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Planetary boundaries for sustainable development

Scientists have defined nine inter-connected 'planetary boundaries' within which humanity and the Earth can operate sustainably, but beyond which lies unacceptable environmental change.

Credit: NASA

Reporting in the journal *Nature* in September, 28 internationally renowned scientists, affiliated with the Stockholm Resilience Centre, made the first attempt to identify and quantify nine biophysical thresholds: climate change, stratospheric ozone, land-use change, freshwater use, biological diversity, ocean acidification, the nitrogen and phosphorous cycles, aerosol loading and chemical pollution. The land-use change threshold, for example, is defined by the percentage of global land cover converted to cropland, while the climate change threshold is defined in part by the atmospheric carbon dioxide concentration.

The group hypothesises that if the planet is to remain in a stable state we should not transgress these boundaries, and because they are inter-connected, crossing one may trigger the crossing of another. If this happens the planet may move out of the relatively stable Holocene state it has existed in for the past 10 000 years into a new 'unstable' geological era – the Anthropocene – where human activities could threaten the Earth's capacity to regulate itself.

Three of the boundaries – climate change, biological diversity and nitrogen input into the biosphere – may already have been crossed and we are fast approaching others.

The group says that their approach does not offer a complete roadmap for sustainable development, but it may assist decision-making around future human development such as the current Copenhagen climate change negotiations.