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Congratulations to IIASA on its anniversary, great pleasure to be here. I want to talk about fairness and climate mitigation. It's impossible to look at political statements coming out of the world's largest emitters; there are three examples here today, without encountering what I think is the false rhetoric of fairness. In a nutshell, the United States says to China: "It's not fair for us to have to act when the world's largest emitter, *you*, are not planning to act." China looks at the United States and says: "It's not fair for us to have to act when in fact you've created this problem to begin with and we're still trying to develop." Ditto for India. If you think about it the concept of fairness being applied here, or the concepts we apply in our everyday lives. We talk about fairness at the individual level: individual responsibility for action and what I think this does is to invite an analysis in which we try to apply the concepts of fairness we use in our everyday lives to this problem. Aggregate up the responsible actions of individuals to get perhaps targets for nations and see where that leads.

Now to do that what you have to do is estimate the emissions of everybody in the entire world. And this turns out not to be particularly easy. You have to go to what I think of as IIASA heaven and wallow in mathematics and statistics for a couple of months. And what comes out the other end is something like the slide shown here. What I've got on the horizontal axis is the population of the world ranked in order of their emissions. So on the left hand side over by zero billion, that's the lowest-emitting desperately poor person in the world. And at the opposite end, at 6.25, that's the highest emitting individual in the world, it's fun to think of who that might be, maybe the Sultan of Brunei, possibly Al Gore, possibly one of us. Now the red line is actually not the individual emissions, it's the cumulative emissions curve and there's a reason for doing it this way. So if you look at the 3 billionth-ranked person you'll see what collectively that means. All 3 billion of the lowest emitting people emit a total, all together, of a half a billion metric tons of CO<sub>2</sub>. The 3 billion poorest people is who these are, and they emit essentially nothing. The take-home message here is that you could increase the emissions of all of those people by putting diesel generators or anything you wanted into their lives and it would not materially affect anything I'm going to say for the rest of this talk. In other words, the development of the desperately poor is not in conflict with solving the climate problem, which is a problem of the very rich. This is very, very important to understand.

In contrast, the rich are really spectacular emitters. I should say also that the numbers at the bottom are the slopes of this cumulative emission curve and they're the individual emissions of those particular points where the red arrows are. Now the black arrow shows that the top 500 million people emit half the greenhouse emissions. These people are really rich by global standards. Every single one of them earns more than the average American and they also occur in all the countries of the world. There are Chinese and Americans and Europeans and Japanese and Indians all in this group. And so if we wanted to turn this sort of a distribution into a set of national targets, the first thing we have to do is to consider not the cumulative emissions of the top 3 billion or the lowest 3 billion emitters or something like that, but the emissions of every single person. So

suppose we line them up and let those blue arrows represent the emissions of each person in the world from lowest to highest. The next step is to say: well let's suppose that there's going to be a cap on individual emissions, and I don't mean this in material terms, this is a way to calculate a national cap. Let's suppose there's a limit placed on individual emissions. Anybody under the limit is free to emit what they want, anybody over the limit is supposed to reduce down to the limit shown by the green bar, and the reductions are signified by those red arrows. Now the calculations I'm going to show you are the limits that would be required to stabilize atmospheric CO<sub>2</sub> at 450 parts per million. It turns out that there is a separate limit in each year, but of course there's only one number in each year for the entire world. That is the limit on personal emissions in that year. The limit falls from about five tons of carbon per person to about one over a 50-year period. But what is interesting is that the earnings of a person at the threshold throughout that entire period (the period in this case is 2007–2030) are between \$30,000 and \$40,000. So these people are all wealthy by international standards. The poor never run afoul of the green line. In fact, the middle class almost doesn't run afoul of the green line.

Now to turn this into a national cap, what you have to do, for instance for the United States is to say—everybody who's not an American leave the line. Then only Americans are left in the line. And then you add up the blue arrows of all the Americans who are left, and the sum of the blue arrows then is the cap for the United States for that year. The sum of the red bars are the cuts required by the United States in that year. You use the same rule for every single nation in the world, and let's see where that takes us. Not too surprising, the US turns out by this analysis on its current trajectory to be the least fair nation in the world. We're the most out of compliance of any nation on our business as usual trajectory. However, the possibly good news is that the bill that's currently making its way through the US Congress, endorsed by both parties (the Lieberman/Warner Bill), would require a very strict reduction in greenhouse gases (the United States), actually that's a little bit more stringent than this fairness criterion would dictate. It requires the US to reduce its emissions to one-fifth of 1990 levels by 2050. Most Congress watchers expect this to pass – 50/50 chance before our next presidential elections, much higher within 18 months. If the US passes this law, it can look at the rest of the world and say, we're being fair, now what about you?

The Europeans would simply have to carry through on the targets that most Europeans have already adopted, those who are in compliance with this fairness doctrine. The big surprise is China. The business as usual trajectory for China from 2007–2030 is shown by the blue dashed line. The red line shows what would be necessary under this national cap plan. China's emissions could grow; unlike the US and OECD emissions, they would be the largest emitter in 2030, that's the good news. The bad news is there are a lot of wealthy people in China already. They'd have to start cutting emissions immediately and in absolute terms their cuts by 2030 are as large as the US cuts. China is a gigantic nation of rich people surrounded in a titanic nation of poor people and the rich people have a responsibility. Everybody always says "China and India," and they shouldn't. This is the business as usual and regarding a national cap for India, you can see that India would be required to do almost nothing throughout this period. India looks

far more like Zambia than it looks like China. So I think that what we need is a new rhetoric of fairness. The one principle that I want you to take home is that responsibility for emissions reductions does not travel with national identity or with your DNA. It travels with your emissions, and your emissions go hand in hand with your income. Follow the money to find the emissions reductions. Thank you.