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Global Gardening with a Leaky Bucket Addressing the Threat of Abrupt Climate Change

Peter Read

Hon Research Fellow

Massey University Centre for Energy Research



Massey University

Art 3.3 of the UNFCCC

- “**The Parties** should take precautionary measures....’
- ‘where there are **threats** of serious or irreversible damage , **lack of full scientific certainty** should not be used as reason for postponing such measures ...[which] ... should be **cost effective** so as to ensure **global benefits.**”

The bad news:

there is such a threat and earth is in crisis

Surface Melt on Greenland

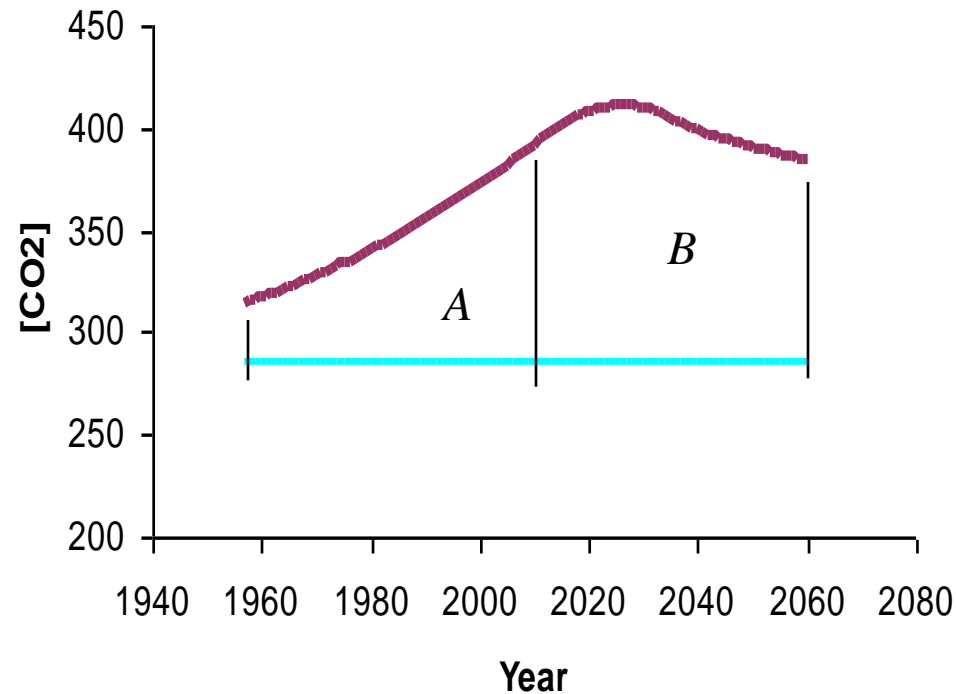
Melt descending into a moulin, a vertical shaft carrying water to ice sheet base

Quite a bit of basal lubrication here ! (*PR*)



Source: Roger Braithwaite, University of Manchester

The metric for this : the integral or cumulative thermal input



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

The good news

**EMMISSIONS REDUCTIONS IS HARD
BUT**

CARBON REMOVALS IS EASY

**besides being effective (possibly effective enough
but we may need cloud albedo modification also)
it is widely beneficial because it means**

- **Better soil quality with reduced fertilizer use**
- **Better water and nutrient management**
- **Better rural livelihoods**
- **Secure food supplies**
- **Geographically diversified energy supply**
- **Etc etc etc**

CO BENEFITS !!

Why easy?

Clear your minds of the idea that CO₂ emissions stay in the atmosphere for 150 years

They stay in the atmosphere-ocean-biosphere system for 150 years

About 120 Gt [C] exchanged with oceans annually

About 110 Gt [C] exchanged with biosphere annually

About 780 Gt [C] in the atmosphere

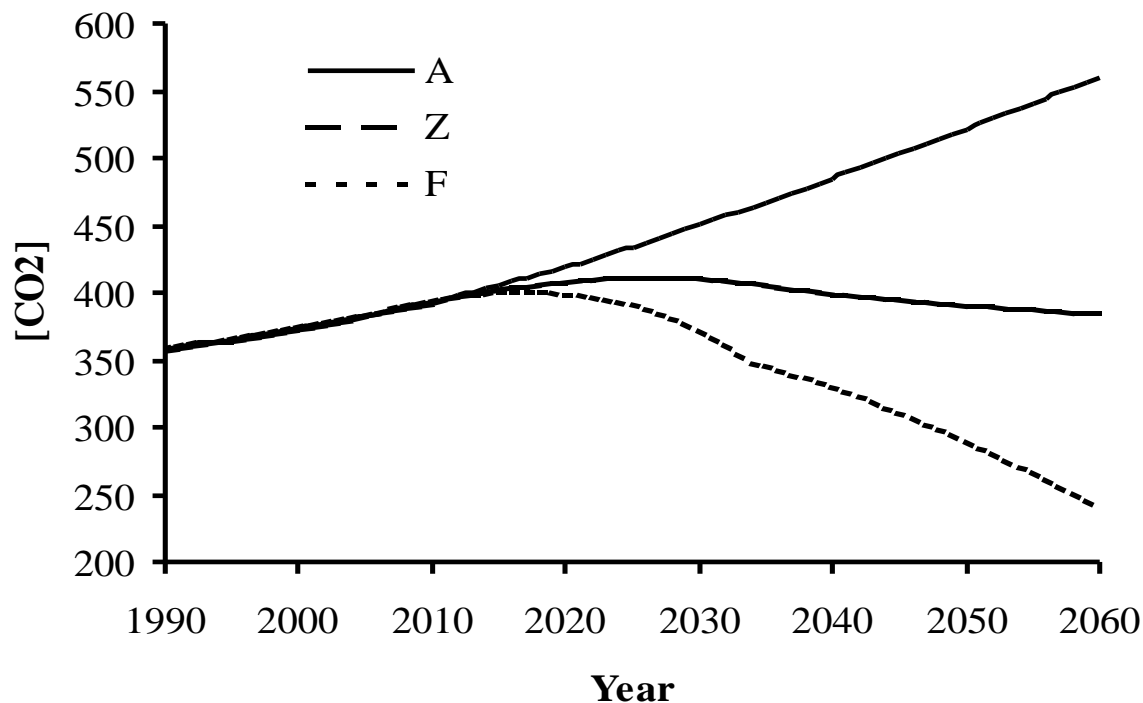
So emissions stay in the atmosphere for <4 years

No easier to extract from ocean than atmosphere

And 60 Gt [C] exhaled immediately by plants in meeting their energy needs

So about 60 Gt [C] is fixed annually by photosynthesis, meaning that that atmospheric C cycles through the biotic stock of carbon about every 13 years or so giving us about 12 opportunities during That 150 years to grab some of it and stock it somewhere safer

Comparison of carbon removals (F) with emission reductions (Z) in mitigating the level of CO₂ (in ppm) in the atmosphere



- A SRES-A2
- Z SRES-A2 with a transition to zero emissions technologies between 2011 and 2035
- F SRES-A2 with a transition to land improvement carbon removal technologies over the same period, with land use change complete by 2035 and technological progress to 2060

Global Gardening

Treat all managed soil – farmland and plantation forestry – the way a good gardener treats his soil.

Raise soil organic carbon and soil productivity through biochar soil amendment

Biochar is long lived ground up charcoal from pyrolyzing biotic waste material and treating with organic wastes (mulch heaps, sewerage ponds, etc) to produce long lived fertilizer

(remember Danny Day IEW 2003)

Some stand alone energy crops but mainly

- Co-produced timber + bioenergy
- Co-produced food + bioenergy

Linked to negative emissions systems

- Some wastes to biochar and C storage in soil
- Some bio-energy plants linked to CCS
giving BECCS

Where?

There is no shortage of land, there is a desperate historic lack of investment in land: “global gardening” is needed – treat farmland and forest land like a good gardener treats his soil

Potential rain-fed arable land, net of protected land and urban settlement, has been estimated by Moreira [28] based on IPCC and FAO studies [29,30], viz:

	Gha	%used	available (Gha)
Sub Saharan Africa	1.05	15	.893
North Africa and Near East	.04	100	
North Asia Urals Eastwards	.28	64	.101
Asia and Pacific	.74	64	.266
South and Central America	.98	15	.833
North America	.43	54	.158
Europe	.32	63	.118
World		3.82	38
			2.38
			of which 1.99 tropical
			.38 temperate

Sustainable Biofuels Consensus

http://www.sef.org.nz/views/Sustainable_Biofuels.pdf

The Sustainable Biofuels Consensus is the outcome of a four day expert workshop held under Chatham House rules and hosted by the Rockefeller Foundation at its study centre at Bellagio on Lake Como, near Milan. The original vision for workshop output was a North-South Biofuels Pact.

In the circumstance of negative publicity for biofuels, with substantially misinformed media discussion, we devoted effort to providing a balanced assessment of the food versus fuel debate, of the question of indirect impacts of biofuels on landuse worldwide, and of the question of carbon debt arising from poorly managed land conversion.

In reality the currently observed negative effects arise mainly as the consequence of the barriers to trade erected by just those countries that are imposing biofuels mandates, all of which could be met by expanded exports of very positive carbon benefit, sugar-cane based ethanol exports from developing countries, using land that is not currently in food production – e.g miombo.

Integrate and better coordinate policy frameworks

Assess benefits and impacts of biofuels trade, use and production, and monitor them

Reward positive impacts and investments, including through carbon management

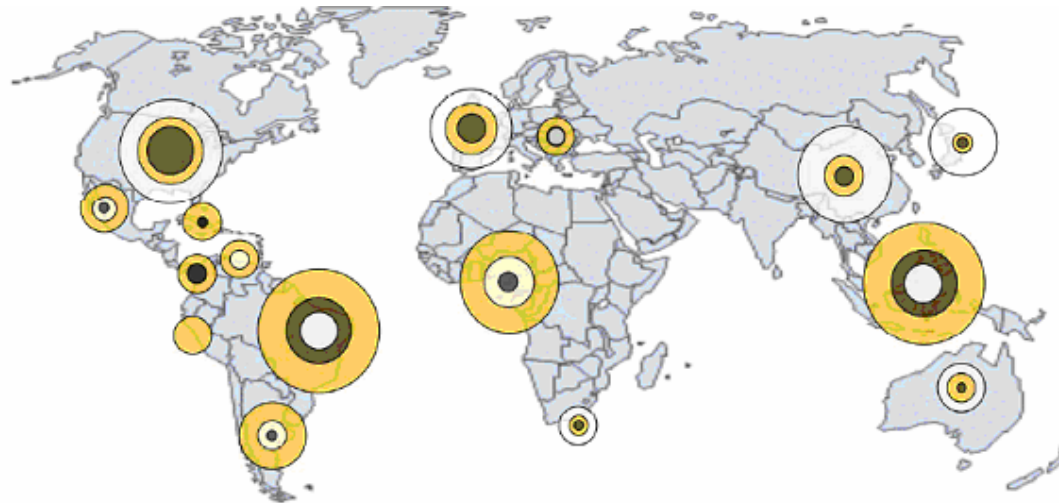
Address negative indirect effects of biofuels trade, use and production

Use informed dialogues to build consensus for new projects

Increase investment in research, development and demonstration

Build capacity to enable producers to manage carbon and water

Make sure that trade policies and climate change policies work together

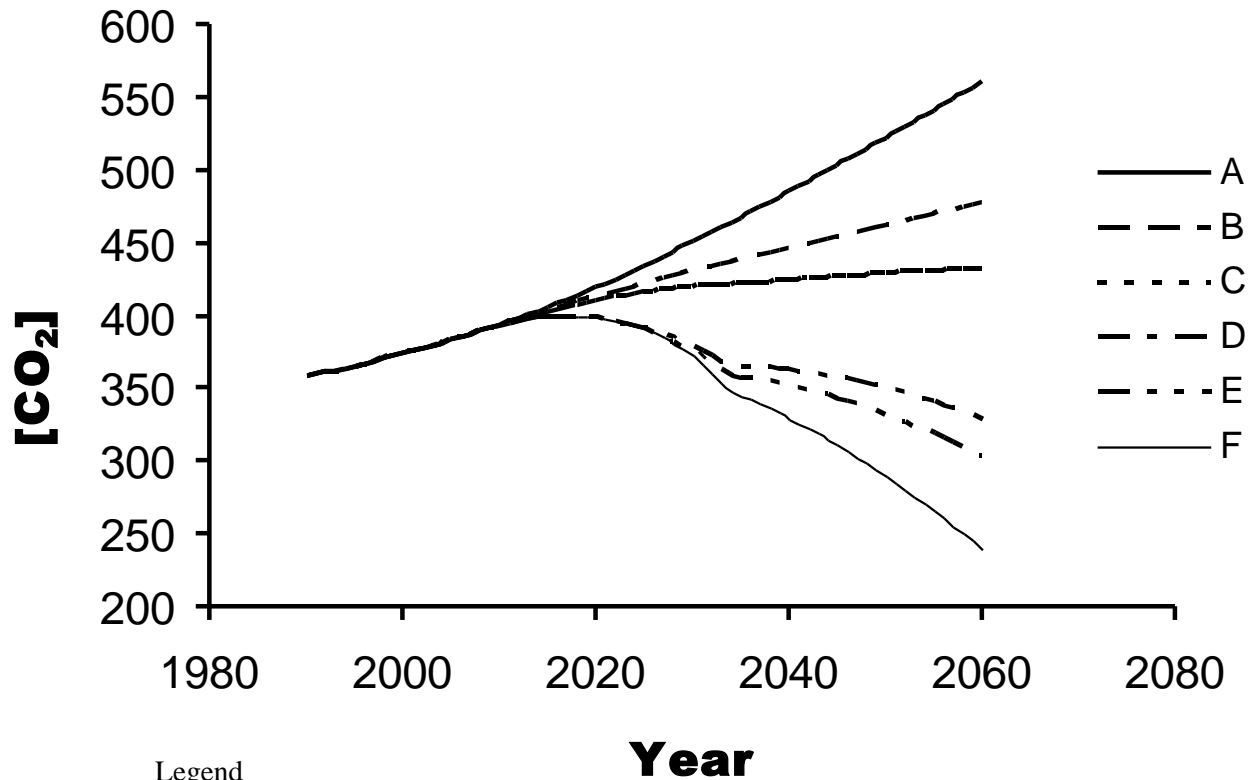


- Feedstock potential based on land available for devotion to first generation biofuel feedstocks.
- Theoretical biofuel demand, assessed to be ~30% of liquid transport fuel consumption in 2006.
- Biofuel production capacity in place at year end 2006.

- Feedstock potential exceeds biofuel demand and surplus production capacity - so export.
- Capacity less than biofuel demand so investment in infrastructure warranted to encourage export potential.
- Feedstock constrained and capacity less than demand - so import.

Source: New Energy Finance www.newenergyfinance.com

Major role for commercial plantation forestry



Legend

A SRES-A2

BSRES-A2 with sugar cane land use change activity [lower case refers to figure 3 with land areas halved]

CSRES-A2 with sugar cane and switch-grass land use change activities

DSRES-A2 with sugar cane, switch-grass and forestry land use change activities

ESRES-A2 with three land use change activities and low cost capture and storage (CCS) of fermentation CO₂

FSRES-A2 with three land use change activities CCS of fermentation and flue gas CO₂

Where's the money coming from?

For capacity building? This is a pure public good that should be financed by the GEF (about \$50m a year should yield an adequate flow of trained grassroots entrepreneurs)

For forestry projects? Similar to a biofuel obligation, fossil fuel extractors or importers must be obliged to invest in a stock of biotic carbon that will, over a rotation (25yrs?) absorb the CO₂ emitted when their product is sold and eventually yield biofuels

Proportional Abatement Obligations (Renewable Portfolio Standards) and dynamic efficiency

(Keeps money out of the hands of governments and
bureacracies)

Increasing proportional obligations represent falling
incentives per unit sales over time

This is per contra a rising C price, widely expected

A falling incentive is needed to capture the learning
externality – early learning is most important, later
learning last shorter

Baumol and Oates theory was comparative static and
fails to capture dynamic efficiency

Leaky Bucket

Replaces

high transactions cost *ex post* project based offsets

(the silver teaspoon, very costly and doesn't shift much CO₂)

With

Negotiated *ex ante* policies and measures linked to low cost best practice verification, disregarding additionality

If the policies aren't working they can be re-negotiated

Parties can deliver on policies; commitments to outcomes involves insincerity (Schelling)

Implement through

Sustainable Carbon Action Management Partnerships

Art 3.3 does not require consensus

Bi-lateral deals

Group-party deals
(a G8 SCAMP ?)

Why go it alone?



Thank you