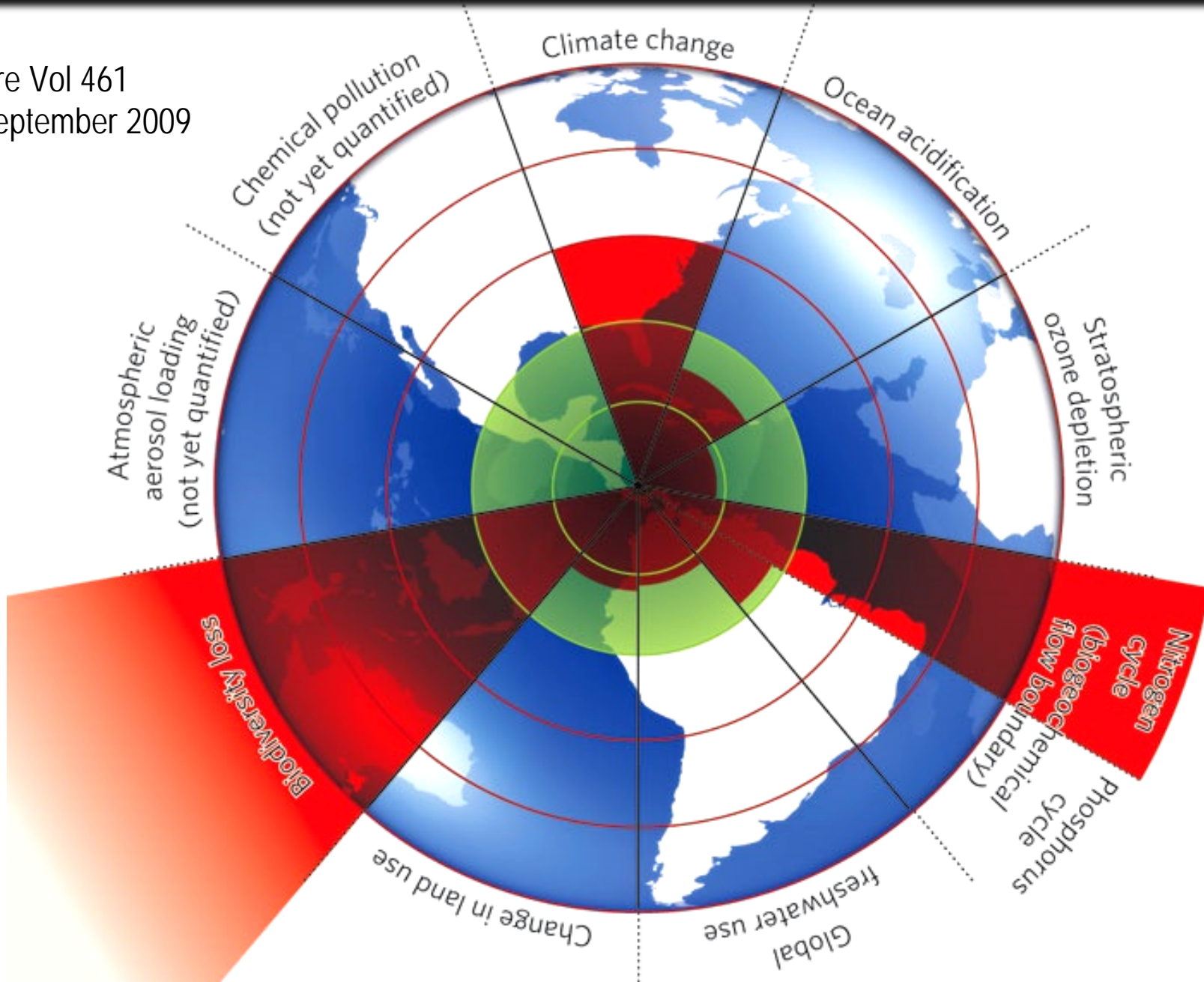


# „A safe operating space for humanity“

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# Parameters & authors

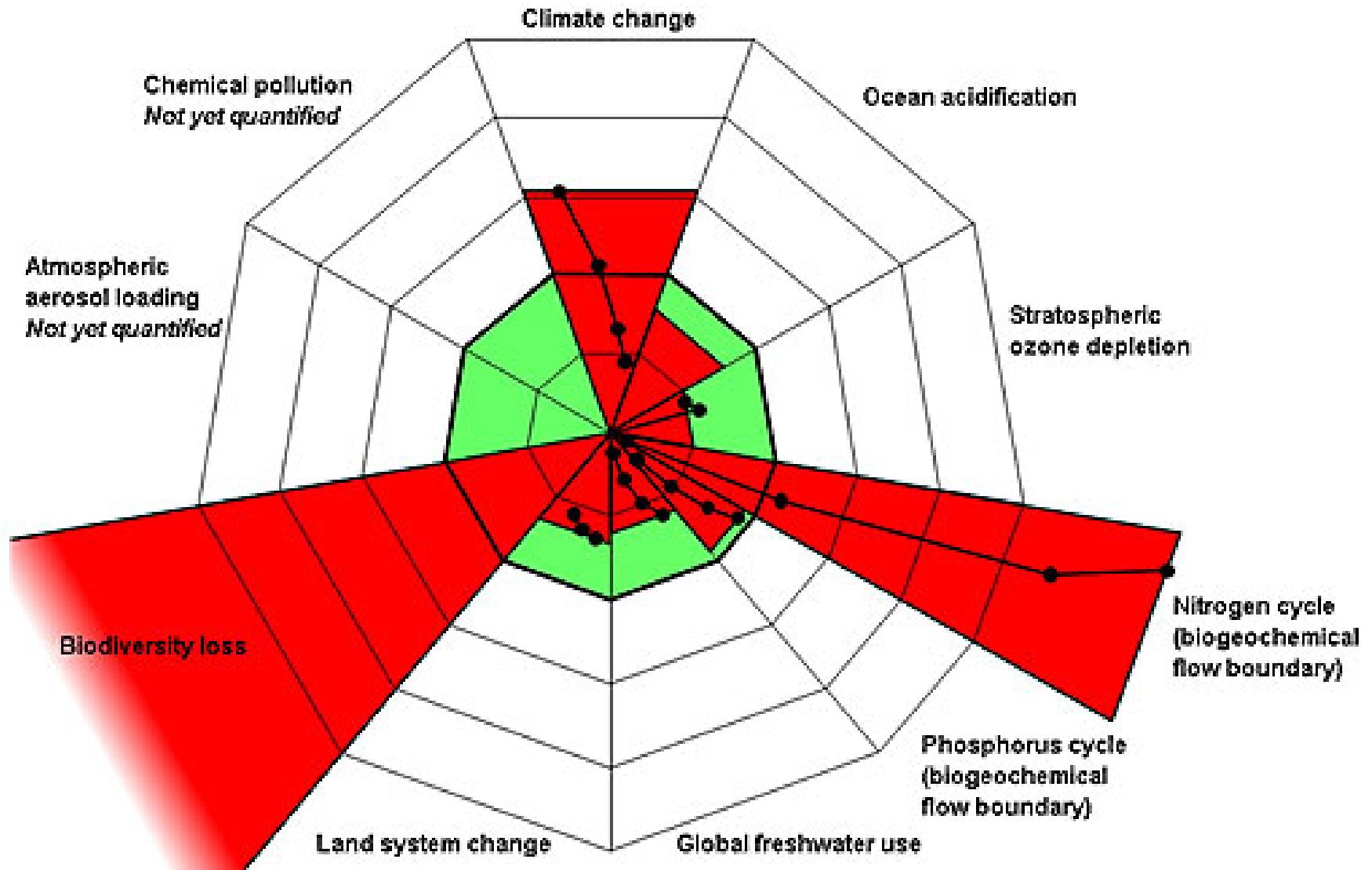
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## PLANETARY BOUNDARIES

| Earth-system process  | Parameters  | Proposed boundary | Current status   | Pre-industrial value |
|---|---|-------------------|------------------|----------------------|
| Climate change  | (i) Atmospheric carbon dioxide concentration (parts per million by volume)  | 350               | 387              | 280                  |
|   | (ii) Change in radiative forcing (watts per metre squared)  | 1                 | 1.5              | 0                    |
| Rate of biodiversity loss                                     | Extinction rate (number of species per million species per year)  | 10                | >100             | 0.1-1                |
| Nitrogen cycle (part of a boundary with the phosphorus cycle) | Amount of N <sub>2</sub> removed from the atmosphere for human use (millions of tonnes per year)  | 35                | 121              | 0                    |
| Phosphorus cycle (part of a boundary with the nitrogen cycle) | Quantity of P flowing into the oceans (millions of tonnes per year)   | 11                | 8.5-9.5          | -1                   |
| Stratospheric ozone depletion                                 | Concentration of ozone (Dobson unit)  | 276               | 283              | 290                  |
| Ocean acidification   | Global mean saturation state of aragonite in surface sea water  | 2.75              | 2.90             | 3.44                 |
| Global freshwater use   | Consumption of freshwater by humans (km <sup>3</sup> per year)  | 4,000             | 2,600            | 415                  |
| Change in land use  | Percentage of global land cover converted to cropland   | 15                | 11.7             | Low                  |
| Atmospheric aerosol loading                                   | Overall particulate concentration in the atmosphere, on a regional basis  |                   | To be determined |                      |
| Chemical pollution  | For example, amount emitted to, or concentration of persistent organic pollutants, plastics, endocrine disruptors, heavy metals and nuclear waste in, the global environment, or the effects on ecosystem and functioning of Earth system thereof |                   | To be determined |                      |

Boundaries for processes in red have been crossed. Data sources: ref. 10 and supplementary information

# Development since 1950



Estimates of how the different control variables for seven planetary boundaries have changed from 1950 to present. The green shaded polygon represents the safe operating space.