

Intro

You look at that river gently flowing by. You notice the leaves rustling with the wind. You hear the birds; you hear the tree frogs. In the distance you hear a cow. You feel the grass. The mud gives a little bit on the river bank. It's quiet; it's peaceful. And all of a sudden, it's a gear shift inside you. And it's like taking a deep breath and going, "Oh yeah, I forgot about this."

Earth Rise



This is the first picture of the Earth from space that any of us ever saw. It was taken on Christmas Eve 1968 during the Apollo 8 mission.

More...In relatively comfortable boundaries... But we are filling up that thin shell of atmosphere with pollutants.

I'm Al Gore. I used to be the next president of the United States. *[laughter and applause from audience]*

I don't find that particularly funny.

I've been trying to tell this story for a long time and I feel as I've failed to get the message across.

I was in politics for a long time. I'm proud of my services.

(Mayor of [New Orleans](#) in background).

There are good people who are in politics who hold this at arm's length because they acknowledge it and recognize it as a moral imperative to make big changes.

And they lost radio contact when they went around to the dark side of the moon and there was inevitably some suspense. Then when they came back in radio contact they looked up and snapped this picture and it became known as [Earth Rise](#). And that one picture exploded in the consciousness of the human kind. It led to dramatic changes. Within 18 months of this picture the modern environmental movement had begun.



The next picture was taken on the last Apollo mission, [Apollo 17](#). This one was taken on Dec. 11, 1972 and it is



the most commonly published photograph in all of history. And it is the only picture of

Earth from space that we have where the sun was directly behind the spacecraft so that the Earth is fully lit up, and not partly in darkness. The next I'm going to show you has almost never been seen. It was taken by a spacecraft called the [Galileo](#) that went out to explore the solar system. As it was leaving Earth's gravity it turned its cameras around and took a time lapsed picture of one day's worth of rotation here compressed into 24 seconds. Isn't that beautiful?

This image is a magical image in a way. It is made by a friend of mine, Tom Dan San. He took 3000 separate satellite pictures taken over a 3 year period, digitally stitched together. He chose images that would give a cloud free view of every square inch of the earth's surface. All of the land mass is accurately portrayed. When that is spread out it becomes an iconic image.

The Most Ridiculous Thing



I show this because I want to tell you a story about two teachers I had, one that I did not like that much, the other who was a real hero to me. I had a grade school teacher who taught geography by pulling a map of the world down in front of the blackboard. I had a classmate in the sixth grade who raised his hand and he pointed to the outline of the east coast of South America, and he pointed to the west coast of Africa, and he asked, "Did they ever fit together?" And the teacher said, "Of course not! That's the most ridiculous thing I've ever heard." That student went on to be a drug addict and a ne'er do well. That teacher went on to be a science advisor in the current administration.

But you know, the teacher was actually reflecting the conclusion of the scientific establishment at that time: "Continents are so big that obviously they don't move." But actually as we now know they did move. They moved apart from one another, but at one time they did in fact fit together. But that assumption was a problem.

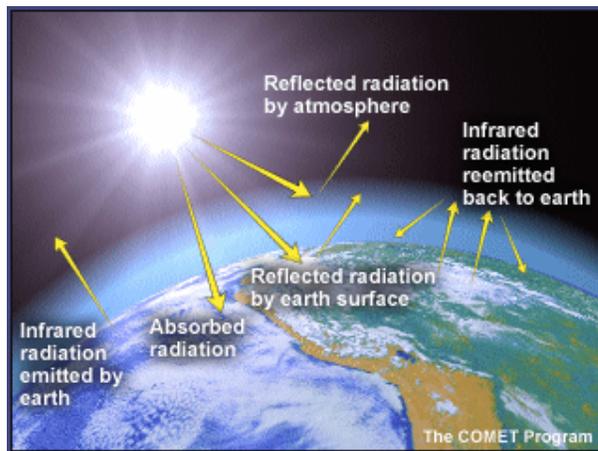
It reflected the well known wisdom:

"What gets us into trouble is not what you don't know, but what you think you know that just ain't so."

This is actually an important point, believe it or not because there is another such assumption that a lot of people have in their minds right now about global warming that just isn't so. The assumption goes like this:

"The world is so big that we can't possibly have any lasting, harmful impact on the earth's environment."

Maybe that was true at one time, but it is not true anymore. One of the reasons it is not true anymore, because one of the most vulnerable parts is the atmosphere, vulnerable because it's so thin. My friend the late [Carl Sagan](#) used to say that if you have a globe with a thin coat of varnish on it, the thickness of that varnish relative to the globe is pretty much the same as the thickness of the earth's atmosphere compared to the earth itself. It is thin enough that we are capable of changing its composition.



That brings up the basic science of global warming. I'm not going to spend a lot of time on this because you know it well. The sun's radiation comes in the form of light waves and heats up the earth. Some of the radiation that is absorbed and warms the earth is re-radiated back into space in the form of infrared radiation. Some of the outgoing infrared radiation is trapped inside the atmosphere. That is good thing because it keeps the temperature of the

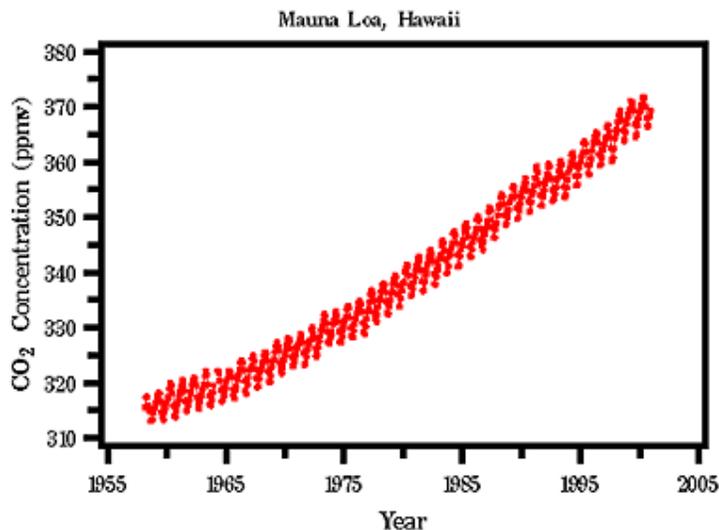
earth within certain boundaries, keeps it relatively constant and livable. But the problem is that this thin layer of atmosphere is being thickened by all of the global warming pollution that is being put up there. What that does is it thickens this layer of atmosphere. More of the outgoing infrared is trapped. So the atmosphere heats up worldwide.

Carbon Dioxide Levels

This is the image that started me in my interest in this issue. I saw it when I was a college student because I had a college professor named [Roger Revelle](#) who was the first person to have the idea to measure the amount of carbon dioxide in the earth's atmosphere. He saw where the story was going. After the first few years of data, he intuited what is meant, for what is yet to come. They designed the experiment in 1957. He hired [Charles David Keeling](#) who was very faithful and precise in making these measurements for decades. They started sending these weather balloons every day. They chose the middle of the Pacific because it was the area that was the most remote. He was a very hard nosed scientist. He really liked the hard data. It was a wonderful time for me, because, like a lot of young people, I came into contact with intellectual ferment, ideas that I'd never considered in my wildest dreams before.

He showed our class the result of these measurements after only a few years. It was startling to me. He was startled and he made it clear to our class what he felt the significance of it was. I soaked it up like a sponge. He drew the connection between the larger changes in our civilization and this pattern that was now visible in the atmosphere entire planet.

He projected into the future where this was headed unless we made some adjustments and it was as clear as day. After the first seven, eight, or nine years you can see the pattern was developing. But I had to question why does it go up and down once each year? He explained that if you look at the land mass of the earth, very little it is south of the equator. The vast majority of it is north of the equator. And most of the vegetation is north of the equator. When the northern hemisphere is [tilted toward the sun](#) as it is in our spring and summer, the leaves come out and they breathe in the carbon dioxide and the amount in the atmosphere goes down. When the northern hemisphere is tilted away from the sun as it is in our fall and winter, the leave fall down and exhale the carbon



Source: Dave Keeling and Tim Whorf (Scripps Institution of Oceanography)

dioxide and the amount in the atmosphere goes up again. It's as if the entire earth once each year breathes in and out.

He started measuring carbon dioxide in 1958. By the middle sixties when he showed my class this image, it was already clear that it was going up. I respected him and learned from him so much I followed this.

Political Journey

When I went to the Congress in the middle 1970's I helped organize the first hearings on global warming, I asked my professor to be the lead off witness. I thought that would have such a big impact we'd be well on the way to solving this problem, but it didn't work out that way. I kept having hearings, and in 1984 I went to the Senate and really dug deeply into this issue with science round tables and the like. I wrote a book about it. I ran for president in 1988 partly try to gain some visibility for this issue. In 1992 went to the Whitehouse. We passed a version [carbon tax](#) and some other measures to try to address this. I went to [Kyoto in 1997](#) to help get a [treaty](#) that is so controversial, in the US at least. In 2000 my opponent pledged to regulate the CO2 and that [was not a pledge that was kept](#). The point of this is all this time you can see what I have seen all these years. It just keeps going up. It is relentless.

Effects of Global Warming

- And now we're beginning to see the [impact in the real world](#). This is [Mount Kilimanjaro](#) more than 30 years ago, and more recently. And a friend of mine just came back from Kilimanjaro with a picture he took a couple of months ago. Another friend of mine [Lonnie Thompson](#) studies [glaciers](#). Here's Lonnie with a sliver of a once mighty glacier. Within the decade there will be [no more snows of Kilimanjaro](#).

- This is happening in [Glacier National Park](#). I climbed to the top of this in 1998 with one of my daughters. Within 15 years this will be the park formerly known as Glacier.
- Here is what has been happening year by year to the [Columbia Glacier](#). It just retreats more and more every year. And it is a shame because these glaciers are so beautiful. People who go up to see them, here is what they are seeing every day now.
- [In the Himalayas](#) there is a particular problem because more than 40% of all the people in the world get their [drinking water](#) from rivers and spring systems that are fed more than half

by the melt water coming off the glaciers. Within this next half century those 40% of the people on earth are going to face a very serious shortage because of this melting.

- o Italy, the Italian Alps same site today. An old postcard from the Switzerland: [throughout the Alps](#) we are seeing the same story.
- o It's also true in South America. This is Peru 15 years ago and the same glacier today.
- o This is [Argentina](#) 20 years ago, the same glacier today.
- o 75 years ago in Patagonia on the tip of South America, this vast expanse of ice is now gone.

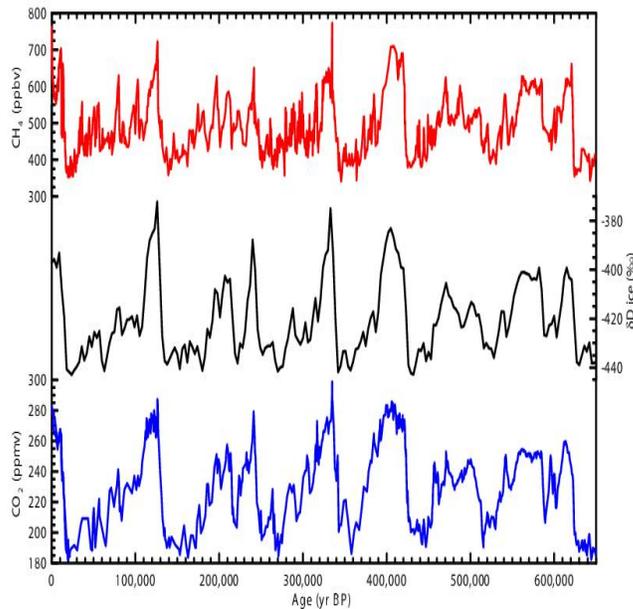
Ice Cores: The 650,000 Record

There is a message in this. It is worldwide. The ice has a [story to tell](#) and it is [worldwide](#). My friend Lonnie Thompson digs [cores in the ice](#). [They dig down](#) and they bring the core drills back up and they look at the ice and they study it. When the snow falls it traps little bubbles of atmosphere. They can go in and measure how much CO2 was in the atmosphere the year that snow fell. What's even more interesting I think is they can measure the different isotopes of oxygen and figure out the very precise thermometer and tell you what the temperature was the year that bubble was trapped in the snow as it fell.

When I was in Antarctica I saw cores like this and the guy looked at it. He said right here is where the US Congress passed the Clean Air Act. I couldn't believe it but you can see the difference with the naked eye. Just a couple of years after that law was passed, it's very clearly distinguishable.

They can count back year by year the same way a forester reads tree rings. You can see each annual layer from the melting and refreezing. They can go back in a lot of these mountain glaciers a thousand years. They constructed a thermometer of the temperature. The blue is cold and the red is warm. I show this for a couple of reasons. Number one the so called skeptics will sometimes say "Oh, this whole thing is cyclical phenomenon. There was a medieval warming period after all." Well yeah there was. There it is right there. There are one there and two others. But compared to what is going on now, there is just no comparison. So if you look at a thousand years worth of temperature and compare it to a thousand years of CO2 you can see how closely they fit together. Now, a thousand years of CO2 data in the mountain glacier. That is one thing. But in Antarctica, [they can go back 650,000 years](#). This incidentally is the first time anybody outside of a small group of scientists have seen this image. This is the present day era and that's the last ice age. Then it goes up. We're going back in time now 650,000 years. That's the period of warming between the last two ice ages back. That's the second and third ice age back.

CO2 Concentration Is Above 300 PPM



Now an important point: In all of this time, 650,000 years, the CO₂ level has never gone above 300 parts per million. Now, as I said, they can also measure temperature. Here is what the temperature has been on our earth. One thing that kind of jumps out at you is. Let me put it this way. If my class mate from the sixth grade that talked about Africa and South America might have said, "Did they ever fit together?" Most ridiculous thing I ever heard. But they did of course. The relationship is very complicated. But there is one relationship that is more

powerful than all the others and it is this. When there is more carbon dioxide, the temperature gets warmer, because it traps more heat from the sun inside. In the parts of the United States that contain the modern cities of Cleveland, Detroit, New York in the northern tier. This is the difference between a nice day and having a mile of ice above your head. Keep that in mind when you look at this fact. Carbon dioxide having never gone above 300 PPM, here is where CO₂ is now. We give off where it has never been as far back as this record will measure. If you will bear with me I would like to emphasize this point. It's already right here. Look how far above the natural cycle this is, and we've done that. But ladies and gentleman, in less than 50 years it's going to continue to go up. When some of these children who are here are my age, here's where it's going to be in less than 50 years. You've heard of off the chart. Within less than 50 years it'll be here. There's not a single fact or day or number that's been used to make this up that is in any controversy. The so-called skeptics look at this and say, "So, that looks seems perfectly okay." On the temperature side: If this much on the cold side is a mile of ice over our heads, what would that much on the warmer side be?

This is really not a political issue so much as a moral issue. If we allow that to happen, it is deeply unethical. I have such faith in our democratic system, our self-government, I actually thought and believed that the story would be compelling enough to cause a real sea change in the way Congress reacted to that. I thought they would be startled and they weren't.

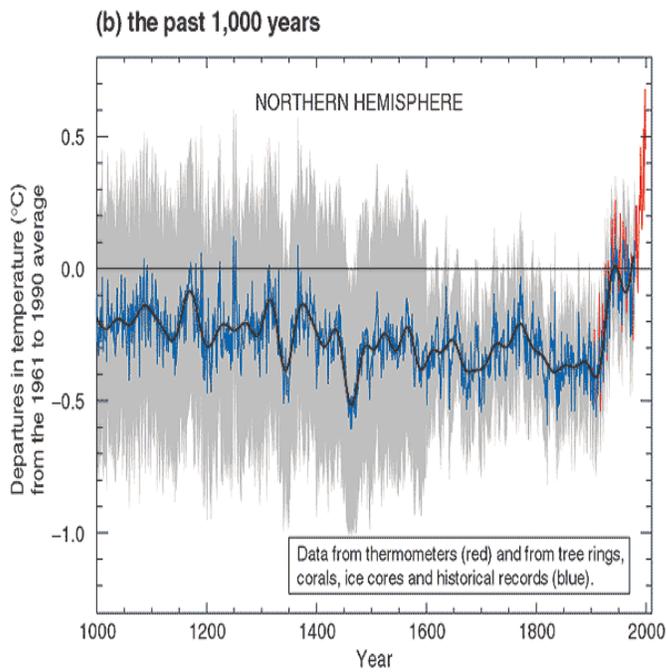
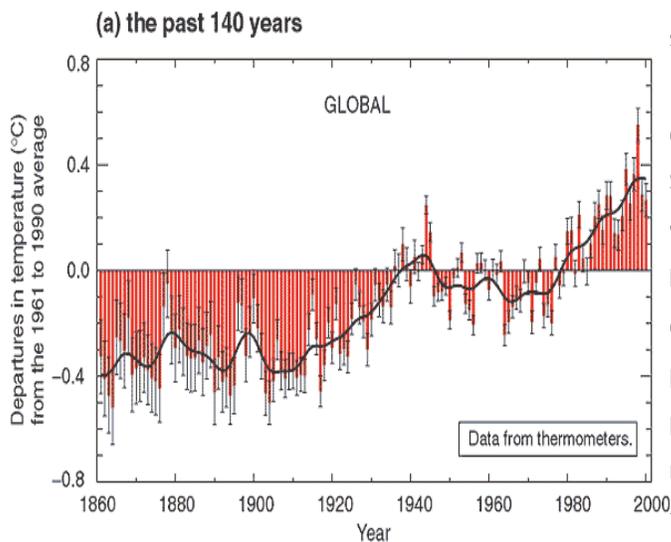
Children

The struggle, the victories that aren't really victories, the defeats that aren't really defeats can serve to magnify the significance of trivial . and exaggerate the seeming importance of massive setbacks.

It just turned my whole world around. How should I spend my time on this Earth? I really dug in, trying to learn about it much more deeply. I went to the South Pole, the North Pole, the Amazon...

The possibility of losing something that was precious to me... What we take for granted might not be here for our children. It turned my whole world upside down. It shook it until everything just fell out.

Variations of the Earth's surface temperature for:



My way of being in the world. It just changed everything for me. How should I spend my time on this earth? I really dug in, trying to learn about it much more deeply. I went to Antarctica, to the South Pole, North Pole, the Amazon. I went to places where scientists could help me understand parts of the issue I didn't really understand in depth. The possibility of losing what was most precious to me, I gained the ability that I maybe I didn't have before, but when I felt it, I felt that we really could lose. What we take for granted might not be here for our children.

The 10 Hottest Years

These are actual measurements of atmospheric temperature since our civil war. In any given year it might look like it's going down, but the overall trend is extremely clear. In recent years it is uninterrupted and it is intensifying. In

fact, if you look at the 10 hottest years ever measured in this atmospheric record, they have all occurred in the last 14 years. The hottest of all was 2005. We have already seen some of the heat waves scientists are saying are going to be a lot more common. A couple of years ago in Europe they had that massive heat wave that killed 35,000 people. India didn't get as much attention, but the same year the temperature there went to 122 degrees Fahrenheit. This past summer in the American west, there were a lot of cities that broke all time records for high temperatures and for consecutive days with 100 degree temperature or more. 200 cities and towns in the west set all time records. And in the east there were a lot of cities that did the same thing, including, incidentally, New Orleans.

It's Natural!

So the temperature increases are taking place all over the world, including in the ocean. This is the natural range of variability for temperature in the ocean. You know people say, "Aw, it just naturally go up and down, so don't worry about it." This is the range that would be expected over the last 60 years. But the scientists that specialize in global warming have computer models that long ago predicted this range of temperature increase.

Ocean Temperature and Storms

Now I'm going to show you, recently released, the actual ocean temperature. Of course when the oceans [get warmer, that causes stronger storms](#). We have seen in the last couple of years, a lot of big hurricanes. Hurricanes Jean, Francis and Ivan were among them. In the same year we had that string of big hurricanes; we also set an all time record for tornadoes in the United States. Japan again didn't get as much attention in our news media, but they set an all time record for typhoons. The previous record was seven. Here are all ten of the ones they had in 2004. The science textbooks that have to be re-written because they say it is impossible to have a hurricane in the South Atlantic. It was the same year that the first one that ever hit Brazil. The summer of 2005 is one for the books. The first one was Emily that socked into Yucatan. Then Hurricane Dennis came along and it did a lot of damage, including to the oil industry. This is the largest oil platform in the world after Dennis went through. This one was driven into the bridge at Mobile. And then of course came [Katrina](#). It is worth remembering that when it hit Florida it was a Category 1, but it killed a lot of people and caused billions of dollars worth of damage. And then, what happened? Before it hit New Orleans, it went over warmer water. As the water temperature increases, the wind velocity increases and the moisture content increases. And you'll see Hurricane Katrina form over Florida.

And then as it comes into the Gulf over warm water it becomes stronger and stronger and stronger. Look at that Hurricane's eye. And of course the consequences were so horrendous; there are no words to describe it.

Sirens, background music, Mayor Ray Nagin. The water is up to my neck. I don't think I'm going to make it.

How in god's name could that happen here? There had been warnings that hurricanes would get stronger. There were warnings that this hurricane, days before it hit, would breach the levies and cause the kind of damage that it ultimately did cause. And one question that we, as a people, need to decide is how we react when we hear warnings from the leading scientists in the world.

Winnie's Warning

There was another storm in the 1930's of a different kind, a horrible unprecedented storm in continental Europe. Winston Churchill warned the people of England that it was different from anything that had ever happened before, and they had to get ready for it. A lot of people did not want to believe it and he got real impatient with all the dithering. He said this:

"The era of procrastination, of half measures, of soothing, and baffling expedience of delays is coming to its close. In its place we are entering a period of consequences."

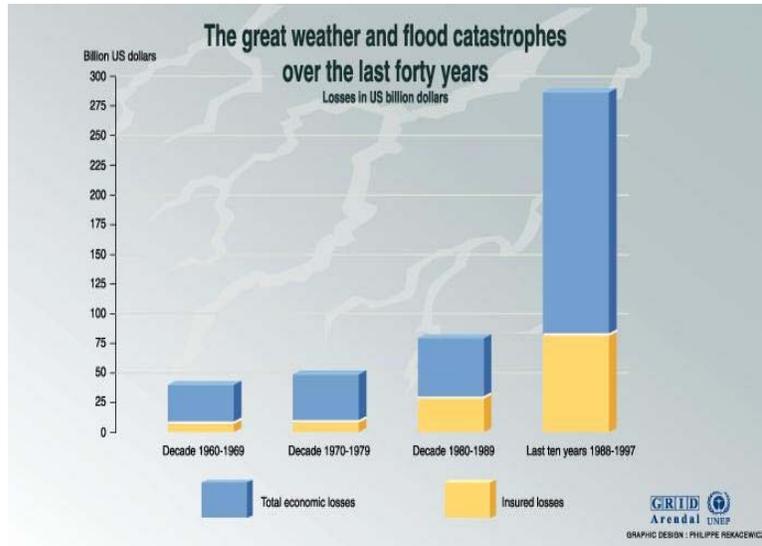
Making mistakes in generations and centuries past would have consequences that we could overcome. We don't have that luxury anymore. We didn't ask for it, but here it is.

2000 Election

Background: 2000 election debacle in Florida. We're officially saying that Florida is too close to call. Supreme Court throws the decision to Bush.

Gore: While I strongly disagree with the court's decision, I accept it. I accept the finality of this outcome. Well, that was a hard blow. But you make the best of it. It brought into clear focus, the mission that I had been pursuing for all these years. I started giving the slide show again.

Insurance



Source: Munich Re Group, 1999.

What is often unnoticed the fact that global warming causes more precipitation but more of it coming in one time big storm events because the evaporation off the ocean puts all the moisture up there when storm conditions trigger the downpour before it falls down. [The insurance industry](#) has actually noticed this. Their recovered losses are going up. See the damage from these severe

weather events. And 2005 is not even on this yet. When it does, it will be off that chart.

Effects of Global Warming

Europe has just had a year very similar to the one we've had where they say nature has just been crazy crazy, all kinds of unusual catastrophes like a major hike through the book of Revelations.

Flooding in Asia, Mumbai, India this [past July \(2005\)](#): 37 inches of rain in 24 hours, by far the largest downpour that any city in India has ever received. A lot of flooding in China also. Global warming paradoxically causes not only more flooding, [but also more droughts](#). This neighboring province right next door had a severe drought at the same time these areas were flooded. One of the reasons for this has to do with the fact that global warming not only increases precipitation world wide, but it also relocates the precipitation. Focus most of all on this part of Africa just on the edge of the Sahara. Unbelievable tragedies have been unfolding there and there are a lot reasons for it. Darfur and Niger are among those tragedies. One of the factors that has been compounding this is the lack of rainfall and the increasing drought. This is [Lake Chad](#), once one of the largest lakes in the world. It has dried up over the last few decades to almost nothing. That has been complicating the other problems that they also have. The second reason why this is a paradox: Global warming creates more evaporation of the ocean that seeds the clouds, but it also sucks moisture out of the soil. Soil evaporation increases dramatically with higher temperatures. And that has consequences for us in the United States as well.

Change and Timescales

Gore revisits the family farm. His father grew up on the farm. Learning it from your dad on the land, that is something special. Eight months in DC in a hotel apartment and the rest of the time on the farm. As a kid it took me a while to learn the difference between fun and work. The places where people live were chosen because of the climate pattern that had been pretty much the same on Earth since the end of the last ice age. Here on this farm, patterns are changing. It seems gradual in the course of a human lifetime but in the course of time as defined by this river, it's happening very, very quickly.

A Canary in the Coal Mine: The Arctic

Two canaries in the coal mine. The first one is in the Arctic. Of course the Arctic Ocean has a floating ice cap, Greenland on its side there. I say canary in the coal mine because the Arctic is one part of the world that is experiencing faster impact from global warming. This is the largest ice shelf in the Arctic, the [Ward Hunt Ice Shelf](#). It just cracked in half a year ago. The scientists were astonished.

Melting Permafrost

These are called [drunken trees](#) just going every which way. This is not caused by wind damage or alcohol consumption. These trees put their roots down in the permafrost and the permafrost is thawing, so they just go every which way now. This building was built on the permafrost and collapsed as the permafrost thawed. This woman's house has had to be abandoned. The pipeline is suffering a great deal of structural damage. Incidentally, the oil that they want to produce in that protected area in northern Alaska, which I hope they don't. They have to depend on trucks to go in and out of there and the trucks go over the frozen ground. This shows the number of days that the tundra in Alaska is frozen enough to drive on it. 35 years ago it was 225 days a year. Now it's below 75 days a year because the spring comes earlier and the fall comes later and the [temperatures just keep on going up](#).

Fastest Temperature Increase Occurs at the Arctic

I went up to the North Pole. I went under that ice cap in a nuclear submarine that surfaced through the ice like this. This thing started patrolling in 1957. They have gone under the ice and measured with their radar looking upward to measure how thick it is because they can only surface where the thickness of the ice is 3 and half feet thick or less. So they have kept a meticulous record and they

wouldn't release because it was national security. I went up there in order to persuade them to release them, and they did. And [here's what that record showed](#). Starting in 1970 there was a precipitous drop off in the amount and extent and thickness of the arctic ice cap. It has diminished by 40 percent in 40 years. There are two studies showing that in the next 50 or 70 years in summertime it will be completely gone. Now you might say, "Why is that a problem? How could the arctic ice cap actually melt so quickly?" When the sun's rays hit the ice, more than 90 percent of it bounces off right back into space like a mirror. But when it hits the open ocean more than 90 percent is absorbed. As the surrounding water gets warmer, it speeds up the melting of the ice. Right now the arctic ice cap acts like a giant mirror. All the sun's rays bounce off, more than 90 percent, to keep the earth cooler. But as it melts and the open ocean receives that sun's energy instead more than 90 percent is absorbed. So there is a faster build up of heat here at the North Pole in the Arctic Ocean and the Arctic generally than any where else on the planet. That's not good for creatures like polar bears that depend on the ice. A new scientific study shows that for the first time they're finding [polar bears that have actually drowned](#), swimming long distances up to 60 miles to find the ice. They did not find that before. What does it mean to us to look at vast expanse of open water at the top of our world that used to be covered by ice? We ought to care a lot because it has planetary effects.

Earth's Climate is an Engine

The earth climate is like a big engine for redistributing heat from the equator to the poles. It does that by means of ocean current and wind current. They tell us, the scientists do, that the earth climate is a non-linear system. It's a fancy way they have of saying that the changes are not all just gradual. Some of them come suddenly in big jumps. On a world wide basis the annual average temperature is about 58 degrees Fahrenheit. If we have an increase of 5 degrees, which is on the low end of the projection, look at how that translates globally. That means an increase of only 1 degree at the equator but more than 12 degrees at the poles. So all those wind and ocean current patterns that have formed since the last ice age and have been relatively stable, they are all up in

Ocean Circulation Conveyor Belt



The ocean plays a major role in the distribution of the planet's heat through deep sea circulation. This simplified illustration shows this "conveyor belt" circulation which is driven by differences in heat and salinity. Records of past climate suggest that there is some chance that this circulation could be altered by the changes projected in many climate models, with impacts to climate throughout lands bordering the North Atlantic.

the air and they change.

One of the ones they are

most worried about where they have spent a lot of time studying the problem is the North Atlantic where the Gulf Stream comes up and meets the cold wind coming off the arctic over Greenland and evaporates the heat out of the Gulf Stream and the stream is carried over to western Europe by the prevailing winds and the Earth's rotation. Isn't it interesting that the whole ocean current system is all linked together in this loop. They call it the [ocean conveyor](#). The red are the warm surface current, the Gulf Stream is the best known of them. The blue represents the cold currents running in the opposite direction. We don't see them at all because they run along the bottom of the ocean. Up in the North Atlantic, after that heat is pulled out, what's left behind is colder water and saltier water, because salt doesn't go anywhere. That makes it denser and heavier. That cold, dense heavy water sinks at a rate of 5 billion gallons per second. That pulls that current back south.

[Disruption of the Ocean Conveyor](#)

At the end of the last ice age as the Vlad glacier was receding from North America, the ice melted and a giant pool of fresh water formed in North America. The Great Lakes are the remnants of that huge lake. An ice dam on the eastern border formed, and one day it broke. All that fresh water came rushing out, ripping open the St. Lawrence, there. It diluted the salty dense cold water, made it fresher and lighter so it stopped sinking. And that pump shut off and the heat transfer stopped, and Europe went back into an ice age for another 900 or 1000 years. The change from conditions we have here today to an ice age took place in perhaps as little as 10 years time. That is a sudden jump. Of course that's not going to happen again, because the glaciers of North America are not there. Is there any big chunk of ice anywhere near there? Oh yeah, (pointing at Greenland). We'll come back to that one.

[Politics: Reagan, Bush1 and Kyoto](#)

It is extremely frustrating to me to communicate . and we are still by far the worst contributor to the crisis. I look around and look for really meaningful signs that we are about to really change. I don't see it right now.

Reagan: Very reputable scientists have said that one factor of air pollution is oxides of nitrogen from decaying vegetation. This is what causes the haze that gave the Big Smokey Mountains their name.

Bush I: This guy is so far off on the environmental extremes, we'll be up to our neck in owls and out of work for every American. This guy's crazy!

This is perhaps the greatest hoax that has ever been perpetuated on the American People. If it is not on the tips of their constituents tongues, it's easy for them to ignore it. They say, "Well, let's deal with that tomorrow."

Predator/Prey Disruptions and Misplaced Cities

So this same phenomenon of changing all these patterns is also changing the seasons. Here is a study from the Netherlands. The peak arrival date for migratory birds 25 years ago was April 25. Their chicks hatched on June 3, just at the time when the caterpillars were coming out: Nature's plan. But 20 years of warming later the caterpillars peaked two weeks earlier. The chicks tried to catch up with it, but they couldn't. So they are in trouble. There are millions of ecological niches that are affected by global warming in just this way. This is the number of days with frost in southern Switzerland over the last one hundred years. It has gone down rapidly. But now watch this. This is the number of new exotic species that have rushed in to fill the new ecological niches that are opening up. That's happening here in the United States too. You've heard of the [pine beetle problem](#)? Those pine beetles used to be killed by the cold winter, but there are fewer days of frost. So the pine trees are being devastated. This is part of the 14 million acres of spruce trees in Alaska that have been killed by bark beetles, the exact same phenomenon. There cities that were founded because they were just above the mosquito line. Nairobi is one. Harare is another. There are plenty of others. Now the mosquitoes with warming are climbing to higher altitudes.

Infectious Disease

There are a lot of vectors for infectious diseases that are worrisome to us that are also expanding their range, not only mosquitoes but all these others as well. We've had 30 so-called new diseases that have emerged in just the last quarter century. A lot of them like SARS have caused tremendous problems. The resistant forms of tuberculosis. There has been a re-emergence of some diseases that were once under control. The Avian flu, of course is quite a serious matter, as you know. West Nile Virus came to the eastern shore of Maryland in 1999. Two years later it was across the Mississippi. And two years after that it had spread across the continent. These are very troubling times.

Coral Reefs

Coral reefs all over the world because of global warming and other factors are bleaching and they end up like this. All the fish species that depend on the coral reef are also in jeopardy as a result. Overall species loss is now occurring at a rate 1000 times greater than the natural background rate.

The Second Canary: Antarctic Peninsula Sea Ice

This brings me to the second canary in the coal mine, Antarctica, the largest mass of ice on the planet by far. A friend of mine said in 1978, "If you see the break up of ice shelves along the [Antarctic Peninsula](#), watch out, because that should be seen as an alarm bell for global warming. If you look at the peninsula up close, every place where you see one of these green blotches is an ice shelf larger than the state of Rhode Island that has broken up in just the last 15 to 20 years. I want to focus on just one of them called Larsen B. I want you to look at these black pools here. It makes it seem almost as if we are looking through the ice to the ocean beneath. But that's an illusion. This is melting water that forms this pool. If you were flying over it in a helicopter, you'd see it 700 feet tall. They are so majestic, so massive. In the distance are the mountains, and just before the mountains is the shelf of the continent. This is floating ice, and there is land based ice on the down-slope of those mountains. From here to the mountains is about 20 to 25 miles. They thought this would be stable for about a hundred years, even with global warming. The scientists who study these ice shelves were absolutely astonished when they were looking at these images. Starting in January 31, 2002, in a period of 35 days, this ice shelf completely disappeared. They could not figure out how in the world this happened so rapidly. They went back to figure out where they had gone wrong. That's when they focused on those pools of melting water. Even before they could figure out what had happened there, something else started going wrong. [When the floating sea-based ice cracked up, it no longer held back the ice on the land.](#) The land-based ice then started falling into the ocean. It was like letting the cork out of a bottle. There's a difference between floating ice and land-based ice. It's like the difference between an ice cube floating in a glass of water, which when it melts doesn't raise the level of water in the glass, and a cube sitting atop a stack of ice cubes, which melts and flows over the edge. That's why the citizens of these Pacific nations had all had to evacuate to New Zealand.

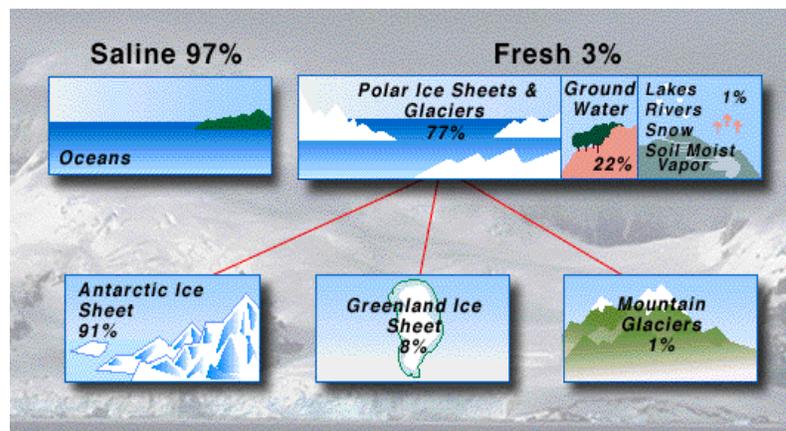
West Antarctica Land Based Ice

I want to focus on West Antarctica, because it illustrates two factors about land-based ice and sea-based ice. It's a little of both. It's propped on tops of islands, but the ocean comes up underneath it. So if the ocean gets warmer, it has an impact on it. If this were to go, sea levels worldwide

would go up 20 feet. They've measured disturbing changes on the underside of this ice sheet. It's considered relatively more stable, however, than another big body of ice that is roughly the same size. Greenland

Impact of 20 Foot Rise in Sea Level

In 1992 they measured this amount of melting in Greenland. 10 years later this is what happened.



And here is the melting from 2005. Tony Blair's scientific advisor has said that because of what is happening in Greenland right now, the map of the world will have to be redrawn. If Greenland broke up and melted, or if half of Greenland and half of West Antarctica broke up and

melted, this is what would happen to the sea level in Florida. This is what would happen in the San Francisco Bay. A lot of people live in these areas. The Netherlands, the low-countries: absolutely devastating. The area around Beijing is home to tens of millions of people. Even worse, in the area around Shanghai, there are 40 million people. Worse still, Calcutta and, to the East Bangladesh the area covered includes 50 million people. Think of the impact of a couple hundred thousand refugees when they are displaced by an environmental event and then imagine the impact of a hundred million or more. Here is Manhattan. This is the World Trade Center Memorial Site. After the horrible events of 9/11 we said never again. But this is what would happen to Manhattan. They can measure this precisely, just as the scientists could predict precisely how much water would breach the levy in New Orleans. The area where the World Trade Center Memorial is to be located would be under water. Is it possible that we should prepare against other threats besides terrorists? Maybe we should be concerned about [other problems](#) as well.

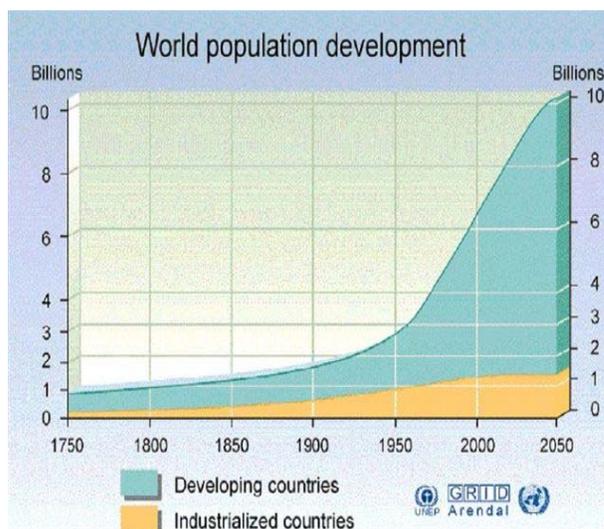
Civilization and Earth

This issue is the same for China as it is for the US.

Separating the truth from the fiction and the accurate connection from the misunderstanding is part of what you learn here. When the warnings are accurate and based on sound science, then we as human beings, whatever country we live in, have to find a way to make sure that the warnings are heard and responded to.

We both have a hard time shaking loose the familiar patterns that we relied on in the past. We both faced completely unacceptable consequences.

We are witnessing a collision between our civilization and the Earth. There are three factors that are causing this collision.

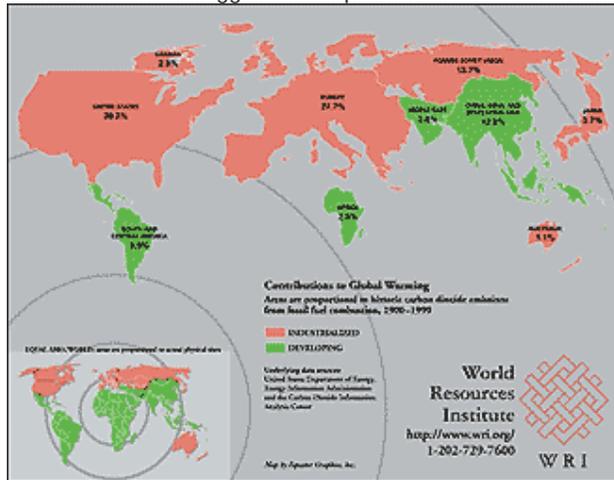


Population - when the baby boom generation was born after WW II the population had just crossed the 2 billion mark. I'm in my 50s and it's already gone to 6 billion. If I reach the demographic expectation for the baby boomers, it will go over 9 billion. If it takes 10,000 generations to reach 2 billion and then, in one human lifetime, ours, it goes from 2 billion to 9 billion, something profoundly different is going on right now. We're putting more

pressure on the Earth. Most of it's in the poorer nations of the world. It puts pressure on food demand. It puts pressure on water demand. It puts pressure on vulnerable natural resources, and this pressure is one of the reasons we have seen such devastation of the forest, not only tropical but elsewhere. It is a political issue. This is the border between Haiti and the Dominican Republic. One set of policies here. Another set of policies here. Much of it comes not only from cutting, but also burning. Almost 30% of the CO2 that goes up into the atmosphere each year is from forest burning. This is a time-lapse picture of the Earth at night over a six month period showing the lights of the cities in white and the burning forests and brush fires in red. The yellow areas are the gas flares like these in Siberia.

2. The scientific and technological revolution is a great blessing in that it has given us tremendous benefit in medicine and communication. But this new power that we have also brings a responsibility to think about its consequences. Here's a formula to think about. Old habits plus old technology have predictable consequences. Old habits plus new technology can have dramatically altered consequences. Warfare with spears and bows and arrows and rifles and machine guns, that's one thing. But then a new technology came. (Atomic bomb blast. We have to think

differently about war because the new technologies so completely transformed the consequences of that old habit that we can't just mindlessly continue the patterns of the past. In the same way we have always exploited the Earth for sustenance. For most of our existence we used relatively simple tools: the plow, the tractor. But even tools like shovels are different now. A shovel used to be like this. Shovels have gotten bigger and every year they get more powerful. Our ability to have an effect on the surface of the Earth is utterly transformed. You can say the same thing about irrigation which is a great thing, but when we divert rivers without considering the consequences, sometimes the rivers never reach the sea. There were two rivers in central Asia that were used by the former Soviet Union that were used for irrigating cotton fields unwisely. The Aral Sea was fed by them used to be the fourth largest inland sea in the world. When I went there I saw this strange sight of an enormous fishing fleet resting in the sand. This is the canal that the fishing industry desperately tried to build to get to the receding shoreline. Making mistakes in our dealings with nature can have bigger consequences now because our technologies are often bigger than the



human scale. When you put them all together they made us a force of nature. This is also a political issue. This is a computer map of the world that purports to show the relative contribution to global warming. In our country we are responsible for more than all of South America, all of Africa, all of the Middle East, all of Asia all combined. The per capita average in Africa, India, China, Japan, EU, Russia, here's where we are way, way above everyone else. If you

take population into account it's a little bit different. China's playing a bigger role, so is Europe, but we are still by all odds the largest contributor. And so it is up to us to look at how we think about.

3. The way we think about it is the third and final factor that transforms our relationship to the Earth. If a frog jumps into a pot of boiling water, it jumps right out again, because it senses the danger. But the very same frog if it jumps into a pot of luke warm water that is slowly brought to a boil, will just sit there and it won't move. It will just sit there even as the temperature continues to go up and up. It will stay there until.. until.. it is rescued. It is important to rescue the frog. The point is this: Our collective nervous system is like that frog's nervous system. It takes a sudden jolt sometimes before we become aware of a danger. If it seems gradual, even it is really adapting quickly, we are capable of just sitting there and not reacting.

The Tobacco Industry

I don't remember a time when I was a kid when summertime didn't mean working with tobacco. I used to love it. It was during that period when working with the guys on the farm seemed like fun to me. Starting in 1964 with the Surgeon General's report, the evidence was laid out on the connection between smoking cigarettes and lung cancer. We kept growing tobacco.

Nancy was almost 10 years older than me, and there were only two of us. She was my protector and my friend at the same time. She started smoking when she was a teenager and never stopped. She died of lung cancer. That's one of the ways you don't want to die. The idea that we had been part of that economic pattern that produced the cigarettes that produced the cancer, it was so painful at so many levels. My father, he had grown tobacco all his life. He stopped it. Whatever explanation that seemed to make sense in the past, just didn't cut it anymore. He stopped it. It's just human nature to take time to connect the dots. I know that. But I also know that there can be a day of reckoning when you wished you had connected the dots more quickly.

Three Misconceptions

1. Isn't there a disagreement among scientists about whether the problem is real or not? Actually, not really. There was a massive study of every scientific article in a peer reviewed article written on global warming in the last ten years. They took a big sample of 10 percent, 928 articles. And you know the number of those that disagreed with the scientific consensus that we're causing global warming and that is a serious problem out of the 928: Zero. The misconception that there is disagreement about the science has been deliberately created by a relatively small number of people. One of their internal memos leaked and here is what it said according to the press. Their objective is to reposition global warming as a theory rather than fact. This has happened before. after the Surgeon General's report. One of their memos leaked 4 years ago. They said, "Doubt is our product, since it is the best means of creating a controversy in the public's mind." But have they succeeded? You'll remember that there were 928 peer reviewed articles. Zero percent disagreed with the consensus. There was another study of all the articles in the popular press. Over the last fourteen years they listed a sample of 636. More than half of them said, "Well, we are not sure. It could be a problem, may not be a problem." So no wonder people are confused. Hey! What did you find out? Working for who? .Scientists have an independent obligation to respect and present the truth as they see it. "Why do you directly contradict yourself in the testimony you're giving about this scientific question?" "That last paragraph in that section was not a paragraph which I wrote. That was added to my testimony." "If they force you to change a scientific conclusion it is a form of scientific fraud by them." "I've seen scientists who were persecuted, ridiculed, deprived of

jobs, income simply because the facts they discovered led them to an inconvenient truth that they insisted on telling." "He worked for the American Petroleum Institute and in January of 2001 he was put by the president in charge of environmental policy. He received a memo from the EPA that warned about global warming. He had no scientific training whatsoever, but he took it upon himself to overrule the scientists. I want to know what this guy's handwriting looks like. This is the memo from the EPA. These are his actual pen strokes. He said, "No, you can't say this. This is just speculation." This was embarrassing to the Whitehouse. So this fellow resigned a few days later. The day after he resigned he went to work for Exxon-Mobil. You know more than a hundred years ago, Upton Sinclair wrote this: "You can't make somebody understand something if their salary depends upon them not understanding it."

2. The second misconception: Do we have to choose between the economy and the environment? This is a big one. A lot of people say we do. I was trying to convince the first Bush administration to go to the Earth Summit. They organized a big Whitehouse conference to say, "We're on top of this." One of these viewgraphs caught my attention and I want to talk about it for a minute. Here is the choice we have to make according to this group. We have here a scale that balances two different things. On one side, we have gold bars. Mmmmm. Don't they look good! I'd just like to have some of those gold bars. On the other side of the scale we have. The Entire Planet! Hmm? I think this is a false choice for two reasons. Number one, if we don't have a planet. The other reason is that if we do the right thing, then we are going to create a lot of wealth and we are going to create a lot of jobs, because doing the right thing moves us forward. I've probably given this slide show a thousand times. I've tried to identify all those things in people's minds that serve as obstacles to them understanding this. Whenever I feel like I've identified an obstacle, I try to take it apart, roll it away, remove it, blow it up. I set myself a goal: communicate this real clearly. The only way I know to do it is city by city, person by person, family by family. And I have faith that pretty soon enough minds are changed that we cross a threshold. Let me give you an example of the wrong way to balance the economy and the environment. One part of this issue involves automobiles. Japan has mileage standards up here. Europe plans to pass Japan. Our allies in Australia and Canada are leaving us behind. Here's where we are. There is a reason for it. They say that we can't protect the environment too much without threatening the economy and threatening the auto makers, because auto makers in China might come in and just steal all our market. Well, here is where China's auto mileage standards are now. We can't sell our cars in China today because we don't meet China's mileage standard. California has taken some initiative to have higher mileage cars sold in California. The auto companies have sued California to prevent this law from taking effect because as they point out, eleven years from now this would mean California would have to have cars for sale that are as efficient eleven years from now as China's are today: clearly too onerous a provision to comply with. Is this helping our companies to succeed?

Actually, if you look at who's doing well in the world it's the companies that are building more efficient cars. Our companies are in deep trouble.

3. Final misconception: If we accept that this problem is real, maybe it is just too big to do anything about. There are a lot of people who go straight from denial to despair without pausing on the intermediate step of actually doing something about the problem. That's what I would like to finish with: the fact that we already know everything we need to know to effectively address this problem. We've got to do a lot of things, not just one. Increasing end use efficiency we can remove global warming pollution that would otherwise be put into the atmosphere.

- o More efficient electrical appliances
- o Higher mileage cars
- o Other transport efficiency
- o Renewable technology
- o Carbon capture sequestration

They all add up and pretty soon we are below our 1970 emission. We have everything we need, save perhaps political will. In America, political will is a renewable resource. We have the ability to do this. Each one of us is a cause of global warming, but each of us can make choices to change that with the things we buy, with the electricity we use, the cars we drive. We can make choices to bring our individual carbon emissions to zero. The solutions are in our hands. We just have to have the determination to make them happen.

States and Cities

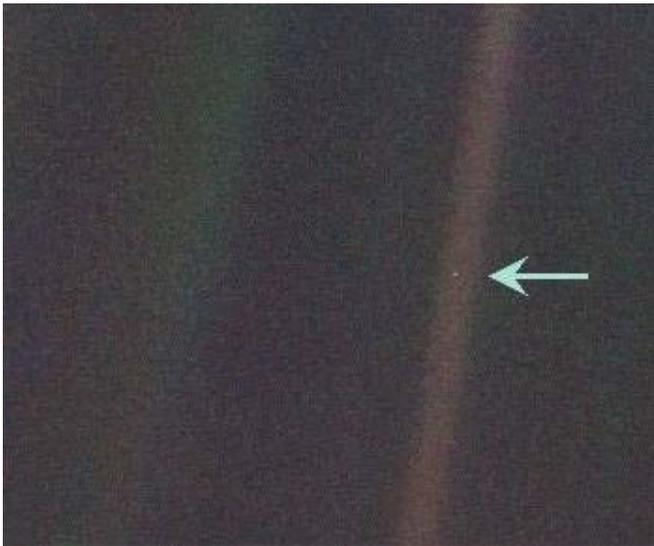
Are we going to be left behind as the rest of the world moves forward? [All of these nations have ratified Kyoto](#). There are only two advanced nations in the world that have not ratified Kyoto and we are one of them. The other is Australia. Luckily several states are taking the initiative. The nine northeastern states have banded together on reducing CO2. California and Oregon are taking the initiative. Pennsylvania is exercising leadership on solar power and wind power. US cities are stepping up to the plate. One after the other, we have seen all these cities pledge to take on global warming.

Rising to the Occasion

What about the rest of us? Ultimately this question comes down to this: Are we as Americans capable of doing great things even though they are difficult? Are we capable of rising above

ourselves and above history? The record indicates that we do have that capacity. We formed a nation. We fought a revolution and brought something new to this Earth, a free nation guaranteeing individual liberty. America made a moral decision that slavery was wrong and that we could not be half free and half slave. We as Americans decided that of course women should have the right vote. We defeated totalitarianism and won a war in the Pacific and the Atlantic simultaneously. We desegregated our schools and cured some diseases like polio. We landed on the moon, the very example of what's possible when we are at our best. We worked together in a completely bipartisan way to bring down communism. We have even solved a global environmental crisis before, the hole in the stratospheric ozone layer. This was said to be an impossible problem to solve because it's a global environmental challenge requiring cooperation from every nation in the world. But we took it on, and the United States took the lead in phasing out the chemicals that caused that problem. So now we have to use our political processes in our democracy and then decide to act together to solve those problems. But we have to have a different perspective on this one. It is different than any problem we have faced before.

Our Only Home



You remember that home movie of the earth spinning in space. One of those spacecraft continuing on out into the universe, when it got 4 billion miles out in space, Carl Sagan said, "Let's take another picture of the earth." See that pale blue dot. That's us. Everything that has ever happened in all of human history has happened on that pixel. All the triumphs and all the tragedies, all the wars, all the famines, all the major

advances: it's our only home. And that is what is at stake: our ability to live on planet Earth, to have a future as a civilization.

I believe this is a moral issue. It is your time to see this issue. It is our time to rise again to procure our future.

There's nothing that unusual about what I'm doing. What is unusual is that I had the privilege to be shown it as a young man. It is almost as if a window was opened through which the future was very clearly visible. See that? That is the future in which you are going to live your life.

Future generations may well have occasion to ask themselves. "What were our parents thinking? Why didn't they wake up when they had a chance?"

We have to hear that question from them, now.