

Climate Change and Global Peace

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President Ohle, faculty and staff of this institution of excellence, distinguished ladies and gentlemen, I'm deeply privileged at the honor that's just been bestowed on me and the opportunity that you've provided me for this occasion when you have given me the privilege of talking to such a large and distinguished audience.

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I think Professor Neiderriter should be proud of organizing this remarkable event and I can tell you as I go back in time to the day when I had the privilege of accepting the Nobel Peace Prize on behalf of the IPCC, this particular ceremony and this occasion certainly doesn't lack anything in elegance or solemnity.

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The only thing missing is that I don't see Mr. Al Gore standing next to me. He is an imposing presence and someone who has been a good friend and someone that I've always looked up to. Thank you for inviting me to Gustavus and I hope I would

have the opportunity to visit her again sometime in the future, perhaps just to take in and breathe the beautiful atmosphere of this institution.

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I'm so happy that you've focused on water as a theme for this year. And, indeed, there is no more crucial issue for human society to ponder over, to analyze, to reflect on, than the future of water on this planet. Indeed, this is the one element that has allowed civilization to flourish in different parts of the world.

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It's certainly no coincidence that wherever civilization and human activity began, it was essentially because of access to water. And it's also no coincidence that those societies which ran into problems in the management of their water resources or had to encounter natural phenomena that led to the depletion or vanishing of water resources, are the societies that actually failed throughout history.

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And we certainly don't want to see a repeat of that for any part of the globe. Though I dare say the trends are not very encouraging. I'm reminded of this little joke of one planet crossing the other and asking how was the universe, what's happening in the universe? And the planet that was asked this question says 'Well, everything seems to be fine except this planet called the Earth.' So he says, 'What's wrong with the Earth?' And he said, 'Well, the problem is there's a race, a species over there called human beings, they are the ones that are destroying that planet.' So this wise planet says, 'Well, don't worry, they're not going to last very long.' I hope that doesn't come true.

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But what I'm going to present before you is a broad overview of factors related to climate change and what the impacts of climate change are going to be. And I hope on the basis of that, you'll be able to assess and appreciate that this is an area where we really need to work diligently to see that the worst impacts of climate change don't come to pass.

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And I'd also like to emphasize the fact that we have very little time because unless we act with a sense of urgency, then certainly there would be conflict, there would be a disruption of peace in different parts of the globe. And it's really perhaps for this reason the Norwegian Nobel Committee gave the Nobel Peace Prize in 2007 to the IPCC and Mr. Al Gore.

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So let me start with giving you some observed impacts of climate change. And here you see a plot of global average surface temperature, which, as is obvious, has clearly been fluctuating. And those fluctuations are the result of natural factors, natural drivers, because there are changes taking place in solar activity and volcanic activity and other phenomena as a result of which, the climate of the Earth has been varied.

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But on top of that, we have also imposed now, and have been doing so for several decades, another influence and that is the influence of human actions. And that's precisely why, if you see a little intruder on the screen, I've just managed to get rid of it, if you see the last few decades, or in fact the last 100 years, and draw a line through this trend, then you'd observe that temperature increase during the 20th century has been about 0.74 degrees Celsius. However, if you look at the last 50 years, then this particular slope is much steeper. And you'll find it's almost at twice the rate of the 100-year trend because the temperature increase has been about zero point, one point, I'm sorry, one point, 0.128 per decade and that essentially means almost the same level as we obtained in the 100-year period, all in a short period of 50 years.

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What is also particularly significant is the fact that 11 of the last 12 years rank among the 12 warmest years in the instrumental record of global surface temperature. So we're on a trend wherein clearly temperatures are increasing much faster than they did historically.

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It's not just a smooth and steady increase in temperatures that climate changes brings with it. It also brings a major disruption of the entire climate system, as a result of which several extreme events are increasing both in frequency and intensity. And the frequency of heavy precipitation events has increased over most land areas.

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It's universal, across the globe. It's happening everywhere. Whether it's heavy snowfall that has taken place in the UK about three months ago, as a result of which Heathrow Airport was shut down. Or in my own country, in Mumbai in 2005, we had a massive cloudburst, as a result of which the entire city came to a complete halt. It was paralyzed and people were stuck in their cars and their buses and even in the trains because there was so much water that nothing could move.

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It's also true that heat waves have become more frequent over most land areas. And an example of that which is not necessarily related to human actions and the human impact of climate change, but clearly what happened in Europe in 2003 is something that'll repeat itself with greater frequency and intensity. Now in that particular event, there were 35,000 deaths, largely in and around the city of Paris but spread actually all over Europe.

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We also know that tropical cyclones are reaching much higher intensity. And they have increased in intensity over the past three decades or so. And this, again, is a matter of observations and record. Last year in the country of Myanmar, formerly known as Burma, a cyclone called Nargis hit that country with great severity, as a result of which 100,000 deaths were reported. But actually we know now that the numbers were actually much, much higher. And that's essentially not just because of the fact that there was a high intensity in this cyclone than was normal, but also because the sea level now is much higher.

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You will all recall the tsunami that hit most Asian countries and went as far as the eastern coast of Africa and killed large numbers of people, destroyed an extensive amount of property. Well, that tsunami would not have been as devastating if sea level was not higher. Because with the higher sea level, each of these events acquires a much more dangerous proportion than would be the case otherwise.

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We also know that droughts have increased all over the world, and particularly since the 1970s. This is very common in the tropics and subtropics. Droughts, floods, heat waves, extreme precipitation events are therefore becoming more frequent, more intense and much longer in duration.

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Now all of this obviously has implications for the availability and the usability of water. Because you may get a lot of water coming down on the Earth in an extreme precipitation event, which means heavy rainfall or snow in a very short period of time. But that's really of no benefit to human society simply because all of it just runs off.

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Similarly in a flood, not only does it cause destruction and damage, but it also doesn't allow human society to make sure of that large quantity of water. So as a result, the entire water cycle is now being disrupted as a result of climate change in a manner that would reduce the access of human society to water for a wide range of applications that we need this vital element for.

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Now, we have made projections of increases in temperature right up to the end of the 21st century. And what we find is that the range of temperature increase would be anywhere from 1.1 degrees Celsius to 6.4 degrees Celsius. And this clearly would be much larger than what we have seen in the 20th century. If you recall, I mentioned that in the 20th century, average temperature increase was about 0.74 degrees Celsius.

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We've actually come up with two estimates within this range that seem to be what we call best estimates. And at the lower end, it's about 1.8 degrees Celsius. At the upper end, about 4 degrees Celsius. Now even this lower end estimate spells a great deal of disaster and doom because that combined with the 0.74 degrees Celsius increase which took place in the 21st century, would give us a total temperature increase of over 2.5 degrees Celsius in the short period of two centuries. And this certainly is going to be accompanied by a wide range of impacts that clearly human society would be well off in avoiding through all the measures that are required.

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Now let's look specifically at climate change and water availability. There are today 700 million people in 43 countries who live, what can live below, what can be defined as the water-stress threshold. The Middle East is the most water-stressed region. And if you go to a place like Dubai, which I happen to frequently for a variety of professional reasons, it does cause you a great deal of concern to find that you have highly energy intensive water desalination technologies installed over there, not necessarily for just meeting the basic needs of human beings, but actually for creating a ski slope, which in addition requires further use of energy.

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Or, for that matter, in maintaining beautiful golf courses. All very good for human society, but what are the costs that are involved? And I think I'd like to emphasize the fact that what we really need to do is to bring about a shift in philosophy. And I think it's institutions like this that that can inculcate the spirit, the desire, the motivation and the knowledge by which young people who are going to face this kind of a daunting future can bring about a major shift towards a far more responsible approach to management of our natural resources.

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Sub-Saharan Africa has the largest number of water-stressed countries of any region. And you can imagine where societies and communities have to fight over limited water resources, there's clearly inherent in that situation the great danger of a disruption of peace and security. And may I say it, in this day and age, when

we are living on a small spaceship Earth, a planet where communication, where movement, where influences go from one corner to the other, clearly if you're going to get a major disruption of peace and a threat to security in one part of the globe, there is no other part of the globe that can remain insulated from these factors.

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So I think we need to look at what's happening in the rest of the world with some degree of concern and alarm because it's not something that's going to remain far away. We know today that some of these influences can have very dangerous implications for every other part of the globe.

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So here in the case of Sub-Saharan Africa, I think there is need for major interventions because one quarter of the population is living in a state of water stress. And all this will be exacerbated by the impacts of climate change.

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Let's look at what this implies for very basic requirements for consumption of water by human beings, agriculture and energy generation. Because there are going to be changes in precipitation patterns. Glaciers are melting very rapidly, which will decrease river flows. I come from a part of the world where you've got this huge reservoir as water established by nature through its genius in the form of ice as glaciers across the Himalayan Range and these glaciers are melting very rapidly. As a result of which the flow in the river systems throughout that region is going to be affected adversely.

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Our projections in the IPCC indicate that something like 500 million people in South Asia will be affected by the possible and likely decline of flows in the rivers in the northern part of the subcontinent. And about 250 million people in China across the other side of the Himalayan Range. And therefore we need to be concerned about some of the implications of these slowly creeping in disasters.

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There's increasing salinity of groundwater. Why? Simply because sea level rise is taking place. And therefore the intrusion of sea water further on shore, far away from coastal areas, is increasing very rapidly. As a result of which, ground water resources are increasing in salinity.

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We also know that a large number of people as early as 2020 are going to be exposed to water stress as a result of climate change, anywhere from 120 million to 1.2 billion in Asia, 75 to 250 million in Africa, and a somewhat lower number in Latin America.

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But consider the fact that, as I mentioned earlier, Sub-Saharan Africa already has a serious problem of water stress. And if you have these numbers as are projected over here, adding to the level and the extent of water stress in that region, you clearly have a situation ripe for conflict. And I think we have to do everything possible to avoid that because, let me repeat once again, it's not going to remain confined to one single location on the globe.

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There are one-sixth of the world population currently living in regions supplied by melt-water from major mountain ranges. And this is not just something that is going to happen two generations from now. It's likely that major changes will take place in the next 10 to 20 years. I have been to some of these areas. I fly across regions where you see the changes that are taking place in the glacial stock on the Himalayan Range and it causes you anguish, it causes you concern, to the point of causing fear. And I think this is something that we need to be aware of, not just in South Asia, but in other parts of the world as well.

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Now the expected change in annual runoff is shown over here in different shaded colors. Actually, if you look at the yellow and red colors, these are regions which are going to suffer a decline in rainfall and precipitation and the blue and purple areas are the ones that are going to see an increase.

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Often you talk to somebody from Russia, for instance, and you get the view that climate change is going to be good for them because a region like Siberia would open up due to melting of perennial snows over there. But reality could be very different. It's likely that the extent of precipitation that those regions are going to get, as you see over here on this map, will be much larger. So even though warming may bring about an increase in temperatures, just the sheer quantity of increase in the snow that falls in that region could actually make the region far more unlivable.

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I recall in 2004 I had gone to speak at a conference in Russia on climate change in Moscow, and this was before the Kyoto Protocol was ratified by Russia and that enabled the protocol to come into formal existence because Russia would have tilted the balance. If they have not ratified it, there would have been no Kyoto Protocol.

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Anyway, on that occasion, President Putin gave a speech which he read out and it was quite uninspiring, if I may say so. And then essentially it seemed to indicate that Russia's not going to worry about climate change and it's not an issue of concern to them. And then there were two other UN officials who spoke and finally I spoke. And I highlighted some of the things that I'm trying to present to this distinguished audience.

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And I said the impacts on the developing world could be disastrous and could certainly create chaos in several locations. And that's when President Putin does this [holds one finger up in the air] almost like a little child who wants to go out of the class for a while. But he wanted to speak. And he came to the podium again and this time he spoke without notes. And he started by saying, 'Everybody tells me climate change is good for Russia because we won't have to spend so much on fur coats.' And everybody laughed a little bit. And then he said, 'And that a large part of our land will be available for agriculture.' But then he said something profound. He said, 'I have to worry about floods. I have to worry about droughts. And I also have to worry about the rest of the world.'

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And that, I thought, was a statement from a statesman because he had obviously read enough about climate change or had been briefed by some people, certainly not among his close circle because I know his close circle consisted of skeptics who thought 'til this day perhaps believe that the Earth is flat. But he then, he then clearly indicated that Russia would sign the Kyoto Protocol even though he didn't say so in so many words. But that was the clear implication of what he said. And Russia did sign the Kyoto Protocol.

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So the point I'm making is, if you look at the region, the Mediterranean, North Africa, South Africa, these are areas that are going to suffer a major decline in precipitation. And clearly these are the regions that would suffer from the impacts of climate change in terms of depleted water resources and availability.

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So there are several locations, including the United States, if you see the southern and southwestern United States, where things are not going to be easy. Mexico is another area where clearly there would be adverse impacts of climate change on water availability.

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Water stress at low latitudes means losses of productivity for both rain-fed and irrigated agriculture. I'd like to remind this audience that there are hundreds of millions of people across the globe who practice agriculture largely at the subsistence level, largely for getting enough food to feed themselves and their families. And a large number of them are totally dependent on rain for agriculture.

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So if the rainfall patterns change, then it has a direct and adverse impact on the livelihoods of hundreds of millions of people. What are they going to do? Well, they would go to urban areas, live in slums. Some of them will become illegal immigrants and go wherever they feel they can earn enough to be able to get a living and take care of their biological needs of water and food.

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And climate change could trigger a yield reduction of 50 percent as early as 2020 in some African countries. And these are countries where you already have large-scale malnutrition and hunger. And climate change would only add to this. And crop revenues could fall by very large margins as a result of which several of these societies will not be in a position to import food from global stocks, if at all, those stocks are going to increase or remain steady in the future.

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Now impacts of water shortage also have serious implications for human health. Malnutrition from reduced food availability, pathogen or chemical loading from reduction of river flows and their ability to dilute effluents. Infectious diseases from water stagnation and contamination. And may I say that whenever there's a flood, the biggest challenge for officials who are managing relief and rehabilitation is to see that they stem the spread of disease. Because in the wake of floods, you have massive outbreak of disease.

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So I think this is another aspect related to water that has direct impact on human health. And overexploitation of ground water because surface water may not be available, would also lead to greater scarcity and stress. We also have a great deal of uncontrolled water reuse, and therefore I think we need to now start looking at management of water resources such that we recycle water where it's possible for some applications. We certainly need to use improved technologies, and, in a sense, we also need to understand that our lifestyles will change.

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I might tell you that whenever I'm in Delhi, which is very rare these days, unfortunately, I normally go for a swim in the morning and I have another person who normally comes along at the same time at the same swimming pool. And this worthy gentleman has a swim and, probably for 15, 20 minutes, and then he has a shower for about half an hour. And one fine day, I found that he had reduced his showering time to a much shorter duration, and I asked him what happened. He said his little son came and told him that the ideal duration of a shower is 7 minutes and he said, 'Now when I shower at home, he comes and knocks on the

door.' And I almost felt like telling him, please bring your son to me because I'd like to hug him and bless him because not only has he reduced water usage, but as long as this gentleman showered, he would also sing and I could now be spared of the singing, so. [laughter]

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So malnutrition and water scarcity may be the most important health consequences of climate change and we need to keep that in mind. Now if you look at some of the hazards, I'm sorry, the quality of this picture is not very good, but all this basically provides is some data on the areas that will be affected, cultivated land to be affected, 21 million hectares in China. People affected 140 million. And the direct economic loss in billions of dollars is 8 billion. And this would also lead to droughts. This is in the event or as a consequence of drought.

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You have some figures for flooding and some figures for tropical cyclone. Now to be quite honest, most countries have not done the kind of exercise that has been done in China, as exemplified by this figures. And I happen to be a member of the China Council for International Cooperation on Environment and Development, an international group that advises the Chinese government. And I must say they have done an extensive amount of analysis. Now what decisions that take on that analysis is another matter. But, you know, there is a huge body of knowledge that has been created on the impacts of climate change.

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Now let me quickly move on to the impacts of climate change on development. As you can see, and as is obvious, climate change will affect basic needs because access to resources and food would be affected. Stable health conditions would be affected. The security of settlements because if people run out of water and have no access to water, clearly they're going to move to other locations. And when they do that, there would be the potential for conflict in those situations as well.

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And without appropriate measures, climate change will exacerbate poverty and slow down the economic growth in developing countries. Climate change will act as a threat multiplier, therefore, in several developing countries.

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Now poverty and food scarcity play an essential role in creating conditions of social desperation and discontent. Food scarcity and the resulting higher food prices are pushing poor countries into a state of chaos. A year and a half ago, when food prices went up, you will recall in several parts of the world they had riots, they had protests, and it turned out to be a pretty serious warning of what might come in the future.

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Now I spoke at the UN before all the world leaders on the 22nd of September and I deliberately highlighted the fact that based on some of the simple analysis that I've done, there's a danger of about a dozen states becoming failed states. And if that happens, clearly these become heartbeds [sounds like] of terrorism, of export of illegal drugs, arms, and illegal immigrants. And this is something that we need to be concerned about because, as I said earlier, there is no part of the globe that would be insulated from these impacts.

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Rising ethnic conflicts can be linked to competition of an increasingly scarce natural resources. Water scarcity also plays a role in creating conditions of social desperation and discontent. There are 260 river basins that are shared by two or more countries. And you can imagine what kinds of danger, what kinds of conflict, and certainly, at a minimum, disputes that would arise as a result. And there are some parts of the world that clearly exhibit these tensions and tendencies already.

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Therefore, the time has come for us to realize the importance of adaptation and mitigation. Adaptation of course has been carrying on for hundreds and thousands of years because the weather and the climate have been changing. And there are communities that have learned to live with the vicissitudes of

changes in weather and climate. But this capacity is limited and uneven across and within societies.

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What may happen as a result of the impacts of climate change is that the capacity to be able to adapt to some of the changes that'll take place will be far exceeded by the intensity of those impacts. And therefore this poses new risks that'll require new investments in adaptive responses. And if you take specific examples of actions being taken, in the case of the Netherlands, they are raising the height and the thickness of some of the dikes because, as you know, the Netherlands is one country a large part of which is under sea level. And they've been able to keep the sea out because of these dikes which have been constructed hundreds of years ago. Now, of course, they realize with sea level rise, there's a danger that the original engineering may not withstand the increased threat that's going to arise.

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There are limits to adaptation, technical, political and social. There are economic limits because costs of adaptation measures. You take a country like Bangladesh, which is a very low-lying area of 460 million people and what can they do to protect themselves? They can't construct a dike all across the coastal area, all across the waterfront because it'll cost hundreds of billions of dollars. And it's a poor country. They just can't afford it.

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So there are going to be economic limits to what societies can do. There are social and cultural limits because there are some countries which just don't have effective governance standards. And there are informational limits. People just don't know what kinds of threats and dangers they are going to be subjected to. Take the case of New Orleans, a city in such a developed country where some voices have actually raised the fear of the damage that's likely to take place, but unfortunately that was largely ignored.

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And there are physical and ecological limits. And adaptation alone is not going to be able to cope with all the projected impacts of climate change. So globally we have to reduce the emissions of greenhouse gasses. And we need to do that with a sense of urgency because as this table shows, if you want to limit temperature increased to between 2 and 2.4 degrees Celsius, then all we have is a little more than 5 years.

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Global emissions of greenhouse gasses will have to decline beyond 2015. At best, they can peak by 2015 and then start coming down. And if we can achieve that and we can bring down emissions rapidly after that, we may be able to avoid some of the worst impacts of climate change.

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And the cost of doing this is not high at all because let's assume we had a steady and smooth increase in GDP between now and 2013. If we were to mount a major program of mitigation, that means reducing emissions of greenhouse gasses, then all that would happen is that this line would bend a little downwards and you would get a slight shift in the date by which the world would reach the so-called level of prosperity that would take place with business as usual.

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And that delay would be no more than a year. That clearly is not a very high price to pay for the world to avoid some of the worst impacts of climate change. Now a technological society, as Gandhi said, has two choices. First it can wait until catastrophic failures expose systemic deficiencies, distortion, and self-deceptions.

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And I think the most dangerous of these is self-deception. When we have the knowledge, when we have the information, and we have the projections of what's going to happen in the future, if we chose to ignore it, that clearly indicates a state of self-deception.

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But an enlightened society would have a culture that provides social checks and balances to correct for systemic distortion prior to catastrophic failures. And I think the systemic distortions that we have today are those that essentially are minimizing the strength of local voices and grassroots efforts. This is where I think both in the developed and the developing world, we need to come up with means by which we think out of the box, by which we innovate.

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We use changes in lifestyles. We use changes in technology, by which we can address and deal with this problem. And changes in lifestyles would really not be difficult. It just means that you have to be conscious of the fact that you're wasting energy in the home, you're wasting energy with transportation, driving SUVs driven by, occupied by just one person long distances. And I certainly think you need investments in public transport on a large scale.

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I've been telling audiences all over the world that we must also eat less meat. Now I myself have become a vegetarian because I realize the enormous emissions associated with the entire meat cycle. But as I tell everybody across the planet, eating less meat, and particularly red meat, is good for you and good for the planet. You would be healthier and so would the planet. And of course there's some people who send me affirmative messages that they accept this advice.

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I was very happy to see about a year ago, I said this to a large audience in the city of Ghent in Belgium, and that started a movement, as a result of which now there's a regulation that does not allow meat, or at least tells people not to have meat once a week. And I think if this practice is followed, as you can imagine, one-seventh of the emissions from the meat cycle could be reduced.

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Sir Paul McCartney, who is a vegetarian himself and a good friend, has now started a movement in the UK. And maybe we need something like that over here. I'm not saying become vegetarians, but certainly try and think of the

impacts of our dietary preferences. And maybe with a little bit of moderation, we can make a difference.

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But most importantly, we can make a difference by looking at innovation and using it in a manner that takes care of the very basic needs of the poor and the rich. And I'm going to show you an example of how the 1.6 billion people on this earth who have no access to electricity can be served through innovation, through institutional arrangements. It's a big challenge but this is something that all of us can join hands to work towards.

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And I'm now going to request that the video that I'd like to show you on the subject can be rolled.

0:39:27.2- 0:42:50.9 Video plays

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Well, Gandhi said, 'Be the change you want to see in the world.' So if each one of us would be that change, I think we can work together and bring about change in the right direction. Thank you very much.