

Some semblance of a game plan*

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Threats, uncertainty and negotiating strategy

The Copenhagen Scientific Congress of March 2009 established that (in the language of Article 3.3 of the Climate Convention) “threats of serious and/or irreversible damage” from climatic change are real and possibly imminent. Art 3.3 provides for cost effective precautionary action to be taken by the Parties to the Convention in the face of such threats, without delay on account of scientific uncertainty. That uncertainty exists in relation to such damage is axiomatic given that the language employs the word “threats” rather than “forecasts”. Uncertainty may also exist as to the efficacy of precautionary action and lack of consensus by the Conference of Parties should not inhibit Parties, or groups of Parties (such as the G8 or the Major Economies Forum) from acting in response to their perception of threats and responses. Cost effectiveness is not achieved by restricting responses to emissions reductions [1], as with Kyoto, and the aim should be for actions under Art 3.3 to be negotiated in the post-2012 regime as buy-out of emissions reduction commitments, on the basis of greater outcome for the same expenditure.

Scylla and Charybdis

The threat of collapse of land based Polar ice sheets into the oceans is one threat. The possibility of inhibiting tropical monsoons through diminished excess land surface temperature relative to ocean, is a second that may be exacerbated by an effective response to the first.

Two metrics for climatic danger

Collapse of Polar ice sheets towards the end of previous warming phases is evidenced by paleo-climatic studies [2,3] and a mechanism of basal lubrication due to meltwater descending to underlying rock has been proposed [4] with evidence of increased frequency of ice-quakes [5]. A cumulative basal warming effect may be adduced given the likely absence of escape routes for such meltwater relative warmth, leading to the integral of CO₂-equivalent gases (above an unknown threshold) as a proposed metric for danger [6]. Limiting that integral through an urgent return of CO₂ levels to pre-industrial [7,8] may (due to the greater thermal mass of the oceans) result in more rapid cooling of land masses than the oceans, with diminished advection of tropical moist air onto continental land masses [9] and threatened monsoon failure. A metric for this threat is the forecast trend of relative ocean-land temperature difference under carbon stock management that addresses the threat from basal warming of land based Polar ice.

Carbon stock management

A survey of geoengineering options [10] found afforestation and reforestation, biochar soil amendment and combined Bio Energy and CO₂ Capture and Sequestration (BECCS) are jointly capable of radiative forcing of -1.40Wm^{-2} and -2.76Wm^{-2} by 2050 and 2100 respectively, substantially greater than any other long-wave forcing reduction potential and exceeded only by increasing short wave reflection through stratosphere aerosols or cloud albedo enhancement (which, however, provides no remedy for ocean acidification).

* “The overarching concern is having some semblance of a game plan for dealing realistically with what may be coming down the road” (Weitzman, 2007).

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Since emissions reductions falls outside the definition of geo-engineering adopted in [10] the carbon stock management estimates excluded the reduced emissions that result from the planned substitution of woody biomass for fossil fuel as the forestation reaches commercial maturity and is harvested to make room for a second rotation [7,8]. Inclusion of these linked emissions reductions effects of the carbon stock management approach approximately doubles its effectiveness as reported in [10]. Thus a return to pre-industrial greenhouse gas levels that closes the integral metric at about double its present value seems feasible, given sufficient investment in the land (particularly the irrigation needed for rapid tree growth). A recent paper [11] argues that reverse osmosis of seawater and the transmission of freshwater to fast growing desert forestation projects can sequester carbon at lower cost than projected CCS costs. Arid land soil improvement can thus provide an easing of the potential competition for land that has been noted [1]. Such a rapid reduction in climatic forcing could, if applied uniformly worldwide, result in land temperatures declining relative to ocean temperatures so as to induce monsoon failures. However, to the extent CO₂ removals are achieved through reforestation in selected tropical areas, the resulting regionally reduced albedo may be managed to sustain the temperature difference needed for monsoon advection to take place. If insufficient, such warming of the land may be supplemented by cooling of the oceans [12].

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