



CENTER FOR GLOBAL DEVELOPMENT

Presents

Third Annual Richard H. Sabot Lecture

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[TRANSCRIPT PREPARED FROM AUDIO RECORDING]

Ed Scott: Thank you for the introduction, Nancy. It's a pleasure to be at the third Richard "Dick" Sabot Lecture. As many of you may know, Dick played a crucial role in forming CGD in its early years, and for that among many other reasons, ****we are all grateful. I am now to welcome Oliver Sabot, Dick's son, to the podium. Oliver, who has very much followed in his father's footsteps of doing good for the world **** more than any of us, and who is a great credit to his father's memory. Oliver Sabot.

[**** indicates missing sound.]

Oliver Sabot: Well, thanks Ed. And as Ed was saying it is really him I can either thank or blame for getting me launched into this crazy career of global development and health. So, it was working with him that I cut my teeth.

I'm now getting to that ripe old age where most of my friends are starting to have children. And as they have and as I have spoken with them about this experience it struck me that the changing way that we and they are approaching having children is a great snapshot of something that I think CGD is incredibly focused on and was at the heart of my father's work and at the heart of his interest. Particularly right at the end of his life. And that's the fact that I am finding that with many of my friends they are naming their children before they are born. That three, four months before that child is born that child will have a name before it has entered into the world.

Now, of course as many of you will know in other areas of the world right now the same families, the same mothers will not name their children until a year or two after they have been in the world and been alive because of the chances that that child will die before they reach the age of five. And we are so confident now in this – in America, in Europe, in the West that our children will live before birth, during birth and after birth, that we will give them a name, that we will make them a person during that time. And I think that is incredibly striking that gap and it is the general issue of iniquity and the growing burden of iniquity that we are seeing in this world.

Just before my father died the topic that he was working most on, and very passionately in a paper he called "The Dollar and Development," was how our decisions here domestically, or decisions of those domestic decisions in Europe impact the developing world. That the fiscal decisions of our government related to budgets and domestic policy, they may impact us. They may affect our well-being. They may impact our purchasing power, our growth, our unemployment rate here in the US. But they will impact the lives of those living across the ocean. Those in the developing world far more than we ever see. And far more than our largess, our aid can ever

correct. And I think that is quite pertinent for our talk we are going to hear today because it is quite true for climate change as well.

With a topic or implication that is near to my heart, infectious disease. Despite the scare mongering of some, even with the most dramatic impacts of climate change Malaria and Cholera and Dysentery are not coming back to get us here in Washington or in London or in Paris, they are not coming back. But, the areas of the world that are already terribly impacted by these diseases which are causing such high child mortality, they will get far worse. By the decisions that we are making here on a daily basis. And that was what my father was so passionate about right at the end of his life. That we need to change the way that we think about development. That it is more than just foreign aid. That it is about the domestic decisions that our government makes that are core to the development abroad.

I just want to close by saying a big thank you to CGD. This is the third year that this lecture series has occurred and I can't imagine a better tribute to the spirit of my father. And even more so than this annual lecture series, the ongoing work of CGD is an amazing tribute. And as Ed was saying earlier fully in line with his passion and his enthusiasm and his optimism. And the amazing impact that CGD is having on a daily basis. The leading role that it is playing in addressing these issues of iniquity and taking forward the innovative solutions that are needed would make him so immensely pleased. And it was one of his favorite things happening in his life was to work on the board of CGD.

So with that, I will turn it back over to Nancy who I think needs no introduction.

Nancy Birdsall: One of Dick's friends wrote in memory of him about Dick, "Husband, scholar, teacher, athlete, world traveler, entrepreneur, farmer, cheese maker" And his friend had also the word of course, "Father." And you could see why Dick was a proud father. I would also like to welcome along with Oliver, Dick's sister, Anne who is here. And I would also like to introduce other supporters, important supporters indirectly of CGD, who are here with Ed today his son, Reese and his wife Cheryl. And now I have the privilege of introducing Lord Nicholas Stern.

Lord Nicholas Stern is the IG Patel Professor of Economics and Government at the London School of Economics. And he is head of the India observatory in the India Research Institute. It is important that he has both these titles as I will mention in a moment.

Nick is a scholar practitioner of the first order. And it is our objective that we have this lecture series feature people who are both scholars and

practitioners. He as a scholar has brought analytic insight and I'd say a kind of ethical and moral wisdom to the work he has done in economics which you will see right away when he starts to talk. He has been a Professor of Economics at Warwick and at the London School of Economics. His research has covered a wide range of issues on economic development, economic theory, tax reform. He wrote a book on Kenya, he wrote a book on the green revolution in India. He was explaining to me just before we came over that he will be returning to India for the fourth time to a village in UP where he has been doing research and where he is beginning to get more and more interested in the dynamics of how this setting in India and what is the response there and what are the consequences of globalization for them.

What about on the practitioners side, Nick was the Chief Economist at the European Bank for Research and Development. And I remember when he went there it was one of the two or three or four times, he could say better, when the World Bank tried to get him. But, he needed to go be in London more than in Washington at the time. And of course he was the Chief Economist at the World Bank. And more recently as you all know he has had several critical positions in the UK government. We are very fortunate to have Nick visit at the Center for Global Development at the time that he was Director of Policy and Research for Tony Blair's commission on Africa - that was in 2004 and 2005.

Now, I say all these things because I want to emphasize that Nick is more than a climate change kind of guy. But, it is also true that he has brought that micro, particularly that micro analytic, micro economic insight to what is as Oliver suggested now, a key issue in interdependence between the rich world and the poor world. Which goes right back to Ed's vision and to Dick Sabot's vision for the center.

Nick, I am very pleased to have you here. And we look forward to what you say.

Lord Nicholas Stern: Thank you very much, Nancy. And it is a great pleasure to be back at CGD. I have admired what you all here have been creating over the years and it is really tremendous. You are really changing the way in which people see things. Not only in the US but much further afield. It is a special privilege to me to be giving the Richard Sabot, Dick Sabot, lecture.

I knew Dick for over 30 years. In various sort of incarnations that we had. In Kenya, where I was working on tea, now maybe 40 years ago. Nancy mentioned IFPRI when I was a trustee, in Oxford where I taught for eight years where Dick was a frequent visitor and in and around the World Bank over a few decades. He was a man of extraordinary wisdom. Great

friendship, great scholarship and entrepreneurship and we could go on through the list that Nancy described. So it is a special privilege to me to be asked to give this lecture. And I thank Nancy and Dick's family for that.

Development and climate change are the two big issues of the 21st Century. And unless we tackle them together we will fail on both of them. Climate change, if it goes on unmanaged will undermine development. Any response to climate change which appears to stall development will fail. It will fail politically and it will deserve to fail. Unless we tackle them both together we are not going to be successful on either. So this is absolutely crucial point and I underline it because sometimes you get into a horse race, should we do the one or should we do the other? And it is really analytically and ethically silly. And it is really important to emphasize the way in which they come together.

Now, I am going to go fairly rapidly because climate change is a huge subject. I know that the CGD is highly selective in its audience so I'm sure that is not going to be a problem. I'm not sure how the amplification system is going, but if I – is it all right there in the back? So if I lapse into inaudibility or incoherence perhaps you could draw attention and tell me which one that it is.

I'm going to move quickly, I'm going to not be too heavy about the economics. There is an awful lot of economics in this. It is actually as difficult a subject in economics as you could imagine. The whole range of the subject is intertwined in all this. But I am not going to be pushy on economics. I realize that there are some people here who are not economists. That is your fault; you have many options to take different decisions. But, nevertheless I don't want to get too heavy on it. Those of you, who are economists I know there are many people here, will be able to see some of the difficulties that I am sliding over a bit. But in the questions I am more than happy to go through those.

So, I will have to go fairly fast. You will know that I will be like Groucho Marx lawyer. It is often repeated but it is one of my favorite Groucho Marx quotes, he said, "I have a long version and a short version and why should I let you down so lightly. So I'm going to give you the long version fairly rapidly." But I am going to slide over some of the areas.

But what I want to do at the end is talk about something that has been worrying me. Particularly since I left government a year ago and that is how we put a global deal together and what a global deal on climate change would look like. So I want to get there and that is where I will finish the story.

Now, how does all this work? Well, climate change starts with people and it ends in people. People cause emissions, from the ordinary activities of life. Consumption and production. Those emissions are not fully absorbed by the planet. So they result in an increase in stock of greenhouse gases. It is the stock that is the problem. The flow stock nature of this problem is absolutely fundamental. It is the stock that is the problem. It is the stock that catches the heat and produces global warming. And global warming produces climate change. Most of the problems of climate change operate through water in some shape or form - storms, floods, droughts, sea level rise. although of course the heat itself is part of the story. And those effects finally disrupt and undermine in many cases the lives of people and their consumption and production activities.

So, that's the story. Actually I think every link in that chain, each of the five links in that chain I just described it is stochastic, it has randomness in it, so we can't predict any of these things with certainty. But now we can start to talk the language of probabilities and the science has told us quite a lot about probabilities. So what I am going to do is to focus on one link in the chain to illustrate those probabilities.

So there we are, that is linking the stock of greenhouse gasses in the atmosphere to temperature increase. This is a scientific production, I know you are still sticking to Fahrenheit in this country but if you want to look at temperature increases you just multiply by 9 over 5. So 5 is 9. I will be doing a fair bit of arithmetic in this talk. I will do multiplication, division and addition. I don't think I will do subtraction at any point, but I might. So those are the degrees centigrade there. We are around 430 parts per million of CO2 equivalent that is CO2 and the other greenhouse gasses aggregated with CO2 in terms of equivalent radiated ****. We are around 430, we are adding 2.5 a year and that 2.5 is rising. So if we went on the business as usual not changing our ways very much for a century that 2.5 would be going up, going up quite quickly over the century with average at least three, probably near a four per year. So over a century you will be adding 3 or 400 that 430 where we are now, would go to 750, 800, 850. Well 750 is bad enough. Let's just focus on 750.

If we got to 750 and stopped right there. Of course you can't stop this train in its tracks. But if you did stop right there, what would the position be? Well look at 5 degree centigrade. You have a 40% probability of being above 5 degree Centigrade. Roughly a 50/50 chance of being above 5 degree Centigrade sometime early next century. That is enormous. Five degree Centigrade is not the difference between Edinburgh and Madrid or Maine and Florida. Five degree Centigrade transforms the planet. Last time we were roughly 5 degree Centigrade above where we are now is the Eocene period 30 to 50 million years ago. The world was largely covered in swampy forest and there were alligators near the North Pole.

Now it is not the alligators at the North Pole that worry me so much. The point here is that it rewrites where species are and it rewrites where humans could be. The last time we were 5 degrees centigrade below where we are now was much more recent - about 10,000 years ago - the last ice age. The ice sheet came down just North of London, Just South of New York when it melted the UK separated from Europe. Now you might regard that as a wholly beneficial outcome. And again, my point is not so much that - it is that this kind of change rewrites where people are. You change the physical geography of the world; you change the human geography of the world. It would involve massive movements of population. And if we learn one thing in the last few hundred years it is that massive movements of population involve conflict and serious loss of life. And this would be something that wouldn't just be the World War that would go on for a few years. This kind of disruption of the climate and movement of population would go on for a very long time.

This is a very big phenomenon and if we just talk about the consequences as many economists do of two or three degrees, they are missing the point. What we can do with strong action now, holding at 500 say and not going to 750, we can keep that probability at 5 degree centigrade down to 3% probability which is 4 degree centigrade at 11%. And look how fast that probability goes up of 4 and 5 degrees as you increase the concentrations. We are talking here and this is the cost of inaction. The cost of inaction is the difference between 3% probability of being 5 degree centigrade from that 500 row and 47% probability in that 750 row. The cost of action is a huge risk of devastating consequences. This is not a black swan in the financial market. Something appears in a rather difficult way only very rarely. If we went there this would be a big probability of massive changes. So what we are doing if we are stabilizing is we are buying down that probability. Buying down that probability in a very substantial way. And we should ask ourselves, are we prepared to pay the 1 or 2% of GDP per annum that that would cost to bring down that probability in that way. And I think most people thinking about that just for a few minutes would say, "Yes, that sounds like a reasonable deal to us."

So, that broadly is the structure of the argument and I will show very quickly how powerful that observation is because that leads you very strongly in the direction of what policies should look like and what ultimately the global deal should look like. If you accept that argument that we should try to stabilize around 500 parts per million it would be nice to be able to stabilize at 450 but I think we miss that we are already at 430 we are adding 2.5 a year in 8 years we will be there and it is very hard to get this stuff out once it is up there. This is the flow stock problem a clear ratchet effect.

If stabilize around 500 we can work out very quickly what kind of policy conclusions what kind of policy measures, what kind of economic instruments follow from that. So I have argued, hang on, there we go, one at a time. I have argued that we should be stabilizing around 500 parts per million. It is certainly dangerous to go beyond 550 you can tell the story in 550 or 500, it doesn't alter all that much. But I will stick to the story of stabilizing around 500 parts per million. You would need to cut emissions in order to stabilize at 500 parts a million, roughly by 50% by 2050. Fifty percent for the world by 2050. I will come back to the question of how much in rich countries and you are going to get fairly quickly in this argument they should be 80% in rich countries. But I will keep that for the global deal.

What we are talking about for the moment is 50% reduction for the world as a whole but 2050. Perhaps 30% reductions if you loosen the target a bit. But I will stick to 50% and 500 parts per million. The cost in doing that I will explain very quickly how we get that in a little bit. But 1% or 2% of GDP. Probably 1% for 550 parts per million around 2% for 500 parts per million stabilization target. Some uncertainty there which I will discuss a little bit.

So, I have given you a story and it has told us these are the stocks we should aim for. This is roughly what it costs. These are the emissions reductions associated with it. That is the basic structure of the argument. That will take us then quickly to what kind of price of carbon we should have. Essentially if you look at what the marginal cost is of cutting at these levels along a path there will be a marginal cost associated with each moment of time and the levels of cut you need. So that simple story of 500 stabilization, 50% reductions by 2050 tells you the path, roughly speaking of the price of carbon because that should be roughly equal to the marginal abatement cost.

You can go back and check just how far, just how closely that marginal cost of carbon, the cost of cutting back on carbon dioxide how that compares with the marginal social cost of a bit more carbon dioxide. Now I go about it this way because it is very difficult to calculate the marginal social cost of a bit more carbon dioxide. Just think about it. You put it up there it stays for a very long time so you have to look at the integral over the indefinite future. That integral will be different according to which path of carbon you happen to be on. You then have to think about how to model the consequences of that and then how to value those consequences. You give me a marginal social cost of carbon I can probably tell you a story as how to what path and what kind of values would give you that. That is why I prefer to go the way I have gone which is to work through a target and then work through marginal abatement costs. And it gives you rather strong, clear results much more quickly.

But one should check on the marginal social cost, or the social cost of carbon as it is sometimes called and see that it is roughly in the right range. But it has such a spread that that is only quite a small story. I will come back to the equity side of the global deal in just a moment. But let's remember that this is deeply inequitable. The rich countries are responsible for about 70% of the greenhouse gases that are out there now. And the poor countries are hit earliest and hardest. The emissions per capita most of Sub-Saharan Africa a good deal less than 1, India at 2 tons per capita, China about 5, Europe and Japan 10, 12, United States, Canada, Australia over 20. That is the kind of spread of the flows now. Of course it is the rich countries responsible for those flows over a long period of time. So the difference is even bigger if you look at stocks.

So that is broadly the structure of the argument. Now, people often ask me actually most people in London Pubs haven't read the Stern review. But people in parties often ask me, "What do you think now, 18 months on?" It actually is so frequent that I've stopped going to parties, because the other thing they ask me in parties is what is it like to work with Gordon Brown and Tony Blair and I don't answer those questions either. But I am going to answer the question very quickly. How do I see it from the perspective of 18 months afterwards? So I will go fairly quickly on this, because that is just a piece of intellectual history really.

But the first thing is to recognize the flow story. I gave you the stock story; I jumped to the flow story. But the blue line is business as usual. Vertical axis is the flow emissions, horizontal axis is time. And what we have got here is 3 paths illustrated here. Path stabilizing yellow at 550, red at 500, brown at 450. That is a pretty difficult call, the 450 path. So that translates the stock story to the flow story and gives you a feel for the emissions reductions relative to business as usual. Do a fast piece of mental arithmetic here; if you go to 2050 you have to cut back relative to business as usual 50/60/65. Take gigatons, giga is billion, take a price of carbon around \$30.00 a ton, multiply 30 by 50 or 60, or 65 you got a number which essentially is \$1.5 - \$2 trillion. World GDP in 2050 probably \$100 trillion, probably \$50 trillion now. Actually that is very conservative. \$100 trillion in 2050. That gives you a feel for the 1 or 2% of GDP. Very roughly if you do those sums you realize you are in the right ballpark. We do our sums by bottom up. Looking very carefully at the kind of investments and technologies you would have to embrace. But it does give you a feel of where that 1 or 2% comes from. That was multiplication.

The now, what about those cost estimates, because we did do them bottom up, other people do them bottom up other people have been doing them in fairly fancy models. But since we published, there have been quite a lot of

analysis bottom up international energy agency, McKenzie has done some interesting work on that. Bottom up and top down work by Edenhofer at the Potsdam Institute by the IPCC and basically people have been coming up with the kind of numbers that we came up, some cases a little bit lower. But a great deal of course depends on good policy. There are lots of ways of messing this up if you push yourself into the more expensive ways of cutting back on flows, you will indeed have more expensive ways of cutting back on flows and it will cost more than the 1 or 2% that I described. The good economics here matters enormously. You have got to get the cost done where it is cheapest to get them done. You have got to take the cheapest options before the more expensive options and of course price mechanisms are designed to do exactly that. This is a market failure. You do not pay for the costs you inflict on others from greenhouse gasses. It is the biggest market failure the world has ever seen. We are all involved and the consequences are potentially enormous.

So what do you do? You fix the market failure. And you fix it first; it is not the only thing you have to do. But you fix it first through the price mechanism - tax or quotas and trading. So the policy response to the market failure is not necessarily to drop back into central planning and it is certainly not not to fix the market failure. The right thing is to fix the market failure and the first shot is a price of carbon. And that is the kind of way in which I've been talking already. The kind of way in which much public discussion has been going on. If you are neurotically Chicago neoclassical you would say just set the price to fix the market failure and let the entrepreneurialship and glorious competition of the market sort out all the rest. It isn't quite as simple as that. There are lots of other market failures out there. The market failures associated with ideas, the market failures associated with capital markets. The market failures associated with the way in which the markets for building and land work and so on. All of which have a profound effect on this problem. And of course the big risk again, they're wrong.

So there is a big argument for supporting technology as well as fixing the market failure and I will say just a little bit about that in a minute.

So looking back I think that we probably got the cost structure about right. Looking back I think that I probably underestimated the costs. The emissions are growing faster than we thought. The absorptive capacity of the earth is looks weaker than we thought and the probability of high temperatures from given stocks of greenhouse gasses looks to be a bit higher than we thought. And the rapidity of the phenomenon coming through seems to be a bit greater than we thought. So broadly speaking I underestimated the risks. In order to aggregate across space and time and outcomes you have to do averaging. So when we average to cost possible outcomes and try to quantify these damages we talk expectations of utility.

When we averaged across regions of the world, we did exactly that. We averaged it across regions of the world with and without appropriate welfare weights. And of course if you average over time you have to think about discounting.

Now, the discussion of discounting in the literature has been truly awful. There are lots of things to remember. I am not going to bore you with the details. I addressed my fellow economists when I gave the Richard Ely lecture to the American Economic Association in January that has just been published in May in the American Economic Review. And I tried to go through quite carefully how the many ways in which the discounting in the climate change literature had gone so badly wrong. This is the discount rates are normally about marginal changes and not about non-marginal changes. This is a non-marginal change.

Risk is enormous there are no markets that tell us how we should act in terms of discounting over a hundred years for collective decisions. The – even so even if there were such markets you would have to think carefully about their ethical relevance. And of great importance, this is isn't a single good problem this is a multi-good problem. And if you postpone and invest in something else and say well I'll buy off the damages caused by climate change further down the track and invest in other things for now. You will find in this many goods problem the relative price of the environment is shot up against you and it is much more expensive to buy down later on.

All the mistakes I have just described have been made and more in the discussion of this literature. But this is something for the nerdy economists amongst you and I'll spare you the rest of it. Those of you who like that sort of stuff I hope you should read my article in the American Economic Review that came out a couple of weeks ago. But academics would say that, wouldn't they?

I'm going to go pretty rapidly through the policy story because I want to get a little bit more on development and the global deal. This says that carbon emissions, carbon dioxide emissions, greenhouse gas emissions come from all over the place. And that means we have to act right across the board from the point of view of sectors. Notice land use there that is mostly problems associated with deforestation, peat fires and so on. That's a very big issue. Agriculture itself emits greenhouse gasses. It will be quite hard to bring that down, although there are ways of bringing it down. Power and transport, very important but of course we should remember that it is much more than power and transport.

Essentially if we are going to get to the levels of greenhouse gasses that I have described to these 50% reductions then we are going to have to have

close to zero carbon power by 2050 and that gives us a good chance of having close to zero carbon road transport. But it is going to have to be much more than that.

The quick wins are energy efficiency, probably if we get stop deforestation in a sensible way that could be done fairly quickly. But there is a great deal that we can do in all these areas with existing technologies and much more we can do with future technologies.

This is a marginal abatement cost curve where you got your amount, your cut back on the horizontal axis; you've got on the vertical axis this is done in terms of Euros for 2030. This is the McKenzie analysis. Notice this big chunk below the axis - that corresponds to stuff in energy efficiency that actually saves money. You cut back on carbon and save money at the same time as you go off further to bigger emissions cuts you get into positive territory and you can see if you are going out at 2025 gigaton cuts by 2030 with the order of magnitude on the path that I am advocating you get to 30 or 40 Euros a ton by 2030. In this case the Euros read dollars and dollars read Euros. I'm not going to forecast the euro-dollar exchange rate in 2030 there must be more sensible ways to spend ones time and one to one is good enough for me if you are talking about 2030. Probably feels good enough for you now but you can't get it at the moment.

Now, the you can go on from there and look at the costs of electricity. The pink stuff here is a 40 Euro a ton carbon price. This is the UK. The horizontal line with the electricity price in January of this year and with the horizontal axis these columns correspond to different kinds of techniques. An optimistic view of nuclear makes it look already profitable relative to UK prices. It is probably a bit optimistic on the nuclear front. Coal looks pretty attractive at current prices but it wouldn't if you put that pink or mauve thing on top of it which would be the carbon price. But what we are seeing now is that the carbon price of around that level would make quite a lot of zero carbon alternatives quite attractive. And of course the dollars a ton here I've got here is 70. If you push up the dollars a ton then it makes some of these zero carbon options even more attractive.

This is the learning process in electricity and what that shows what you have got in the horizontal axis is cumulative electricity production. On the vertical axis you have got how fast costs come down. And what that's telling us is that learning by doing and indeed learning by watching the collective experience in the sector technology by technology is giving us lower costs. And that is an argument from the point of view of ideas and experience for cutting back, for supporting technology directly. This explains why we need a price for carbon and technology policy at the same time. Be careful not to pick winners but you can't be ignorance as

you set these things of the products process of the stage in the technological process that is there.

Now, what about the development story? Well I've already argued and argued strongly that we have to take these two issues of climate change and development together. What are the threats? Well I think they are pretty obvious now. I've mentioned them, Oliver mentioned them too. All the dimension of development that we worry about, health and income and education and dislocation and so on are going to be affected by climate change. You could add education as well I think to this story because this is a great deal about water and we all know the conditions for water have a profound effect on the ability of girls for example to go to school. This will affect absolutely all parts of the story. There will be some opportunities here for the challenge of adaptation. I don't want to overdo them. But both in adaptation and mitigation, if developed countries think these things through, if there are some sharing ideas in thinking them through I think there could be opportunities move into a different path as you think about adaptation to think about greater resilience which might give you pay offs in other areas.

Now, that is the one that got repeated a little bit of that. Adaptation and development let's just look at it a little bit more closely. I am painting it with a fairly broad brush here and there is lots to discuss underneath all this. But the first point I would like to emphasize is that development is the key to adaptation. Development makes you more diverse in your economic activities it strengthens your human capital. It strengthens your income and wealth that you can invest in more defensive activities. Development itself is a key part of adaptation. It means we should not start treating adaptation and development as separate boxes in which you know you have some money for adaptation and some money for development. You can't tell what fraction of the foundations of the bridge you are building because you need to be more resilient to droughts and floods.

If you decomposed every development project into what you would do if the climate in an imaginary sense didn't change and another version of the development project given that the climate will change you'd divert your attention, you'd undermine your sources of finance and analysis. It simply doesn't make sense. We have to treat them together. So it is crucial to think of the funding for adaptation as being absolutely interwoven with the funding for development. They are not separate topics and we endanger not only development but also the process of funding for development if we try to separate them out.

International support for adaptation - well the first thing is that development in a hostile climate is much more expensive than

development in a climate that is less hostile. And when we looked and those of us a number of people in the room who are involved in the story of financing for development in Monterey in 2002 before I wrote the report the Commission for Climate Change I did the report on the Commission for Africa. And we had strong promises at the Gleneagles Summit in 2005 to double aid for Africa from 2005 to 2010. We are getting pretty close here and they have got some way to go.

But when we had that discussion I don't think we as development economists really factored climate change into the story. My view on this now is that had we gone back to those numbers we would have come back with bigger numbers for the millennium development goals. The human development report talks about costs by 2015 of climate change to the challenge of development around \$85 billion per annum. Now you can fuss about precisely how these numbers are done and you should look at them closely. But the point is that there are scores of billions of dollars extra as a result of climate change. We didn't factor that story in when we were discussing aid.

My view now is that our first challenge is to deliver on our promises for 2015. Europe promised to raise its aid relative to GDP to .7% by 2015 in 2005 we should challenge ourselves as Europeans to meet that goal. I couldn't possibly comment on the ratio of ODA to GDP in this country. That's the first thing, to deliver on the promises which we made. But as we go to the post millennium development goal period, we must factor in climate change into the development challenge and the development funding story. As I said you could have made a case and can make a case for increased ODA now. I say the goals that we've got are challenging enough for 2015, let's step up to those but as we get closer to 2015 let's think through that story.

Lots of things in forecasting and disaster response, crop varieties, technologies in water and so on and the way that we look at Malaria as a result of climate changes is a tremendous amount in terms of global public goods, if you like, that we could all do. But I haven't got time to go into all of that. What I want to do is spend my last few minutes or my last minus few minutes on the global deal.

This obviously has to be a global deal. The emissions in Johannesburg, London, Los Angeles, Beijing, Delhi wherever you look have the same effect on the climate. So what does a global deal look like? I have essentially gone through the basic elements of a global deal and I am just going to assemble them now.

The 50% cuts by 2050 we arrived at that very early on in the story. So 50% cuts by 2050 what about rich countries? Well, here's a little bit of

mental arithmetic again. We were this should be relative to 1990. We were in 1990 a little over 40 gigatons per annum of CO2 equivalent in our flows of emissions. Population then sort of 6 billionish, it is about 6.7 now. Where should we go? Well cutting by two means that by 2050 we should be around 20 gigatons of CO2 equivalent, 40 divided by 2 is 20. So that's roughly where we should be by 2050. How many of us will there be? Around 9 billion, 20 divided by 9 because giga is billion, 20 billion divided by 9 billion just over 2. We needed to as a world be around 2 tons per capita average by 2050. So that gives you the rich country 80% it is not magic out of nowhere. Europe is 10-12 tons per capita. To get that down to 2 Europe should be dividing by 5. Japan, something similar. US is over 20 tons per capita. Should really be dividing by 10, 90% cuts. My own view is we will settle for 80% and discuss the rest.

Because once you set off down this road you discover so much which has been an awful lot of learning to do along the way. So 80% cuts that we discussed for rich countries are not arbitrary. This is the kind of arithmetic on which they are based. They are predicated on the story of 50% cuts for the world by 2050. That is the first part of the global deal there are six parts.

Developing countries. Well developing countries are in a different position in terms of a historical responsibility. They are – they do have more worries taking the risks of moving to low carbon growth. And what you constantly here and I've just been under long discussions particularly with the Indian government where many of our close friends and people in the room are now also close friends those friends are in senior positions. I have been close to them over this last year. But it is true of China, Indonesia, Brazil, wherever you ask is they say well look this is a problem in terms of its starting point largely created by rich countries. But the developing world is going to be 8 billion out of the 9 billion in 2050 or the currently developing world. You don't get an average of 2 tons per capita over 9 billion if you aren't pretty close to the 2 tons per capita over the 8 billion.

So there is a clear realization now, increasing realization in the developing world that whilst the starting point may be very unfair, and it is very unfair. We all have to be involved in this story. So they're recognizing very clearly this challenge. But they are asking the question; well what do we need to understand from rich countries to help us get down to 2 tons per capita by 2050? China already at 5. Possibly 6. The challenge is really four things. The kind of targets I just described, the 80%, demonstrating that low carbon growth is possible. Showing that it can be done. That is a responsibility of the rich world. I believe that can be done quite quickly. A flow of finance through carbon prices, development and

sharing of technology. Those are the four things that they look for and rightly so.

So my own view is that we should ask the developing world or the developing world should describe the deal to us, we shouldn't ask them, they should describe the deal to us and they should say to us, this is the deal. You take on those 80% targets; we all go for the 50% world average. We will take on, we will commit to commit in 2020 to targets consistent with the 2 tons per capita. But we look to you for those four things, 80% cuts, low carbon in terms of targets, low carbon growth, carbon financial flows, development and sharing of technology. That is conditionality by the developing countries on the developed countries. About time, I hear you cry. And that is the kind of glue and understanding that will hold this global deal together. I have already emphasized the carbon trading and carbon finance story. That is private to private flows of income. That is absolutely crucial.

Last three points of the global deal then I stop. Deforestation is a crucial part of the story. Depending how you do the sums, 15 or 20% of the emissions. I would guess that for \$10 or \$15 billion per annum we could cut deforestation in half. It does have to be a global approach otherwise you just shift the deforestation around. The program should be designed by the countries where the trees stand. Their trees, their countries their economies and their local communities which are involved with the forests. But the outside world is a great beneficiary of that and it should provide the majority of finance.

Demonstration and sharing of technologies. I think we should have a broad view of technologies whether it be hydro, nuclear, wind, solar, we are going to need the lot. I just would identify carbon capture and storage for coal is of particular importance. World electricity roughly 50% coal at the moment. India and China are going to be 80% coal over the next 30 or 40 years.

Unless we sort out carbon capture and storage for coal we are going to miss this one. So it is extremely important to demonstrate that it works on scale over the next 10 years or so. We need 30 at least up and running commercial **** plants so that we can sort out the problems and show that it really works. If it doesn't work we have got a bigger problem on our hands and the cost won't be 1 or 2% it will be more. And I think still worth paying. But it is crucial to understand how that is going to work. That is the only technology I would single out, not because I like it or I fancy it or it's beautiful in any sense. It is because coal is going to be there and we have to learn how to deal with it.

Finally, I have emphasized the importance of the overseas development aid commitments. That is a global deal. We can see the analytics. We can see the quantities that are involved. So I think the important thing is to get there. We haven't got very long to get there. We have to get this global deal together in the United Nations framework convention on climate change conference to the parties, number 15, cop 15 as it's called, in Copenhagen at the end of next year. If it is to be a treaty, we have to have the words well ahead of time. If we have the words we have to have the principles. We haven't got very much time to put this deal together. That's why it is so important to get it there.

It is also very important that this is not like the WTO where nobody does everything until everybody has agreed to everything – nobody does anything until everybody is agreed to anything and it goes on and on and on. What we have to do is have a framework which is put together but as we put it together each country can take a decision on the basis for which it is responsible. What is going to drive this? What are going to be the sanctions for people who misbehave? I do not believe that we are going to get a global government that if people misbehave in terms of emissions comes and whacks them on the head with a big stick. You might like that idea. Actually I don't like that idea, that is not the kind of sanction that is going to work here. What is the sanction is it will be what people want the people of Australia, threw out, bless them, John Howard in November last year partly because he – I don't know if there are any Australians in the room but you did the right thing. It is really nice not being in government anymore. You can say that sort of thing. Why? Many reasons, he had been in power for a long time. But he wasn't serious about climate change. Nicola Ullo (sp?) the great French TV ecologist put out an ecology pact in February of last year during the French presidential election he said to all the candidates, "You come to the place I describe on the date I describe and you sign my ecological pact and if you don't I'm running for president." They all came, they all signed and then they competed with each other over the sincerity of their signature.

In a number of countries now not all of them, far from all of them, but in a number of countries now the direct pressure from the bottom is starting to take effect. But that won't work in all countries it is going to need leadership as well so that over time you get recognition of the severity of the problem around the world. And it will be the people of the countries that are the enforcement mechanism it is partly that push now it needs to be much more and it needs a lot of leadership to get there. If we throw up our hands and say wow this is all too difficult nobody will agree and so on, well we simply have to face up and say that we are ready to go to 650 or 700 parts per million or whatever the weaker assumption we want to argue for and we have to face up to the great risks that that will involve for our children and grandchildren. So cynicism about that about how

difficult all this will be and it will be difficult, cynicism to the point of saying it is all impossible requires the honesty to describe the risks that follow from that and they are very large indeed. So, I'm sorry I went on slightly too long, perhaps much too long but thank you all very much.

Nancy Birdsall: So Nick has agreed of course, to take some questions. The original plan of my staff was for us to go sit up there but Nick has kindly relieved me of that duty and he will take questions from the podium. But I would like to seize the prerogative of not asking the first question but making a request that my colleague David Wheeler ask the first question perhaps with a word related David, if you don't mind, to this last point Nick was making or one of the last points he was making about who has to do what, when. And particularly in the context of the US. I'm asking David to do this because as some of you know who follow our Web site Nick testified recently Barney Frank's House Banking Services Committee. And he was talking about some of the things that need to be done in Washington both in the global institutions and he has been thinking about US too. So if you could tell us something and make a question David, I would like to sort of like at the nominating convention when the state cedes to another state the right to go ahead. And Nick will continue if that's okay with calling on people who want to talk to you.

David Wheeler: Well, thank you Madame Chairman. I'm just going to take a second; people want to hear from Nick not from me. I just thought I would pose two questions very quickly, very concrete questions. But in the context of some rather sad developments in this place in the last two weeks. As many in this room know, the US has just failed on both counts. Both on financing clean technology and on legislation to curb greenhouse gas emissions. Once again we haven't succeeded and now in the general spirit of waiting for Godot politically we are waiting for a mythic next administration which will somehow do better.

Despite the fact that there are manifest divisions in this society that will not disappear because there is a new administration republic or democrat. So with that as the context, let me be really quite specific about what one might do in the mean time. I think the global deal will never come to pass without the US. We are not sure when the US will get fully on board or when even partially on board. But let's suppose it takes some time. Let's suppose it takes some years before the US gets mature enough to do this.

Many people here are in the aid community they are interested in the bilateral or multilateral aid. So the first question I would pose is, given what you know, and you know plenty about how the aid business is conducted, given the fact that there are so many projects that are designed and implemented by these bilateral and multilateral agencies that have consequences for this, what policy should they adopt now? Not waiting

for a global deal. How should they conduct themselves in thinking about the climate change issue? So that is question one. Question two, it is a bit sobering, many of us were at a luncheon for Jim Hansen on Monday it was a celebratory lunch because it was a 20 year anniversary of his announcements to the Congress about what was coming. He turned out to be more right than wrong, as we know. And his latest says that 350 in CO2 not CO2 equivalent, so perhaps 400 CO2 equivalent is the danger line. So my question is, if he is right, what then? Because that is clearly more ambitious than 500.

Lord Nicholas Stern: Thank you. I spent the morning I think it was close on two and a half hours testifying on my own to Rick Boucher's house committee. I was and then this afternoon met with a number of the key senators in this story. I remain impressed by the degree of understanding of many people in very responsible positions in the US. Probably deeper actually than you can find say in Parliament in Europe, including in the UK.

At the same time I was also impressed by the quite extraordinary science denial of some of them. I did mention that I would fight for their right to be members of the Flat Earth Society; it is a free country you can think what you like. But, I was impressed by those two things. But the thoughtfulness of the people who engaged in this on the Hill is actually quite striking to somebody from outside. I think there is a decent chance, and you know, I am not the right person to ask about this but I'm not an American, but I think there is a decent chance that some time in the first part of next year we will see the outlines of where the US might go. That might be enough to help put a global deal together. Provided that it is credible. You can't have a Kyoto type agreement where you sign up and you go back and it is just thrown out by a hundred to none or whatever the number was 90 something to none.

So that's the optimistic story and I don't give up hope of that and I think we should all do our best to see that happening. And it is a new start. And we in the United Kingdom have always been great admirers of the fixed term Presidency. And the hostility to the US for a number of reasons in the world is remarkable and it is dangerous. And I think that this could change and it could change with leadership by the US of something that is quintessentially a multilateral issue. There is a huge opportunity here and I would rather, I will answer what if question in a moment. I do want to emphasize very strongly that we should act as if and work towards US leadership in the first part of next year if possible. Because I do think there would be a response. I underlined, just take India and China; they know two things they know just how vulnerable they are. The main rivers in Asia rise in a few hundred square kilometers in the Himalayas and if you just go around the Yellow and the Yangtze and the Brahmaputra and Ganges and the Jumnar and the Indus and so on those are the big rivers in

the world in terms of the people that they serve. They serve countries with populations of close on 3 billion people. They rise in that few hundred square kilometers of snow in the glacier in the Himalaya, the glacier in the Himalayas have retreated by about 15% in the last 40 years. Not surprising that last year in Bihar you saw the biggest floods that they have ever seen. In China they are deeply worried about the water flows and what is happening to them.

Vulnerability now is increasingly recognized. They know it is a big problem, they know that the developing world is 8 billion out of 9 billion and that they are going to have to be a central part to that story and they know they are potential deal breakers. And they are smart people. They are focusing on this. But on top of that realization stays the very understandable resentment of the rich countries pulling us in such a difficult starting point. That is why the global deal is so difficult. And why it is important to go through the key elements and understand the sequencing of who does what. The time is right for US leadership; it is an enormous opportunity in the first half of next year. And the first thing is to work as hard as we possibly can to create that. And there are a lot of tremendous people in the United States, Jim Hansen, you and others who are working away at this challenge, and on the Hill itself. I say I was quite impressed by many people we talked to today.

But what if it doesn't happen? You have to live in hope because otherwise you just reach the suntan lotion and the hat. And you go enjoy it whilst you can. In the sad knowledge that your children and grandchildren won't be able to do it. That's the policy if you give up. Let's not do that and let's think through and suppose that we are going to get reasonably strong action at some point in time. The prices are going to change. It is going to be more difficult to emit greenhouse gasses, more costly to emit greenhouse gasses down the track somehow. Even now in the US now that carbon dioxide is classified as a pollutant, firms are worried now about the possibility to the future even though they can't see, necessarily, precisely the future pattern of the cap and trade scheme.

I think similarly in developing countries. Think ahead. Suppose that solar and hydro and wind are going to be more attractive in the future than they look now and work on that. So I think the answer to your question on the international institutions clearly work very hard at adaptation as a big problem, but also try to support the newer, cleaner, technologies as a matter of policy now. Because you have to look ahead and think where it will go.

So that's the way I think international institutions should behave. I think international institutions have a real potential role to play in surveillance a big part of the challenge here is going to be to try to understand what each

individual country is doing. And that is quite complicated. You know, work done right here in CGD is looked at some of the problems of identifying the trade stance of a country. It was quite complicated lots of non tariff barriers and so on. To analyze the stance a country is taking on climate change, to think how and when and in what terms it can be integrated into emissions trading scheme for example, would I think be something that is best done in international institutions because the assessment has got to be as best we can impartial and disinterested. I think there is lots that the international institutions can do and looking ahead adaptation I was talking about, I put that to one side. On the mitigation side there is lots the international institutions can and should do. I think it should be the World Bank that leads on deforestation is leading on deforestation. It must do it fast. I will share with you one remark, actually two remarks of a friend who knew the World Bank very well when I was setting off to become Chief Economist of the World Bank. He said, "Nick, when you get there, perform an experiment. Tape up all the windows and all the doors and find out how long before anybody notices." And the second thing he told me is that is has a biblical view of time. We are in a hurry on this one. We need pilot projects, we need to learn, we have got to learn fast. And I think that is a key challenge for the international institutions here. And they can lead on that. How to work quickly. How to - I mean when you get into public life an decision making the decisions you have to take is given what you now know, what would you now do? That is the challenge of public office. It is not, well that is interesting question. If I have a research grant I can tell you something that might be helpful in a couple of years.

This is urgent, urgent and we have to think through as analysts as policy advisors in the international institutions, if I may still use the word "we". We have to think just how to act quickly on the basis of partial knowledge on something that involves big risk. It is actually a very interesting analytical problem we have to respond to it very quickly and I think the international institutions take a strong lead on that. And why not start with clean technologies and deforestation?

Oh Hansen, yes, yes. The guy is a hero. I agree with you. I wish I could be optimistic about, you are right his 350 is roughly 400. We are already at 430. If you are going to get there you have to think of technologies that get CO₂ out of the air. And I think we should do quite a lot of research on that. You can say a tree is a technology to get CO₂ out of the air. I mean reforestation of course is one part of the story. But given that that flow stop process is moving quite fast, 2.5 per year being added now, we will be at 450 in eight years or so. You can't stop this engine just like that. I think it is going to be very, very, hard. I mean the old story is you wish you didn't start from here. But that is where we start. And I think Jim does a great service in reminding us that the kind of language I have been

talking, the 500 parts per million is pretty risky. It's hugely less risky than 650 or 700 or 750. It may be the best we can settle for.

But if we do research on getting this stuff out of the air. If we find ways of doing it there are lots of interesting people who are dreaming dreams about that. Some of which may turn out to be interesting but we can't bet the planet on finding those methods quickly and we have to cut back on the emissions as best we possibly can. But, I shared Jim's concerns, I'm less convinced on whether we can manage to stabilize at 400.

Is there a lady just here?

Melinda Janki: Lord Stern, I'm really excited and impressed by what you said. I'm not an economist, I'm a lawyer, mea culpa. And I have a very practical question for you. I'm advising a developing country now on protecting its forests. If this country cuts, clear-fells it will get a lot of money in timber and of course it is eligible for money for reforestation. But if it continues to protect these forests it isn't eligible at the moment in the global markets for any kind of payment. Do you have any suggestions on how we can address this? Thank you.

Yes, my name is Melinda Janki.

Lord Nicholas Stern: I think that we have to very quickly move to public support directly to countries where the trees stand in an understanding on containing deforestation. That is the \$10 or \$15 billion a year I described.

I think we have to essentially say that money is available if you don't deforest. We can talk about whether the baseline should be zero or something different. But basically I think international public money channeled through the international institutions which pays directly for the aggregate amount of avoided deforestation in that country. As I say, the details matter because the incentive structures matter. And the incentive structure you just described is exactly right. It is a very serious problem with the way we have it now.

So in the short run, contracts with the country as a whole for protecting the forest. So they do indeed get resources for protecting the forest. I think it has to be at the level of the country as a whole because otherwise if you do it at the level of the locality you may be shifting it from A to B you protect it in A you cut it down in B. You get some money for protecting A but you actually haven't changed the amount of deforestation at all. That is why it has to be done at a fairly big level. And it really has to be done as the world at a whole on a really big scale.

And so I think it has to start with public money. But I think over time what we should look for is supporting the governance, the property rights, the whole enforcement structures, the development story, the integration into the development story so that people see good alternatives, activities to cutting back on the forests. That is the kind of thing we have to build up. And support the countries where the trees stand in their plans for doing exactly that. And then I think after a few years you can start to think about the mechanisms for integrating it much more strongly into the markets. So I see mostly public money direct to government initially and then as it were the public money running down and the private markets running up. But that's exactly what I understand the World Bank will be producing plans on. It is not easy but we wish them luck.

The gentleman, just next to you, just there.

Larry Bridwell: Hi my name is Larry Bridwell and I teach MBA students at Pace University in New York. And I have a student from Europe we are working on a paper, I am not sure the title is correct, but the title of the paper is BMW Goes Green. And they have put out a lot of the material on how they are environmentally responsible. So I have a very practical question. The EU is talking about 120, 130 kilometer, CO2 emissions per kilometer. BMW is in over 200. And I asked a question of the German Ambassador to the United States and I said, "What is Germany going to do about this controversy. Because Germany produces these high CO2 cars and the rest of Europe does not." And his reply was that Germany needs those jobs making those cars. So I would like for you to give a how response to how do you think Europe is going to deal with some of these serious industrial issues involving, particularly, German automobiles that do emit a lot of CO2s per kilometer.

Lord Nicholas Stern: I don't have a particular plan for the German automobile industry. The challenge is a very general one. Because if you are trying to push for a different kind of way of doing things then there will be some dislocation because you will have to give up doing things in some ways and start doing them in other ways. You can have time to make adjustments for example. Emissions trading schemes you can have initially a giving away of allowances and phasing in over time of an auctioning system. Those are two ways if you like of phasing the adjustment process. But you can't say we can't do it because it is too difficult and jobs will be lost because then you get no adjustment at all.

I do think we are going to start to see a much bigger presence of hybrid cars right across the board. If BMW started making hybrids and I'm sure they know how to do it. They know how to make Hydrogen cars. They have already got one or two, you know more about this than I do, but they have already got Hydrogen prototypes. So give time to make the

adjustment and it will happen. But keep over five or ten years the pressures on making an adjustment is strong.

Now, I know they think it is a conspiracy in favor of the Italian car industry and their small engines but they know how to make diesels. They know they are already advertising their technology they turn the engine off when you get to traffic lights. They got big adverts on the back of London buses saying sometimes they do sit but I mostly sit on London buses but very occasionally you sit behind a London bus and it says that if you had a BMW you wouldn't be consuming any CO2 now. So these kinds of technological margins, Hydrogen, hybrids, bio fuels which BMW is pursuing and I think you just have to put pressure on them to go on pursuing those things whilst at the same time come from other places to. None of us should be lecturing anybody else on this unless we approach it in a collaborative way; unless we think about it as something other than arm wrestling. We have to think about it as building collaboration and we have to have a clear view of what's involved, we have to have the incentive structure that promotes that kind of collaboration. If I came through as a high minded toffee nose Brit telling everybody what to do, I can only apologize.

Santiago Levy: I'm Santiago Levy with the Inter-American Development Bank. I wonder whether you can talk a little bit what the distributional impacts of the measures would be here. I'm thinking for instance while many of these technologies develop and you want to move fast in reducing carbon emissions, you have to work through taxes. These taxes would imply large income changes for some households, which I would see as at the end of the day the main political reason why it would be difficult to adopt many of these measures.

So are we talking about taxes that would be collecting 1% of GDP, 4% of GDP, and so what's the order of magnitude. And secondly I think the changes in relative prices is required for these kinds of adjustments would be much facilitated if there were compensating mechanisms for households so that we separate the income effect from the price effect of all these changes and I wonder if you can speculate a little bit or talk a little bit about that.

Lord Nicholas Stern: Yeah, I agree with you. The whole line of argument that you're putting. Just a bit of mental arithmetic, again only multiplication, if the US, just take the US example, if the US had a five gig-a-ton target, this being also 20 years from now, and you had a price of \$30 a ton, that would give you \$150 billion. Probably by the time you look ahead, a little bit less than 1% of GDP. The US is ahead of most paces in its discussion of auctioning permits and I think it's absolutely right to push ahead with that as part of a cap and trade scheme. You could probably do quite a lot with

compensation for \$150 billion or close to 1% of GDP. Then there are many ways to think about doing it. I think that a focus on support for those who are particularly damaged by the relevant price increases would be part of the story. Some part of that slug of money could go to supporting research. Another \$20 billion a year in the US research public sector, public money, going on R&D research would be a huge increase.

The current worldwide expenditure on research public sector R&D not much over 10 billion. Now you can make a big difference in some areas. And I think the political selling of all this matters enormously. If you go and ask a Brit who's thinking to go on holiday in southern Spain, do you want to pay a lot more money to go to Spain on your holiday for some dubious benefit down the track. They'll say "no" and in the survey they do say no. If you put it like Stephane Dion who's campaigning in Canada, tax what you burn not what you earn, then it goes down a bit better. So a lot depends on the politics of this in how you frame the question of course that, if it's honest, has to depend on how you use the resources.

Nancy Birdsall: I think we have time for just one more question. We have several of our other also distinguished board members here and I want to be sure, Nora or Jacob, Jacob is from the NRDC. Nora has been looking at – maybe Nora you want to ask about the link to the food prices, the bio-fuels, whatever. With apologies to others back there who didn't have an opportunity.

Nora Lustig: Okay, yeah, I'm Nora Lustig, visiting professor at GWU and member of CGD board and I was wondering you didn't mention anything about the impact of the huge change we've seen in relative prices recently of oil and other fuels. And this I think brings up two types of questions, one is, is this going to sort of help. I've seen some arguments in favor, others against it, and secondly the fact that you have this huge rise in gas prices probably opens the door to begin to introduce some of the changes that you need in terms of taxation over time just to make sure that people do not readapt to low oil prices in the future. So politically maybe this is sort of an opening that could be used. But the first question is in your, I don't know if you factored it in your updating of the analysis, what would be impact of this rise?

Lord Nicholas Stern: Let me talk about the policy response to those two issues and then the impact. Very crudely speaking I think the right response to high prices for food is to produce more. And the right response for high prices for oil is to consume less. We know roughly speaking that both of these areas are tricky and the details of policy, of course, matter. But we've got some basic ideas about how to do that. With existing technologies in agriculture we could do much more. The output of rice breaker in India is about half China. The output breaker in Africa has hardly changed for grains over 20

or 30 years. There's a lot more that could be done to increase those outputs breaker.

I, like many others, are very uncomfortable with bio-ethanol from corn and sugar. I mean corn and sugar require good land and water and we should be looking for bio-fuels that come from semi-arid lands. Getropha is one example of that. It's quite promising. It plants a bit like castor oil and you crush it. Essentially you can make bio-fuels by distilling things; that's the ethanol. You can crush the oils and that's bio-diesel or you can catch the gases from waste. I mean those are broadly the three roots into bio-fuels. I worry about the ethanol story but I do think even there cellulosic ethanol, you know, from the waste of the grain and so on has real possibilities.

So this is a young subject and I think that people are thinking very hard and constructively about how to make bio-fuels much less pressure on the land. If you grew getropha from parts where nothing's growing now you may help slow down desertification, create employment in areas which are very poor and so on. So I think there's tremendous potential there in way that doesn't compete with good land that needs a lot of water for food and there's enormous potential in raising food production. I don't see any future in persuading the Chinese to go vegetarian. I don't think that's likely to have much policy traction. But I do think the supply of food could be increased a great deal and I do think with all the kinds of descriptions I was giving, the demand for hydro-carbons, fossil fuels could be cut enormously; indeed would be cut enormously by the description that I gave.

Was there another question in there? I got the feeling I forgot something.

Nora Lustig: My question was whether competing prices ...(inaudible)

Lord Nicholas Stern: The higher prices for hydrocarbons obviously make the cost of switching away to other things lower. So to that extent it makes it easier. It makes it politically more difficult in some cases to increase to introduce say a carbon tax. A carbon price of around \$40 a ton of CO₂ would translate into about 40 cents per gallon of petrol. I mean not devastating but 10% more than a – I understand it's about \$4 a gallon now, so it would be an increase carbon tax of about, the price of petrol, of about 10%. It's significant but it's not I think devastating. It is politically more difficult to introduce such taxation at times when fuel prices have gone up. See you got the switch story which makes it cheaper to go for other things; it does make life politically a bit more difficult.

Nancy Birdsall: I'm very glad you said those bit about ethanol because I had been tempted to ask you if you talked about that when you were on the Hill but

I thought better to leave it at the level of grand. But it did remind me of something I didn't say in introducing Nick is that he was absolutely heroic when he was Chief Economist at the World Bank in persuading the Bank as an institution and Jim Wolfensohn at that time to take the perspective of the developing world on the trade issue. And I think one of the most important and interesting things you said today in a way that we will all remember is that it's time for the developing world to think about conditionality on their policies of the rich world.

Let me with that ask you all to give Nick a firm hand for a brilliant and you are all invited to stay for a reception. And it's a lovely evening to do that here.