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A SAFE SPACE

With just ten weeks left until negotiations begin in Copenhagen, it's all too easy these days to view global sustainability solely in terms of climate change. In this issue, experts respond (see page 112) to a gallant effort to define the limits to sustainability — one that sets planetary warming, among other environmental issues, in the wider context of global change. The 'planetary boundaries' framework, conceived by a group of renowned Earth and environmental scientists led by Johan Rockström of the Stockholm Resilience Centre, identifies thresholds for seven environmental indicators (*Nature* **461**, 472–475; 2009), from ozone depletion to biodiversity loss.

Crossing even one of these boundaries could affect the stability of the entire Earth system. For most parameters, such as ocean acidification and freshwater availability, we are still within our safety zone, say the authors, though we must proceed with caution to remain there. For others, such as climate change, we may have already passed the point where abrupt change is a real possibility.

But defining an acceptable upper limit, or tipping point, for any indicator of change can be somewhat arbitrary (see pages 115 and 117). On climate change, for example, Rockström and co-authors define the boundary using a dual approach: both as an atmospheric CO₂ concentration of 350 parts per million (p.p.m.) and as a radiative forcing of one watt per square metre above pre-industrial values. While there is a broad consensus on the need to keep temperatures within 2 °C to avoid 'dangerous climate change', there is a notable lack of scientific agreement on acceptable upper limits for the parameters chosen by Rockström and co-authors. Depending on how sensitive the climate is to changes in atmospheric CO₂, it could well be true that 350 p.p.m. represents a dangerous level of interference with the climate system. Dwindling Arctic summer sea ice, among other visible climate impacts, is certainly one reason to argue for setting a safety limit below current levels.

But caution is warranted in taking these values as targets for decision-making. Atmospheric CO₂ concentrations are currently at 390 p.p.m., and even if we could put an end to our emissions now, a sizeable fraction of CO₂ would remain in the atmosphere for millennia (*Nat. Rep. Clim. Change* **2**, 156–158; 2008). Unless we find a way of sucking CO₂ out of the atmosphere (*Science* **325**, 1654–1655; 2009), returning to 350 p.p.m. within a time-frame that is relevant to decision-makers will be well nigh impossible.

Targets can all too easily be used to justify continued environmental degradation on the basis that it is within an acceptable range (*Nature* **461**, 447–448; 2009). That's especially true of long-term goals, whose chances of being met can't be measured by present-day behaviour. In that regard, near-term targets for emissions reductions, such as those being espoused by the European Union and Japan in the lead-up to Copenhagen, and by the 10:10 campaign to slash UK emissions ten per cent by 2010, may ultimately be more effective at keeping humanity within a safe operating space — on one measure of sustainability, at least.

OLIVE HEFFERNAN, EDITOR

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