Hello Tomorrow: R&D II - Adapting to the Greenhouse

So far we have dealt with preventing global warming. But of course nearly one degree centigrade of it has already occurred. Even if we start comparatively soon, it is unlikely we will muster the political will anytime before 2010, and by the time we phase out fossil fuels, it is nearly certain that a second degree will have occurred. A feedback cycle may have already begun that will take us beyond that. And if the carbon lobby has its way we won't start anywhere near as soon as 2010.

I'm optimistic. I don't think the feedback cycles are so great as to be uncontrollable, and I think starting by 2010 will hold our losses down to a level our species and civilization can survive. But we will lose a lot, and we need work out how to adapt to it.

One of the big losses has already begun – water. We have less fresh water available where it is needed worldwide each year. Not of all this is due to global warming. We over tap aquifers, and recklessly contaminate freshwater sources with toxins. But we are also getting less snow pack in mountains, less rain where it would recharge aquifers in climates that need water most[i]. (We also get more rain in humid climates where there is no shortage of water. Of course some cities in rainy climates still depend on snow pack for fresh water. So, to take an example near where I live, Seattle may someday suffer a flood and a drought simultaneously.)

The material intensity section outlined some techniques to greatly increase production per liter of water. After all we have plenty of water for drinking, cooking and washing. (There are people without any of this of course, but they could be provided it at an absurdly low price. That anyone in the world goes without clean drinking, cooking or wash water is an example of hideous cruelty and injustice; for these purposes there is no shortage - only deprivation.) We may run short of water for agriculture and industry – even with a factor four productivity increase in its use.

There is a technique that is well known, and actually in fairly widespread commercial use - reverse osmosis desalination. It is very expensive, but a mature technology. It is very well suited to wind-power, since it essentially consists of pumping water through very fine filters which filter out the salt and let the water through. This might be a prime use for offshore wind – a market for the electricity right at the point of production. Similarly if wave power became practical, this would be an obvious application for it as well. (In fact most wave research assumes co-production of water and electricity, rather than producing either singly.)

[i] Rainfall and snow pack have natural long term cycles. So we don't know how much of the current drop is due to global warming, and how much is due to the end of a peak.

Of course there is more research needed on reverse osmosis. While energy is one major cost of converting sea water into fresh water, it is not the only significant cost. Reverse osmosis filters are expensive, and don't last long. We need to improve this as much as possible, either by making the filters cheaper, making them last longer, or making them recyclable, or better yet, regeneratable. All of those at once would be nice of course. They have already improved a great deal. As energy efficiency improves for reverse osmosis, we not only save energy costs, but capital costs in the huge pumps they require as well.

Other adaptations are more development than research; we need better public health to make up for increased exposure to exotic disease; we need to restore wetlands, build up levees, and generally learn to prevent, mitigate and recover from the increased numbers of natural disasters .

One consequence we have already talked about of global warming is increased energy in the atmosphere. While in most respects this is bad news (very few climates will be improved by higher winds) it is good news for wind energy; many areas that are currently not suitable for wind power will become suitable as class 3 wind areas become class 4 wind areas, and class 4 wind areas class 5 wind areas. This is not an unmixed blessing even for the wind industry; you can't run a wind generator in a hurricane or even winds of above a certain the speed (what that speed is depending on the wind generator). Still, overall, commercially exploitable wind resources will increase.