

Cutting Carbon Costs

Lord Professor Nicholas Stern

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In many cases, the dangers of the inability to collaborate can be seen directly. But we cannot, given the scientific logic of climate change, rely on the evolutionary experience of tragedy to make us feel that it's time we create institutions because by the time the full consequences of neglect are demonstrated it is too late to reverse them. There was a moment in the 1940s and 1950s when we were creating international collaborations and international institutions, where we did make a change to world politics: the European iron & steel agreement leading to the European Union, the UN, the World Bank and IMF and so on. But we had already seen the consequences of starting to collaborate – two World Wars and a great depression.

This is a great test for human rationality. Evolution has given us the power to anticipate, to work out the logic. We have to use that ability to anticipate: we can't wait until the blood is on the carpet. The combination of huge potential consequences, long lags, uncertainty and the necessity to collaborate make this a special challenge for human rationality.

We wouldn't be here if we thought we couldn't overcome that challenge, but it's worth reminding ourselves how difficult that challenge is for politics and economics. The difficulties come directly from the scientific logic of the question. The dangers of delay are in the scientific logic, in the sense that it's a flow-stock process. A ratchet effect means that the later you leave it, the more difficult the starting point. And we're already at a very difficult starting point because we left taking action for so long.

But also, there's the logic of lock-in of infrastructure and capital equipment. In the energy sector, the IEA, the International Energy Agency, reckons about 80% of the energy infrastructure in 2020 is already with us, and that's notwithstanding big investment programmes coming in Asia and so on. So it's not simply the flow-stock process of the ratchet effect that makes delay dangerous, it's also the lock-in of the capital equipment and the infrastructure.

We have to convince people of the sense of urgency. We do have to worry people, and we do have to explain the sense of urgency. But we're not going to get there with only scare – though we should indeed be very worried. But that's only the first part of the argument. I think the next part of the argument, and this is something where we need serious research, serious examples of action in firms, communities, and countries, is to show that this is not only industrial revolution that is necessary, but an industrial revolution that is extremely attractive.

What do we have to do? Well to get anything close to a fifty-fifty chance of holding to a two degrees centigrade increase relative to the 19th century, we have to cut emissions globally from a little below 50 billion tonnes of CO₂ equivalent per annum now, to somewhere below 35 billion tonnes, 20 years from now, and somewhere below 20 billion tonnes, 40 years from now. So we have to cut by a factor of two and a half over 40 years, down from close to 50 billion tonnes, to well below 20. And let's suppose that the world economy is moderately well managed, I know that's a fairly fierce hypothesis, for the next 40 years, and you would imagine, say, output in the world tripling in that time. Thus emissions per unit of output would have to be divided by two and a half for absolute

emissions, and by a factor of three for the growth of output. Therefore we need to divide emissions per unit of output by something like two and a half multiplied by three, around seven or eight, over the next few decades. That surely is an energy-industrial revolution by anybody's standards. So it is important to say that if you want a fifty-fifty chance of two degrees, and it would be nice to have a better one than that, this is the kind of radical change we have to embrace.

But seen this way the story gets very attractive, because industrial revolutions are times of creativity, innovation, growth, and investment flows. These are very exciting, dynamic stories. This is the growth story. High-carbon growth kills itself. Anything like business-as-usual runs substantial risks of reaching temperatures over a century or so, to not seen on the planet for 3 million years. It would cause likely changes in the environment so drastic that hundreds of millions would have to move, probably billions. And that would very likely lead to intense conflict and a collapse of development and growth.

So we have to show that the only sensible growth story is indeed the only feasible growth story is that of low-carbon growth. The high-carbon growth story is the anti-growth story. If we try to sell this as deeply frightening, which of course, it is, and then go on to argue that we must abandon and give up growth we will not carry people to action, still less if we call it that and by the way tough if you're in India or Africa, it's all full this atmosphere, and growth is off the agenda. A) I don't think it's necessary to do that and B) it would be a political disaster to try.

Why is it not necessary? Well, just think of the numbers that we started with. If you took the almost 50 billion tonnes per annum that are our lower of CO₂e emissions now, then you just stop growth altogether and said "right, that's it, we're stopping [at] 50 per annum from now on in" – that clearly is going to lead you into very difficult territory. That would simply go on adding two and a half parts per million per year to stocks of greenhouse gases in the atmosphere. We've got to get that flow right down below 20 billion tonnes in 40 years from now. So simply stopping growth is obviously, in terms of emissions not going to cut the mustard. It would mean less emissions *ceteris paribus* than if we did grow, but it will not deliver the drastic reductions that are necessary. You're not going to do this unless you break the relationship between emissions and output. Breaking the relationship between emissions and output means both partly breaking the relationship between energy and output – though you can't break that completely and breaking the relationship between emissions and energy.

And therein those two parts – the relationship between energy and output, and the relationship between emissions and output – lies the industrial revolution. And that's the story that we have to tell – this is the growth story. It's the exciting growth story and it is not just about absolute growth. When you look inside it, and ask what it will look like – it's going to be cleaner, it's going to be safer, it's going to be quieter, it's going to be more bio-diverse.

It's also going to be more collaborative: you can't reuse and recycle other than in a community, you can't have combined heat and power other than in a community, and you can't have car-sharing other than in a community. So, I think we can describe a story that's not only attractive in the physical sense of being cleaner and quieter and so on, but also in the social sense, in the way that societies can come together. And if you are involved at the village level, and probably some of you are, you know that people quite enjoy this sort of thing. Giving your neighbour a lift, is actually, in

some cases, getting to know your neighbour. When collaborating with the recycling of Christmas trees, you chat in the car-park at the school, and get more involved with the local community.

So I think we have to tell this as a growth story, but we also have to start with the worry and the urgency. You can't say "don't worry" because you have to worry – that's the point. Telling the story of the attractiveness in terms of aggregate growth, and the attractiveness in terms of the kind of growth, becomes crucial for bringing people on board. If you heard our Chancellor of the Exchequer, giving a speech to the party conference this autumn (2011), he said that you don't save the planet by putting yourself out of business. That view is a mistake, and we have to patiently explain that mistake. And it's not a mistake unique to that young man. If you talk to people in developing countries, they will challenge you – and correctly so – "look, this is a very poor country, deeply poor people, how can we combine rising living standards with long-run climate and environmental responsibility?" We have to reply to that question. And that has to be the story of the industrial revolution. We must show the attractiveness of that kind of change, including the way in which the creative energies will be released if the right policies are in place.

And that takes us to the power of the example. We can say what I've just said, and they can say in reply, "well yeah, I suppose, but give me some examples, who has done this? We don't want words, we want a few models that we can look at and learn from." Fortunately the last five years have been quite creative in the form of models. We can point to the very big energy saving examples of companies like DuPont who save about three billion dollars a year from energy efficiency, similar in order of magnitude to its profits. You can look at companies like Wal-Mart. You can look at what Denmark has started to achieve. You can look at towns like Woking. You can describe the way in which the capital cost of solar has been crashing down. And you can point to not only the things that have already been done, but the potential creativity in the pipeline of ideas.

We as academics, policy advisors and policymakers have to assemble not only the argument about the new industrial revolution and why it's attractive, both in aggregate and in its make-up, but we also have to assemble in an articulate and clear way, a whole body of examples which can, in a structured sense, show people what's possible. And I think that's absolutely vital for winning this argument.

Otherwise, people will build their narrow models where they portray low-carbon action simply as you kicking up an input-output coefficient upwards. If you increase the input-output coefficient because you actually use something more costly to produce the same energy, you will reduce output, and you will reduce growth, other things being equal. That's mechanical blinkered modelling – it has no learning, it has no technical progress, it has no creativity, and it has no sense of collaboration or community. But it's quite influential, and it's the easiest modelling to do. It's far easier to do that modelling than build the kind of story that I'm trying to tell. Thus we run into problems, not only with people who don't know much economics, but also people who do know a bit of economics, and are concerned to build simplistic models. It's so easy to build a simple model where switching to a higher-cost technology inevitably involves loss of output and growth.

So we have to conduct ourselves, and the way we frame our arguments, in a strong and clear way. I haven't got much time to speak about what's happening in the world, and maybe we can pick some of that up in questions, but I think the biggest climate event in the last year or two has been China's

twelfth five-year plan. They have declared for increasing the share of consumption and income, much cleaner energy and output generally, not just lower carbon, and much greater innovation.

At the moment, China's emissions are about nine billion tonnes per annum, CO2 equivalent. Recall that by 2020, we can't be much above 30 billion tonnes per annum as a world. The current plans in China look on track to see emissions around 12 billion tonnes per annum by 2020, adding three billion tonnes per annum to the flow. If they added another three between 2020 and 2030, that would be 15 billion tonnes per annum. Remember the global budget for a fifty-fifty chance of two degrees - it's only a bit over 30. If one country of a billion and a half people, are producing 15 then we're not going to do meet that budget. So it is crucial what happens in China, that's why it's so important that we examine and understand the change in the twelfth five year plan. We're also going to have to hope that China learns rapidly during that plan, that it's able to actually stop emissions rising in the early 2020s, so that they don't go much above 12 billion tonnes a year, and then start to bring them back down from there. Otherwise the carbon budget constraint will obviously be broken globally. It is important that China has seen and anticipated the problem, but they are struggling with the mechanics and the technology to make it happen and that's something which I think we all have to recognise and collaborate with them in making the change.

With a majority of two in the lower house, Australia has recently voted for a carbon market. It'll go through the Senate, and before the next election it'll be in place, people will be receiving their cheques from some part of the auction revenue and this money will be going back to households.

China has brought recent good news (although it's only the beginning), so has Australia, while the new government in Denmark has intensified their targets quite radically. In India, the discussion about their own twelfth five-year plan, and a much greener structure to that plan, is intense right now. What happens and what the delivery will be like, we will have to see. But you have got examples round the world, albeit with fits and starts. Brazil has shown commitment, though it's emissions go up and down with the speed of the deforestation. If you look outside Europe and the United States, it is possible to start to see the kind of changes that we're thinking about. Nowhere near fast enough, but at least there are initiatives which are interesting and strong, and in the right direction.

We're not going to see anything soon in the United States at the Federal level: there's a small matter of a presidential election, and this subject isn't going to get anybody elected in the United States in 2012. But change is possible. I had a long conversation with Al Gore about two weeks ago, and ever the optimist, he told me that Barack Obama would be re-elected and then he would place climate change near the top of his agenda in his new term. I report that without comment, other than it's nice to be hopeful.

But if you look elsewhere in the United States roughly half of the output of the United States is produced in states or cities that have quite strong policies. If you look at the examples of DuPont and Wal-Mart, and GE, you've got firms that are taking this very seriously. Partly because they think it's responsible to take it seriously, but partly because they see the dangers of being a firm that's dirty 10 or 15 years from now. People are already calculating the implicit carbon price of neglecting policies, and it looks as though the United States will be far down that pecking order and so the target of those who want to exclude dirty goods from their economy.

Ten or 15 years from now, it's quite possible that as border tariffs start to come in, from countries that have started to take action, they'll be against the United States, not against China. So that's the kind of argument in the industry that has traction. People see what's responsible, and that does weigh with them as firms. They see the value to the bottom line in energy saving. But they also see the dangers of falling behind in the technological race, and the dangers of being shut out of markets 10 or 15 years from now because they're dirty.

These are the kinds of arguments that are impinging on the investment choices of firms and individuals. And they're the kinds of arguments that we have to work to enhance. Now I can't go on cantering around the world, because I've probably already gone over my time and I'm very happy to take questions if you want to follow up on any of these things or ask me about something completely different. Thank you.