Comments to "What Next?" IPCC meeting, Berlin, 23 Nov. 07

By Peter Read

Chairman, Colleagues – thank you for this opportunity to draw attention to my forthcoming editorial essay in *Climatic Change* for which a flier is available 'on the table'. The flier links to background research published as a Working Paper.

The key result is that

> **There is a limit to what can be achieved by emissions reduction so that threats of abrupt climate change can likely not be averted by emissions reductions alone**.

Here "Abrupt Climate Change" is loosely defined – by it I mean the threat of passing a single aggregate tipping point for the earth as a whole, precipitating "a large scale singularity" – a shift to a state that may be much less amenable for human life. .

Most of the threats of abrupt climate change seem likely to be temperature driven, that is to say driven by the integral of the heat input caused by elevated greenhouse gas levels – the double integral of net emissions less (rather slow) natural removals. These threats include methane escapes from thawing tundra, loss of Arctic summer ice and collapse of land based ice sheets.

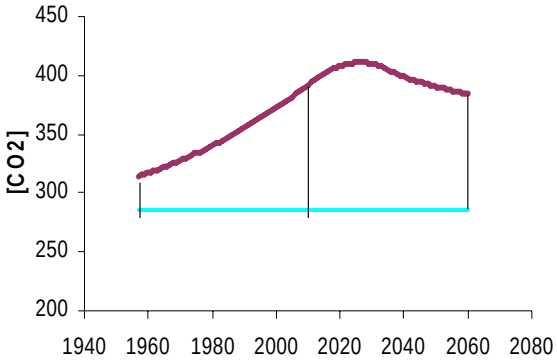
Signs are that these are beginning already with only 0.7 degrees Celsius temperature increase. Yet even a most implausibly successful program of emissions reductions, that sees a linear decline to zero by 2035, commits earth to roughly twice as much heat input over the next 50 years as has occurred over the last 50 (during which emissions have taken off) and with no ending then (see 1st figure below).

It is therefore necessary to supplement emissions reductions with large scale carbon removals – getting carbon out of the atmosphere and stocking it somewhere safer.

Carbon removals, on the scale illustrated by the calculations in the Working Paper, limits the additional heat input to only about as much again as has occurred in the last half century, and ends it by around 2040 (see 2nd figure below).

That may not be enough to avoid abrupt climate change and my essay recognizes the possible need, if climate science news gets worse, for raising cloud albedo, as proposed by Paul Crutzen in an earlier Editorial Essay, and elsewhere by Salter and Latham. However, albedo enhancement does nothing to reduce CO_2 concentrations in the oceans.

Thermal input to the climate system in the last half century
and, **IF emissions are reduced to zero by 2035**, in the next



N.B.the non-linearity due to saturation of infra-red absorption is not represented in this figure. The top curve is the middle curve from the figure below, projected back to 1957 using recorded data. By inspection it is apparent that the area above the pre-industrial 285ppm is roughly twice as great for the next 50 years as for the last 50.

Note also that collectively changing our ways and leading less consumerist lifestyles, as widely canvassed, constitutes emissions reductions and does not provide an effective precaution against the threat of abrupt climate change.

What next for the IPCC ?

I believe that IPCC Working Group One has been too much concerned with scientific certainty. This is not only because certainty in relation to the future behaviour of a complex non-linear dynamic system, such as earth's climate, is a *chimera* – a will-o'-the -wisp. It cannot be forecast though it can be controlled given sufficiently prompt response measures.

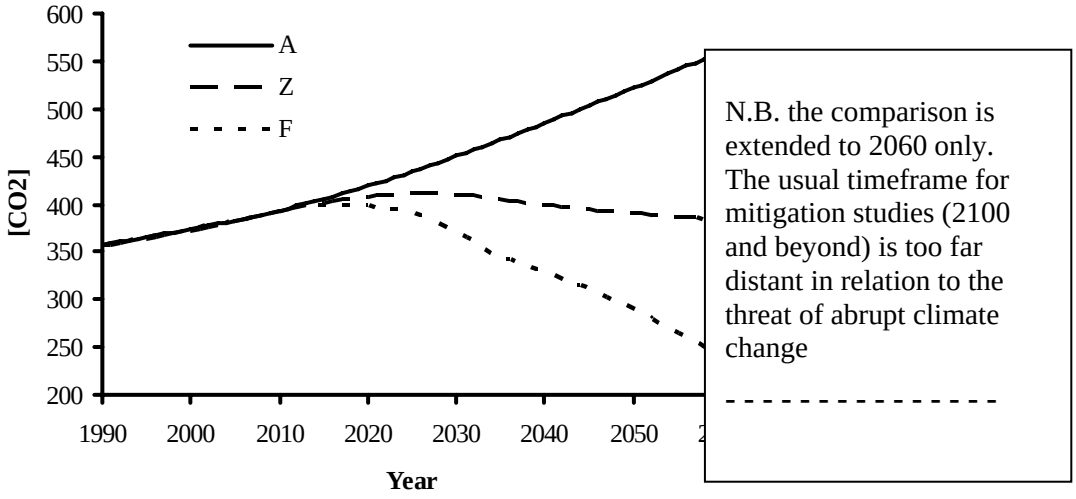
More is it because Article 3.3 of the Climate Convention commits the Parties to "take precautionary measures … where there are threats of

serious or irreversible damage" [without delay on account of] … "lack of full scientific certainty".

The significance of this is that there is no need for the Parties to agree on collective action (as under Article 4.2(d) which is the basis for the Kyoto Protocol) or even on the existence of a threat.

Pandering to the demand for certainty distracts us from focusing on research to underpin precautionary measures under Art 3.3

Comparison of zero emission systems and carbon removals systems in mitigating the level of CO_2 (in ppm) in the atmosphere



Legend

A SRES-A2 [17]

Z SRES-A2 with a transition to zero emissions technologies between 2011 and 2035

F SRES-A2 with a transition to negative emissions technologies over the same period

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Each Party that perceives such a threat is duty bound under Art 3.3 to take precautionary action whatever other Parties do, without waiting for the negotiating convoy to proceed at the speed of the slowest ship (located somewhere in the Middle East).

Such individual action can quickly lead to the formation of a group of major Parties (e.g. the G8 Global Bio-Energy Partnership) to drive the take up of carbon removals technologies and create a global market in sustainably produced biofuels. This gives hope for the effective action this decade that some scientists have claimed is needed to avert disaster.

Accordingly, those of us who believe that such a threat exists may choose to focus their research on demonstrating the existence of threats of abrupt climate change, and on detecting its precursors, rather than improving confidence that climate change is (gradually so far) taking place.

On the "What next ?" theme of this meeting, I hope the IPCC in its next assessment will give prominence to such research.

Additionally, I hope that mitigation research will increasingly focus on negative emissions systems and that Working Group Three will give prominence to such research as a response to the threats of abrupt climate change. Such research must focus on land-use improvements that sustainably increase the global aggregate of Net Physical Productivity.

The background paper has illustrative calculations of only three negative emissions systems deployed on a vast scale. These were designed to demonstrate the effectiveness of negative emissions systems, and are not a policy proposal (line F, 2nd figure above) .

Implementation would entail environmental and socio-economic desiderata to be advanced by obligations on emitters that result in a vast number of modest scale carbon removals projects employing a wide variety of sustainable best practice negative emissions systems adapted to the local conditions where they are carried out.

Call it Global Gardening

For instance the calculations included the effect of 1 billion Hectares of plantation forestry created over a 25 year period. But best practice (costly and therefore *prima facie* evidence of additionality) would result not in 1000 plantations averaging 1 million Hectares but in, say, 300,000 plantations averaging 3000 Hectares. These provide carbon credit cash income to the local communities as well as meeting needs for firewood, poles, etc., through gathering windfall and thinnings prior to eventual harvest and replanting.

Such a program, alongside a great variety of carbon conservative agricultural land improvement projects adapted to the needs of local communities to yield enhanced supplies of co-produced food, fibre and fuel (illustrated in the working paper as greatly expanded sugar cane in tropical regions and switchgrass cropping in temperate zones) requires the

creation of a corps of many thousands of ‘grassroots entrepreneurs’ initiating country-driven projects adapted to the sustainable development path of their own countries.

GEF funded capacity building for global carbon removals adds ~0.04$/tC onto costs of projects that would otherwise not start.

There are valid concerns over competition for land with food production, but these neglect an earlier concern over subsidized food exports driving prices down and impoverishing third world farmers. And there is potential for synergies with co-production of traditional food and fibre with biofuel from currently wasted residues. The money comes from energy suppliers investing in a strategic stock of biomass raw material, e.g. in new short or long rotation plantations, and thereby discharging carbon removals obligations.

There are ~2.4 billion Hectares of potential arable land that is not in commercial use, and this was used as the basis of the background paper calculations. But there are ~6 billion hectares of variously managed land worldwide. Investment in these lands – induced by higher food prices and by carbon removals obligations on emitters – would, prima facie, result in sufficient food and co-produced biomass fuel raw material to meet all foreseeable global demands (providing population growth can be stabilized in line with forecasts).

Of course there are problems, including water constraints that maybe relieved by saving some of the fresh water that currently flows to sea. Water diversion, irrigation and desalination schemes are a suitable outlet for the large capital project capabilities of the major energy companies.

There is $30 trillion to be spent on energy investment over the next 30 years according to the IEA, not including additional cash flows arising from positive carbon prices. Energy firms can be driven to spend it on growing biofuels, rather than extracting fossil fuels, through carbon removals obligations attached as a condition of the initial issue of emissions permits.

Not immediately, but before long, macro-economic multiplier effects in underemployed but land-rich countries would raise living standards, and not only of farmers. The urban poor would find employment through the economic expansion made possible by direct foreign investment and by the

relief from oil import costs resulting from an expanding domestic biofuels industry.

Through mutual interest of North and South, carbon removals is prospectively negotiable, *per contra* an emissions reductions strategy calling for burden sharing between Parties with sharply differing views on past and future responsibilities.

A commitment by the South to accepting objectively assessed sustainability criteria in exchange for a commitment to direct foreign investment in land-use improvement projects by the North – with improved energy security for both – is more promising.

Bilateral arrangements under Art 3.3 could be negotiated as an offset against emissions reductions commitments in the post-2012 regime, maybe in the context of the Russian proposal for voluntary actions to be taken into account.

So yes the problems are there – currently highlighted by the deficiencies of first generation corn-starch to ethanol projects and the destruction of ancient forest to make way for oil palms.

But the expansion of biofuels is inevitable in the age of high cost oil. ***The task of the research that I would want to be involved with, hopefully to be assessed by WG3 for the Fifth Assessment Report, is to provide policy makers with sustainable solutions to these problems***, recognizing that the Net Primary Productivity of the soil is not fixed but a function of land management.

However carbon removals is not rocket science. Now, in 2007, it is rather like the atom bomb in 1940 – the basic science had been done and the British, the Germans and the Americans all knew how to do it in principle. The prize went to the Americans because they mounted the vast effort of organization and technological improvement that was needed to apply the known basic science.

So, to say it again:

> **threats of abrupt climate change can likely not be averted by emissions reductions alone. Getting carbon out of the atmosphere and stocking it somewhere safer is feasible with known technology, if applied worldwide**.

Thank you

Accepted for publication – not for citing or quoting without author's ageement

Biosphere Carbon Stock Management:
Addressing the threat of abrupt climate change in the next few decades.

"Il faut cultiver notre jardin" (Voltaire, 'Candide or Optimism')[1]

1 Introduction

Climate change is taking place, and fears of triggering abrupt climate change (ACC) are rising. This is mainly because of an excess stock in the atmosphere of otherwise benign CO_2. That can be remedied by beneficial changes in the ways we manage the biosphere.

But first, imagine that everything that could go well with the Kyoto process after 2012 does go well. That not only do the Parties find a way of ensuring that all the major emitting nations – USA, China, India, etc. – reduce their emissions, but that successive agreements under extensions of the Kyoto Protocol result globally in a linear[2] reduction in man-made emissions to zero over a 25 years period, starting in 2010. Then the profile of CO_2 levels is line Z in Figure 1 (relative to the IPCC's economically bullish SRES A2 baseline scenario – line A). That is a much greater success than global emulation of the British target, widely regarded as very ambitious, of a 60 per cent reduction by 2050.

Alternatively, imagine that a programme of biosphere carbon stock management (BCSM) is implemented over the same period, yielding worldwide improvement, *à la Candide*, in the ways we use land, raising its sustainable productivity through investments on the scale of current global investments in getting oil and other fossil fuels. With enhanced photosynthesis thus taking more CO_2 out of the atmosphere than under current land management practice, the carbon fixed thereby is conserved carefully through large-scale deployment of bio-based negative emissions systems. While using products of the land for food, fibre and fuel, a large part of the carbon-rich wastes is then stocked more safely than in atmosphere.

Under an illustrative characterisation of this alternative programme, the resulting profile of levels is line F in Figure 1. Line Z is, by definition, the best that can be done by emissions reductions under the 25 years linear assumption. However, deploying more biosphere carbon management activities could, imaginably, yield lower profiles than F.

The contrast between lines F and Z is the principal result in a discussion paper that also carries rejoinders to the comments of its most recent referees[3]. How the policy process came to overlook BCSM has been attributed to a false vision[4] of CO_2 as contamination resulting from failures of communication between the disciplines involved.

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[1] Candide's final comment has been variously interpreted – I take it as Optimism's call to act locally after a travail of thinking globally in the face of Panglossian denial and miserable experience. " 'We must work without arguing' said Martin; 'that is the only way to make life bearable'. The entire household agreed to this admirable plan… Small as the estate was, it bore heavy crops." (translated John Butt, Penguin Classics).

[2] I.e. emissions in 2011 are 96 percent of SRES A2 for that year; in 2012 they are 94 percent of SRES A2 for 2012; and so on until they are 4 percent of SRES A2 in 2034 and zero from 2035 onwards.

[3] Read and Parshotam, 2007. "Holistic Greenhouse Gas Management Strategy (with Reviewers' Comments and authors' rejoinders)". *Institute of Policy Studies Working Paper* 07/1, Victoria University of Wellington. Wellington New Zealand. http://ips.ac.nz/publications/publications/show/205 . See also "Policy Instruments for a Sustainable Future", http://ips.ac.nz/publications/files/f659c9661de.pdf for discussion of an additional policy instrument for addressing strong detrimental externalities, which the price mechanism cannot handle.

[4] Not in the connotation of 'visionary' but the more prosaic 'concept of the world' conveyed by the German *weltanschauung*, for which there is no precise English equivalent. In a world of excess information and bounded rationality it is such vision that guides our selection of information, thus creating and reinforcing the knowledge, possibly false, which informs our actions. Fransman [2] cites IBM management in the 1980's (having better information than anyone about the potential of the PC, but with its vision wedded to the mainframe computer) as the classic case of false knowledge leading to commercial disaster. In this essay I argue that climate change mitigation is in jeopardy because wrongly envisioning CO2 as contaminating pollution has led to a policy focus on costly and divisive emissions reductions rather than widely beneficial and geo-politically sweet BCSM.

BROADENING THE RHETORIC

Policy language highlights "emissions reductions" with "carbon removals" sidelined

For a carbon removals strategy to run harmoniously with the emissions cap it needs

1. **A different scientific basis from the very long term problem envisaged by the 1995 Berlin Mandate: i.e potential abrupt climate change**
2. **A feasible technological basis: growing plants, bio-energy and C-storage are not rocket science, although a vast organizational effort is involved**
3. **A valid response to environmental concerns) through best practice**
) conditionality on the
) discharge of policy
4. **A valid response to concerns for socio-economic equity) obligations under (5)**
5. **A policy instrument separate from Kyoto – tradable carbon removal obligations (RPS-like) – leaves the C-price available for implementing the emissions cap**
6. **A fit with the existing diplomatic process - bi-lateral bioenergy partnerships that may converge to multinational agreement on sustainable best practice carbon removals in a complementary protocol hanging from Art 3.3 of the UNFCCC.**

Environmental sustainability because	*Socio-economic equity because:*
1. *More ambitious CO2 reductions at low cost* 2. *Renewable transportation fuel* 3. *Sustainable forestry and timber supply* 4. *Biodiversity conservation [MEA]* 5. *De-acidification of the oceans [MEA]* 6. *Bio-barriers against desertification [MEA]* 7. *Sea level rise limited – wetlands conservation [MEA]*	1. *Bio-fuel export earnings for many developing countries* 2. *Sustainable rural development [MDG]* 3. *Reduced energy poverty [MDG]* 4. *Based on direct private sector investment by North in land use improvement projects in the South* 5. *Alternative income for farmers* 6. *Co-production for food and fibre with biofuel* 7. *Investment to address water conservation*

Mutual benefit to North and South – with increased energy security for both and a backstop limit on oil price rises, and through gains from trade, based on the comparative advantage of the South in biotic production realized through investment by the North – may ameliorate the North-South divide that has vitiated progress with negotiating effective emissions reductions