening income gaps between rich and poor, poisoning the biosphere with intractable waste, and generating endemic financial instability and market volatility.
- **Demographic stress** arising from marked differentials in population growth between rich and poor countries, a destabilising mismatch between population growth and viable livelihoods in poorer nations and regions, the runaway growth of crisis-prone megacities often vulnerable to climate change impacts and recurring epidemics, and large-scale population movements spurred by population pressures, conflict, human rights abuses, and environmental degradation.
- **Species stress** Through the destruction of marine and terrestrial habitats humankind has provoked a mass extinction spasm on a scale not seen for 65 million years — many millions of years before the relatively recent appearance of our species on Earth. The industrial scale production and slaughter of animals for human consumption, trade and

recreation also threatens habitats and ecosystems.

- **Political and social stress** as competition for scarce resources and disputed territories intensifies, international power alignments shift, inter-communal and sectarian strife escalates, food and water insecurity spreads from poorer regions, and populations are displaced.

The Great Acceleration

Over the last decade an international team of scientists has been working on a suite of key indicators showing the dramatic acceleration of human impacts on the Earth system over the last two centuries. The twenty-four graphs — twelve socio-economic and twelve Earth system trends from 1750 to the present — are strong evidence of our entry into the Anthropocene. Changes in human production and consumption, indicated by gross domestic product, direct foreign investment, energy consumption and telecommunications, are reflected in changes in the Earth's natural systems: climate (greenhouse gas levels,

global temperature), ocean acidification, terrestrial biosphere degradation and fish capture.

A recent updating of the graphs includes an analysis of the relative impacts of wealthy nations, emerging economies and the developing world. This new work highlights the inequities between nations. The emerging economies of the BRICS (Brazil, Russia, India, China and South Africa) now show a significant contribution to production, but the lion's share of consumption still lies within the developed OECD world.

What is apparent from this analysis is the synchronous acceleration of trends from the 1950s to the present day — over a single human lifetime — with little sign of slowing. These trends are known as the Great Acceleration.

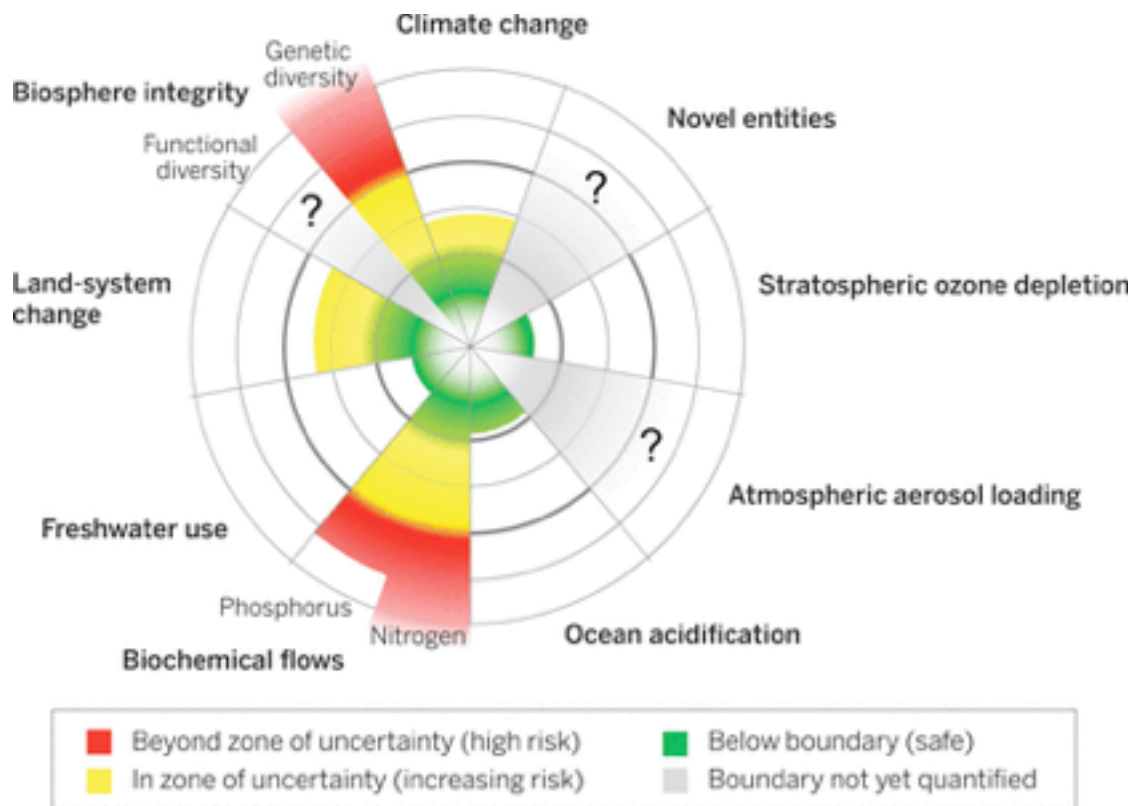
Planetary Boundaries

The planetary boundaries concept aims to define a safe operating space for humanity within the dynamics of the Earth system. Identifying and quantifying planetary

boundaries that must not be breached could help prevent human activities from causing irreversible environmental damage.

This framework distills the complexity of the Earth system — of land, oceans, atmosphere and life — into nine global-scale processes that keep the Earth in its current hospitable state. They include: climate change, biodiversity loss, land-system change, biogeochemical flows, stratospheric ozone depletion, ocean acidification, freshwater use, atmospheric aerosol loading, and chemical





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pollution. Knowing where these boundaries are can provide early warning when we are approaching a potential threshold in a planetary process, beyond which we risk destabilising the Earth system.

Four of nine planetary boundaries have now been crossed as a result of human activity, says an international team of eighteen researchers in the journal *Science* (16 January 2015). The four are: climate change, loss of biosphere integrity, land-system change, and altered biogeochemical cycles (phosphorus and nitrogen).

Two of these, climate change and biosphere integrity, are what scientists call "core boundaries". Significantly altering either of these "core boundaries" would "drive the Earth System into a new state" perhaps hostile to continuing human habitation.

Mitigation - Adaptation - Transformation

By their nature the symptoms of the planetary malaise cannot be successfully dealt with one-by-one. Nor can they be addressed solely by technological innovation or political will. They are tightly intertwined in complex ways and deeply embedded in the very fabric of contemporary human societies.

One implication is that a crisis in any one area, even one triggered by a natural disaster, could rapidly propagate across the whole global system. The density and speed of communication, enmeshed financial markets and trading patterns, regional and global arms races, and the ability of extremist groups and rogue states to spark serious disruption amplify the danger of cascading systemic failure.

Our response to this global emergency must be threefold:

- **Mitigation:** Urgent action to reduce harmful human impacts on the biosphere by measures such as: drastically reducing greenhouse gas emissions, ending deforestation and protecting threatened habitats, phasing out ecologically harmful chemical use by industry and agriculture, slowing the rate of biodiversity loss, limiting and containing mining impacts, restricting exploitation of marine and arctic ecosystems, ameliorating human population pressures.
- **Adaptation:** Comprehensive and integrated planning to deal with ecological disruptions that can no longer be avoided, such as: extreme weather events, fresh water and food scarcity, sea level rise, spreading desertification.
- **Transformation:** Fundamental redesign of our societal, economic, and technological systems to achieve compatibility with the planet's life support systems. To succeed this systemic transformation must be informed by a transformation of our core cultural values.

There will be communities and even whole societies that respond to these challenges with varying degrees of wisdom and compassion. Others will remain mired in self-defeating denial and confusion. Some will regress to destructive conflict, violence and extremism.

Living in the Anthropocene

The Anthropocene fundamentally reframes our relationship with the non-human environment. It represents the emergence of a new worldview: humans are an integral part of the Earth system and, more importantly, can collectively shape its future.

Anthropologist Gísli Pálsson of the University of Iceland argues that the most striking feature of the Anthropocene is that it is the first geological epoch in which a defining geological force (us) is actively conscious of its geological role. This awareness can, at least potentially, give us the capacity to reshape our human presence on the planet by reshaping our shared culture.

In the final analysis the Anthropocene represents a profound existential challenge. As Swedish scholar Steven Hartman puts it: "The great environmental predicament of the early 20th century is not primarily an ecological crisis, though its ramifications are far-reaching within ecological systems. Rather it is a crisis of culture."