



## Climate Change: The Need for Immediate Action

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*#MayorsCare Summit on*

*Modern Slavery and Climate Change: The Commitment of the Cities*

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Good morning, distinguished ladies and gentlemen,

It is an honour to welcome you all to this historic meeting on behalf of the Pontifical Academy of Sciences. I am going to talk to you today about climate change, easily one of the most defining problems our civilization faces.

I am going to start with the Encyclical. I am sure each one of us have our own favourite parts of the Encyclical, minus the one dealing with integral ecology, where it convincingly reminds us we have to think of the natural system and the social system interacting together. By natural systems we mean nature; social systems are our cities and states, which are all represented here.

The Church, through the Pontifical Academies of Sciences and Social Sciences, brings science and religion together. In this meeting, by bringing in city Mayors and Governors of states, it has taken another bold step, bringing science, religion and social institutions together.

So let me start with the climate change issue. I am going to start with the social systems. I think of the world as consisting of two worlds, one inhabited by what I call the Top 1 Billion, whose unsustainable consumption of coal, oil and gas contribute to about 60% of the climate-warming greenhouse gases.

Contrast that with the second world living side by side, three billion people, about 40% of the planet, due to poverty still relying on eighteenth century technologies, for example cooking with firewood and dung. That is a picture of a woman in the Himalayan region. I was her houseguest for a week. She pays a huge price for that, forced to inhale the smoke from cooking with biomass. Their contribution to greenhouse gases is marginal at best, about 5% or less.

So let's talk about what happens to these fossil fuels. Basically fossil fuel is hydrogen and carbon. The carbon combines with the oxygen in the air to form carbon dioxide. How much of it have we already put in? Starting from the pre-industrial times, 1750 to 1970, we have added one trillion tons, that is a thousand times billion, and it took us just forty years from then to add the next trillion. At the present rate of consumption, in another twenty-five years we will put in another trillion tons and so on and so forth.

About half of everything we put stays there for a century or more, so there are a trillion tons going to be changing the climate and the ecosystem at least for the next century if not longer, for generations unborn.

So what happens to this carbon dioxide? Because it's so long-lived it covers the entire planet like a blanket. Just like the blanket keeps you warm on a cold winter night by trapping your body heat – it doesn't even heat, it just traps your body heat – this blanket of a trillion tons of carbon dioxide traps the infrared heat coming from the planet and heats it up.

How large is that warming and how soon is that going to be? There are already enough greenhouse gases to heat the planet by 1.5°C. We have seen over two-thirds of it, about nine-tenths of a degree. The remaining half a degree is in the ocean and the ocean will cough it up in the next thirty years. In that thirty years we will have added another trillion to a trillion and a half, contributing another half to seven-tenths of a degree, so we are already on target to heat the planet by 2°C not one hundred years from now, not fifty years from now but thirty to forty years from now. It is just around the corner.

So how is the planet going to look like? Let us just focus on the next three decades with more intense droughts, heat waves, forest fires, intense hurricanes: we're already seeing all this, they are just going to become more intense and likely more frequent.

Let's take the Bottom 3 Billion. California is already experiencing severe drought in the last four or five years. Such a drought, if it were to hit the Bottom 3 Billion, would wipe them out from their livelihood, because they're all depending on that particular year's water, because they are subsistence farmers.

I also want to point out the other insidious natural system feedback that is happening. Because of the warming, 40% of the sea ice has retreated during the summertime. It exposes the darker ocean, letting more sunlight

into the ocean. This feedback between warming, sea ice retreat, intense solar heating we documented just last year. We showed that the effect into the Arctic Ocean of this feedback is equal to adding another 300 billion tons of carbon dioxide. So if we continue merrily along this path beyond 2050 what we are forecasting is an increase of 4°C. By the time it reaches 4°C, I must say I really can't rely on our models anymore. We are talking about huge unknown natural feedbacks, tipping points, etc. But city Mayors and Governors like you want to know what is the worst possible. It's likely to even go to 6°C. By that time the planet will be unlike anything we have seen through our instruments for the last several tens of millions of years.

So the question is, how are we going to deal with it? So far, this was in the domain of natural and social scientists, but now physicians are interested in this problem. Just two weeks ago one of the most prestigious magazines, *The Lancet*, released this report which basically declares that climate change is the greatest threat to global health and it documents the horrendous type of health effects we would be faced with, and it of course targets women and children and the poor to be worst affected. It basically concludes that climate change is a medical emergency.

Having painted what's in store for us, let me switch gears. Fortunately, it's still not too late to solve the problem. I see this as basically bending the curve. The first curve measures carbon dioxide. Carbon emissions curve something like that, and you've got to get it there. The second curve, our climate, is warming rapidly: we have to bend that curve too.

Let me start with the CO<sub>2</sub> emissions. I think of it as under two categories. One is intergenerational equity, since the carbon we put in stays for centuries to thousands of years, really impacting generations unborn for our unsustainable consumption, so we've got to reduce the carbon emissions by 50% by 2015. These are not my numbers, they are United Nations numbers, and I guess it's also consistent with what Professor Jeffrey Sachs has come up with in his report, and bring them down to zero emissions by 2080. What is the cost of this? The UN has said it will invest a trillion dollars per year for the next thirty years to decarbonize the economy. We are giving 550 billion for fossil fuel subsidies, so if you subtract and divide it by the Top 1 Billion, it's \$450 per person. As a physical scientist I see this as a \$450 problem we need to solve.

The second issue is intragenerational equity. Remember the 3 Billion who have little to do with this and they're going to be the worst victims of it and 2°C warming is already in the bag. That 2°C warming is something we have not seen in the last two or three million years, and the only time the planet was that warm, 120,000 years ago, the sea level went up by five to six metres, about 15 to 20 feet, and it took about 1,000 years to do that. So we have to provide clean energy access to the Bottom 3 Billion. This is what exactly was enacted by the Millennium Development Goals, so it's not something inconsistent with that, and the cost of that, if it is borne by the Top 1 Billion, makes it a \$250 problem. So I can ask, why should I, who belong to the Top 1 Billion, give \$250 to this woman sitting in Kenya, or Uganda, or India? We've talked about the ethical issue, now let's talk about the selfish issue. If they get on the fossil fuel ladder, their fossil fuel consumption in thirty years is going to swamp what we are doing now, and if neither the selfish argument nor the ethical argument appeal to you, I refer you to another one that we are sharing for others and the world, altruistic.

Let's go on. So I talked about bending the carbon curve. How about bending the climate curve? Carbon dioxide is slow acting. Even if you take actions now, it's going to take thirty to forty years to bend the temperature curve. For that we have another knot. If we dial down the CO<sub>2</sub> knot there are four other pollutants. This other knot was discovered forty years ago, when I published a study showing the halocarbons used as refrigerants are the most potent greenhouse gas known to man. A ton of that has the same effect as 10,000 tons of CO<sub>2</sub>. Quickly many were added and this is the current understanding of the United Nations IPCC, that non-CO<sub>2</sub> pollutants contribute as much as 50% to the global warming, so if you target four of them – ozone, halocarbons, methane and black carbon – black carbon is basically the soot that comes out of diesel and its lifetime is two weeks. If we all stop black carbon emissions the global warming effect is gone in two weeks from now. In the left hand dial are these other pollutants. We can cut down the rate of warming by 50%, so without losing track of the right hand, just dialling down CO<sub>2</sub>, so the issue now is, I want to conclude showing that the science and technology has done its part, we know how to solve this problem.

By the fact that you leaders are here it's clear there is commitment from our social institutions, but we lack public support. How do we get that? I think that's where I feel religion has a huge role to play. Four years ago the Church organised, through the Pontifical Academy of Sciences, a meeting on glaciers. Remarkably, with the top glaciologists of the world and several Nobel laureates we concluded, if we want justice and peace, we must protect the habitat that sustains us. That's a remarkable and unusual conclusion for scientists to come to. That's the revelation the Church and the Academy is doing. That meeting culminated last year in a collaboration between our Pontifical Academy of Sciences and Professor Margaret Archer's Academy of Social Sciences. This had again several Nobel laureates, major thinkers of the world and several in this audience were here, including Professor Sachs and others, and we came to the conclusion – of course there were tremendous

scientific and other conclusions – that a sustainable relationship with nature requires a fundamental change, you know, our attitude towards nature and towards each other, and therefore requested moral leadership. That's why as a society we are so lucky to have Pope Francis to provide that moral leadership.

Let's conclude with a remarkable statement of the Encyclical. It says "He" – he here I think is Saint Francis of Assisi – "shows us just how inseparable the bond is between concern for nature, justice for the poor, commitment to society, and interior peace". Two weeks ago I was in a public event with the Dalai Lama – there were 10,000 people – and he talked about how you need to change your inner environment to change the outer environment, so it is exactly this consortium of faith leaders of all religions in the world and leaders of our tremendous social institutions, cities and states and such, working together, who can have a transformation impact. It can happen, it is happening, and we can solve this problem.

Thank you.