Moving to Decarbonization

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Remarks at the International Press Institute World Congress, Helsinki, Finland
June 9, 2009

Over the past few years, much of the public has come to accept the scientific consensus about climate change – that our emissions of greenhouse gases are leading to a change in the globe's climate. And further, that something should be done about it. The press has played an important role in communicating that consensus. As more and more nations move to trying to reduce greenhouse gas emissions, the "story" will shift somewhat from communicating natural science results to conveying an understanding of what is involved in solving the climate problem, of reining in carbon emissions. This is just as complex and uncertain an issue as the scientific debate of the past decades.

To this end, I would like to focus my remarks on how we, as a world, and we as individuals, might actually reduce our emissions of greenhouse gases. We assume all we need is some government resolve, some regulation and bingo, down goes our carbon emissions. That is always what has happened in the past.

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For instance, acid rain was a problem that plagued us for many years, arising from excessive sulfur emissions. After some debate, electricity generators were required to spend to reduce emissions and the problem was largely solved. There was a cost but most of us would probably say that we hardly noticed it. The story is similar for most pollution problems. Solutions cost money but that's it – no changes in lifestyles and the cost gets lost in the grand scheme of things.

But carbon is different and people are asking what regulating carbon really means. With carbon, new technologies will emerge and there will be investments by firms to reduce emissions. But there will also be behavioral choices and changes by individuals. This is something that we have rarely seen with most other pollution problems.

Proponents of doing something about climate change have argued for some time that it is really straightforward to move to a less carbon intensive world, if we have a mind to do it. Make carbon more expensive to emit and we all will be surprised at how creative the world's innovators, businesses and individuals will be. Climate skeptics have suggested this will be very difficult and will end up taking a noticeable hit on our quality of life. Where the truth lies is not clear.

With major legislation before the US Congress, legislation that can be viewed as an economic experiment, this is an important question to ask. This is particularly the case since we have been trying to rein in energy consumption since the 1973 Oil Embargo and have not been very successful at it.

So the question is, how easy will it be to decarbonizes an advanced economy, such as in the US, Japan or Germany? And just what will that

transformed economy look like in terms of changes that make a difference to citizens?

One way to answer this question is to look at countries that have been trying to tighten their carbon belt for some years now. One would expect to see some success stories on how to dramatically cut carbon emissions. This first slide (Figure 1) shows the per capita carbon emissions and the per capita GDP for a number of countries (all Kyoto signatories except the US) plus the state of California, which some of us like to think of as a little country. There are patterns here, with a clustering of relatively densely populated countries. The low density countries of Canada, the US and Australia use substantially more energy per person. California does pretty well.

The next slide (Figure 2) suggests how much progress has been made over the past fifteen years to decarbonize economies. What stands out to me is the ambiguity of this slide. Being a Kyoto signatory doesn't seem to make much of a difference. A few countries, notably Germany and the UK have made some progress, though as we know, they have unique circumstances. Canada, Finland and the US perform similarly.

The general consensus of the economics literature (and there isn't actually all that much of a literature) is that stabilizing greenhouse gas emissions is doable at fairly modest cost and little inconvenience, provided we take our time.

The next slide (Figure 3) illustrates this, for the case of California. Current CO2 emissions are around 500 million tons and 1990 emissions are around 430. State law requires the state to return to 1990 emissions by 2020. One of the simplest ways of reducing state emissions to 1990 levels is to change fuels for electricity generation. You can infer this from the graph. Costs will go up for electricity consumers but not excessively. But legislation

also calls for taking a big bite out of emissions by mid-century. That will be much tougher.

In this last slide (Figure 4) we see that residential housing is responsible for about a sixth of US greenhouse gas emissions. I have direct responsibility for how much energy I use in my house or apartment. Transportation is another area that we as individuals have some control over – about a fifth of greenhouse gas emissions are from automobiles.

That leaves well over half of our emissions that are associated with industries that provide you and me with goods and services. And the reason they emit is because you and I buy those goods and services. Buy a cup of coffee and you are responsible for a share of the emissions of the coffee shop, the coffee roaster and the coffee grower. Buy a new energy efficient TV and your own direct carbon emissions go down but China's emissions go up in making your TV. Don't blame China for all of those emissions. Consumption of goods and services is a major contributor to our individual carbon footprints. And don't forget that what the government does with our tax money also generates emissions in much the same way. The process of consuming our GDP directly and indirectly generates the carbon emissions we are responsible for.

In my closing minutes, I would like to suggest what can be done by governments and beyond that, just what a low carbon world might look like. It will be essential that governments increase the price of carbon so that each and every one of us sees selfish virtue in reducing our carbon footprint and so this signal gets transmitted by firms through to the ultimate decision makers – those of us who are deciding what to consume. If we do this with a cap and trade system, it is important to prevent volatility in the carbon market. It is also important to cushion those hit hardest by the increased price, though not by

neutralizing the price signal. Direct regulation – efficiency standards for example – will also play a significant role. I also think it is important to provide domestic firms some protection from migration of production to non-regulated states (leakage).

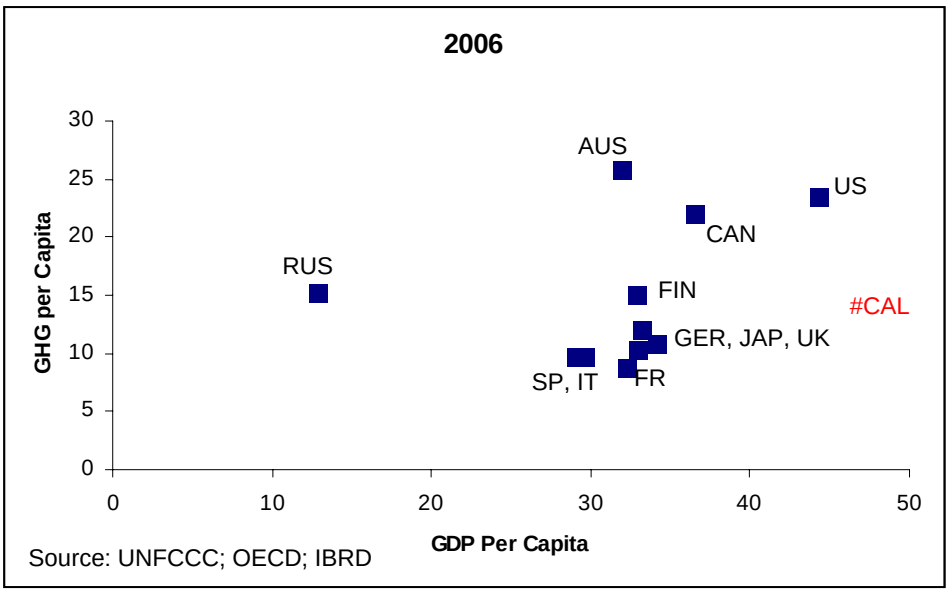
Looking in my crystal ball, I see, and this is based on a mixture of fact and optimism, a much more electricity intensive economy, from sources that are carbon free or much less carbon intensive. This may mean nuclear, renewables or carbon sequestration. This will gradually occur over the next 20-30 years in conjunction with innovation.

I also see energy efficiency playing an enormous role. Lighting is currently undergoing a transformation. LED lighting promises to dramatically reduce energy use in lighting by a factor or ten or twenty. It is not quite there yet but making enormous progress. Energy for space conditioning in new housing can be dramatically reduced, as has been shown by the German Passivhaus designs. What to do about existing housing is more problematic. Automotive fuel efficiency is also making great progress, both in terms of technology but also in terms of consumer choices – people are choosing lighter and smaller vehicles. Vehicle use will be addressed with a carbon price.

Let me close with the metaphor of the frog in the water which is slowly brought to a boil. Sometimes this is used to illustrate what we are doing to ourselves as we slowly warm the climate. I like to think of it as applying to decarbonization. If we slowly increase the pressure to move away from carbon, not moving too quickly, we will find ourselves, in a couple of decades, in a dramatically different world. And we will not even miss the old one.

GDP and GHG Emissions per Capita, 2006

(tons per person; 1000US$ per person @PPP)



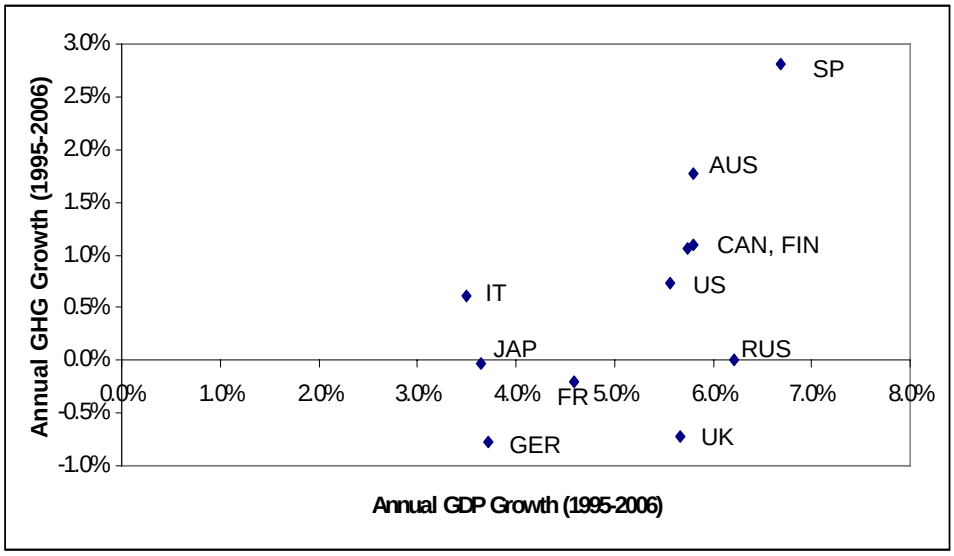
Source: UNFCCC; OECD; IBRD

Figure 1

Figure 2

Growth Rates in GDP & GHG: 1995-2006

Source: IBRD, UNFCCC; nominal GDP growth shown



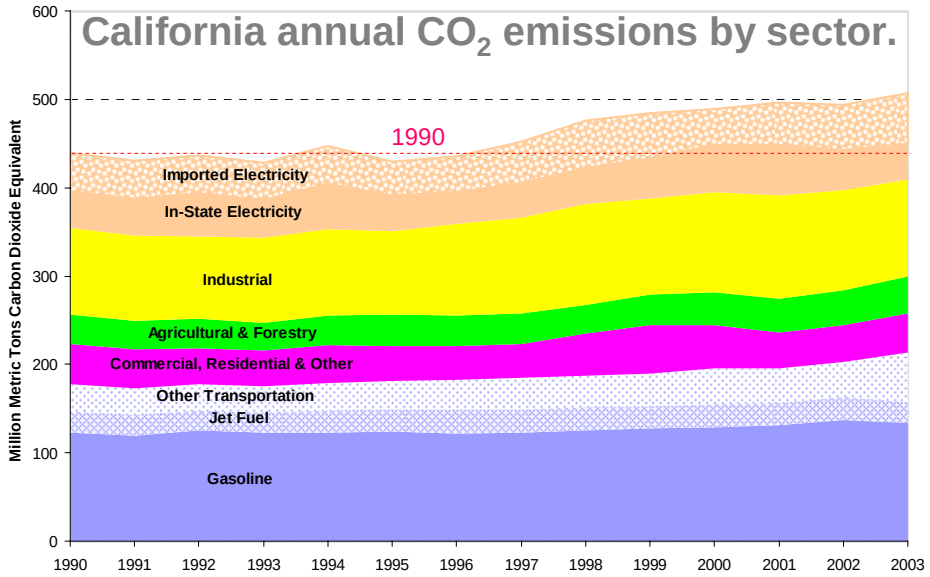


Figure 3

Figure 4