Picking the lowest fruit in our climate change response: Solar cells for everyone?



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Pic credit: Seligman, Peter (2010), "Australian sustainable energy by the numbers", Melbourne Energy Institute (U of Melb) p.62.

Because I know what you (maybe) are thinking ...

US public opinion (Gallup polls)



"Thinking about what is said in the news, in your view is the seriousness of global warming generally exaggerated, generally correct, or is it generally underestimated?

Do you think that global warming will pose a serious threat to you or your way of life in your lifetime?

...which one of the following statements do you think is most accurate—most scientists believe that global warming is occurring, most scientists believe that global warming is NOT occurring, or most scientists are unsure about whether global warming is occurring or not?

Because I know what you (maybe) are thinking ...

US public opinion (Gallup polls)



Which of the following statements reflects your view of when the effects of global warming will begin to happen? They have already begun to happen, they will start happening with a few years, they will start happening within your lifetime, but they will affect future generations, (or) they will never happen.

...do you believe increases in the Earth's temperature over the last century are due more to the effects of pollution from human activities (or) natural changes in the environment that are not due to human activities?"

Quick review: why it's (highly likely to be) us ...

The Geological Story



(i)

Source: Hansen, J. (2005). A slippery slope: How much global warming constitutes "dangerous anthropogenic interference", *Climatic Change*, *68*(3), 269–279.

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Quick review: why it's (highly likely to be) us ... (ii)



Source: Intergovernmental Panel on Climate Change, 4th Assessment Report, 2007, p.40.

The target: Why 2 tonnes per person ...



The work ahead: stocks & flows of GHGs



Sources: World Resource Institute, "Climate Change, by the numbers"; US Dept. of Energy, Carbon Dioxide Information Analysis Centre (CDIAC).

So you want to be a Sustainability Leader? ...

1. GHG emitting activities are not confined to a sub-sector of the economy: *it is economy wide* (so policy must be 'whole of economy')

(It's mainly energy + transport, but also some specific industries (e.g. cement))

2. Costs are all born by present generation (governments), and benefits reaped by future generations (governments) (so classic temptation to delay)

3. GHGs know no boundaries! -- it is a global commons problem (so a headache for global agreement)

4. It's a hard sell:

-> CO2 is an odourless, colourless gas (black balloons)

-> The scientific argument involves an understanding of non-linearities, tipping points, thresholds (but we only educate a 'linear' world!)

-> Behaviourally we don't deal well with this kind of information (e.g. 'extreme' events thinking, 'this won't happen to me')

5. Actually, rich countries will be far less impacted than poor countries (incentive compatability?)

"Climate change presents a unique challenge for economics: it is the greatest and widestranging market failure ever seen."

⁻⁻⁻ Nicholas Stern, Stern Review, 2007, p. i

Two main policy options ... it's all about information

Policy: 'Direct Action'

aka: 'picking winners'

Idea: identify proven methods that presently exist to reduce CO2 emissions and **fund them directly**, make them required by law, or artificially increase the demand for them through tax rebates and offsets.

Key assumption: Viable, and low-cost (efficient) solutions are **known already**, expectation of the discovery of vastly cheaper solutions is **low**.

Policy: 'Putting a price on carbon'

aka: 'market based solution'

Idea: ensure (by law) that carbon emissions are part of the **costs of production** (either cap/trade, or tax). Let individual firms and citizens respond to the new signals generated by the new price landscape.

Key assumption: Governments don't and **can't know** all of the solutions (current or future) to the problem, so shift the rules of the market to favour low-carbon solutions and let entrepreneurs and individuals come up with ways to reduce carbon emissions.

Option 1: Some known solutions ... very different costs!



\$ per tonne CO2 reduced per year

What does 'direct action' (picking winners) look like? (i)

MAC: 'Marginal abatement cost'



Source: Carbon Emission Policies in Key Economies, Productivity Commission Research Report, May 2011, p.152

So .. effectively, 'direct action' looks like this ...



Actually, we're already backing some expensive options ...



Source: Carbon Emission Policies in Key Economies, Productivity Commission Research Report, May 2011, p.80

Why do we hear so much about solar, then?



In the absence of a price on carbon, the market is saying nothing on the subject of carbon emissions ...



Allowing other considerations to come to the surface ...

Option 2: pricing - how a tax works





Outcome:

Firm 1:

- reduce by 4 tonnes (cost of \$60)
- pay 1 x \$30 for last tonne
- --> outcome: \$90 total

Firm 2:

- no reduction
- pay 3 x \$30 --> \$90 total

Total outcome: 4 tonnes reduced Cost: \$180 (\$45/tonne)

Option 2: pricing - why trading is more efficient



Outcome:

Firm 1:

- reduce by 3 tonnes (cost of \$35)
- reduce 1 more tonne, and sell 1 permit to

Government Policy: CAP & TRADE Give out: 4 permits

Market price: \$30

- firm 2 (cost \$25, revenue \$30) (+\$5)
 - --> outcome: \$30 total

Firm 2:

- no reduction
- pay \$30 for additional permit --> \$30 total

Total outcome: 3 tonnes reduced Cost: \$60 (\$20/t)

Comparing taxes and cap/trade

Policy: 'Putting a price on carbon'

.. by taxing

What do you know: what the maximum cost on industry will be

What don't you know: how much reduction will occur

Who likes it: businesses

Why: more certainty (no prices to forecast, no trading to do, simplicity)

Key assumption: government can figure out the right price to get the reduction they need

Policy: 'Putting a price on carbon'

.. by cap & trade

What do you know: the exact emissions that will result (= permits you issue)

What don't you know: what it will cost industry

Who likes it: economists (!)

Why: high efficiency (lowest cost imposed on the economy for given reduction in Carbon)

Key assumption: government doesn't and can't figure out exactly the right price, but needs certainty on the amount reduced

The road ahead ... time to step up

Why we need (leaders like) you

1. Humans are not very good at this sort of problem, but .. likewise, we do know that they respond to **charismatic**, **strong**, **leadership** (uncertainty avoidance!)

2. We actually only have a small 'window' of action. Remember this debate is about the last 0.4+ C . So the time is now.

3. If you aren't persuaded by the long-run equity claim (2t CO2 pp by 2050) then, ... consider the moral dilemma that we (global north) are the villains, **but it will be the global south who will be the victims**.

4. There actually is a lot of low-hanging fruit ! .. Mostly around **behaviour change at the personal/domestic level** (ride a bike, take public transport, switch off lights, change over to LED tech, talk to your PV-mad parents, replace the heating system (use it less), eat less meat, live in a smaller house, ..., ...,)





Obama's budget on climate change: cap-and-trade

The Administration is developing a comprehensive energy and climate change plan to invest in clean energy, end our addiction to oil, address the global climate crisis, and create new American jobs that cannot be outsourced. After enactment of the Budget, the Administration will work expeditiously with key stakeholders and the Congress to develop an economy-wide emissions reduction program to reduce greenhouse gas emissions approximately 14 percent below 2005 levels by 2020, and approximately 83 percent below 2005 levels by 2050. This program will be implemented through a cap-and-trade system, a policy approach that dramatically reduced acid rain at much lower costs than the traditional government regulations and mandates of the past. Through a 100 percent auction to ensure that the biggest polluters do not enjoy windfall profits, this program will fund vital investments in a clean energy future totaling \$150 billion over 10 years, starting in FY 2012. The balance of the auction revenues will be returned to the people, especially vulnerable families, communities, and businesses to help the transition to a clean energy economy.



Q: What if we used *only* solar?



Pic credits: Seligman, Peter (2010), "Australian sustainable energy by the numbers", Melbourne Energy Institute (U of Melb) pp. 8, 9.



(detail)

Source: Intergovernmental Panel on Climate Change, 4th Assessment Report, 2007, p.38.