Overheated

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Greg Dalton: Welcome to Climate One, a conversation about America's energy, economy and environment. To understand any of them, you have to understand them all. I'm Greg Dalton.

Today, we're looking at the human cost of climate disruption. Many people think of polar bears or melting glaciers at the mention of carbon pollution released by burning fossil fuels. The connection to human health doesn't get as much attention as environmental concerns, but it should. Rising temperatures in the seas will also increase risk of well being of people in the United States, and even more so in developing countries. Many of those risks are connected to severe weather events that will deliver a one-two punch of too much water or not enough water.

Over the next hour, we'll discuss keeping people and communities healthy in a world with a crazy climate. We will include questions from our live audience at the Commonwealth Club meeting today in Lafayette. Our two guests are a doctor and a lawyer. Andrew Guzman is a professor at UC Berkeley Law School and author of *Overheated: The Human Cost of Climate Change*. And Richard Joseph Jackson is a pediatrician and professor at the UCLA School of Public Health." He's a former director of environmental health at the Centers for Disease Control and Prevention in Atlanta. Please welcome them to Climate One.

[Applause]

Greg Dalton: Thank you both for coming. Andrew Guzman, tell us briefly how a law professor came to write a book about the human impacts of climate disruption.

Andrew Guzman: Right. Climate change is thought to be a scientific topic, at least most of us, which certainly it is. But the reason we care about climate change, at least most of us, isn't because of the physical changes it's going to have in the world, it's because it's going to affect us.

And so I felt, one, that wasn't clear enough in forms that were accessible to people, but also the things that law professors and economists study, I'm an economist as well, are human institutions, how society reacts to challenges, how people are affected by changing situations. So that's obviously, all part of climate change. And so the book is an attempt to bridge the gap between what the scientists and others tell us are going to happen to the physical world and then take that information and move it to explain what's going to happen to human beings in the hopes that this will motivate people to act, to become political agents to support change.

Greg Dalton: And Richard Jackson, what do you say to people who say, "Well, climate change? That's an environmental concern. It's about butterflies and polar bears." How do you respond to someone who says – frame it as a health issue?

Richard Joseph Jackson: I and my family lived in Lafayette until 1994. I was offered a job as the director of the National Center for Environmental Health at CDC. It's a big job. We worried about everything, from very tiny like molecules and atoms and viruses all the way up to very large issues. And I did that for about ten years. And over time, this issue of the planet's changing – one of my friends used to say, "The mosquitoes in the backyard are now these different kinds of mosquitoes that carry malaria and dengue." This is in Atlanta. And we've seen, the growth zones move up about

150 miles, 200 miles just in my child's lifetime.

And so when I left CDC and came back to California and was teaching at Berkeley, I decided I'd do full immersion into the issue of climate and health. I thought I could knock it off in six months, and I bet Andrew would agree. It took me several years to begin to master the size of this literature. I'm going to assert that climate change will be the biggest health issue of my grandchild's lifetime and my great grandchildren's lifetime.

And I will assert that we will be looking at somewhere in the range of a half a billion lives being affected profoundly by the impacts of climate change.

Greg Dalton: And how about today? Are people being affected today because it's often framed as a legacy issue? The President did it recently when he talked about climate change, children and grandchildren. But we know from Hurricane Sandy and other events, and rising temperatures all over that it's here today. Are there health impacts today?

Richard Joseph Jackson: I moved to Atlanta in '94. And in '95 we got a call from the coroner of Chicago and he said, "We're ordering more freezer trucks. We cannot take care of all the bodies they're bringing in." And over time, about 500 people died from the huge heat stress, the heat wave in Chicago. Mainly people that were already kind of frail, either very young, very old, maybe mentally challenged, physically challenged. The buildings were wrong for that kind of weather. Black top buildings, it just baked in the sun. And people were anxious about their environment. The windows were nailed shut.

In 2004 we saw 70,000 people in Europe died from huge heat wave. And California itself, we had a bigger heat wave. If you remember, I think it was in 2005-2006 where it's hitting 115 out here. And you can't work in those kinds of temperatures. You are at risk, particularly if you have an environment where you can't get air-conditioning.

Greg Dalton: So it's here now. Who's most at risk for these types of impacts?

Richard Joseph Jackson: Well, I think it is – if you've got money in your pocket, you got an air-conditioner, you don't have a brownout, you don't have to do hard labor on a hot day, you're not going to have the risk as someone who's less educated. We always have a couple of deaths in farm workers every year in California, at least in the past. It's very hard to be out there bent over, picking strawberries in 105, 110-degree heat.

Greg Dalton: Andrew Guzman, let's look a little bit at the history. You write in your book about some incidences of disease and collapse, et cetera. The first one I'd like to talk about is you write about the Khmer Kingdom and sort of 30-year droughts. So let's talk about that story.

Andrew Guzman: Sure. So this is a kingdom that flourished for hundreds of years in what is now Cambodia, and then quite quickly collapsed. And as far as anybody can tell, at least the reports as scholars and others have investigated, an important triggering event seemed to be climate change. And they had a very sophisticated irrigation system that seems to have failed them, which created internal tensions because people who didn't have water then were unhappy, and there was internal unrest, and there was less food which weakened the state, and eventually the Khmer Kingdom was overrun by one of its neighboring kingdoms. And that was the end. And that was a kingdom that was around for 600 years that seemed to have gone from near the height of its power to gone in a century as this climatic event overtook them.

Greg Dalton: And that was not a human-caused climatic event. That's part of a natural –

Andrew Guzman: Right.

Greg Dalton: – variation but it's an example of how droughts can –

Andrew Guzman: Exactly.

Greg Dalton: – lead to the decline of civilizations. Richard Jackson, anything to add to that?

Richard Joseph Jackson: You know, I talk a lot about if it gets hot; we're going to be in danger. If we have more mosquitoes that carry malaria and dengue, we're going to be in more danger. But in many ways, I think the social disruption that Andrew has just reflected on, when suddenly a million or ten million people have lost their fresh water, have lost their food supplies, have lost the political stability of where they're living and begin to have to move either in their own country or to another country to stay alive. I think in my grandchild's lifetime, they're going to see a great deal of this.

Andrew Guzman: I don't think there's any doubt about that.

Greg Dalton: Let's talk about Darfur because that may be an example of where, actually, a drought did lead to a climate war.

Andrew Guzman: Right. [Crosstalk] Let me say first that the specific categories in which things fall don't matter a whole lot. But if you're struck by a bullet that has a bad effect on your health, and so when you think about health affects, all of that ends up getting included. And Darfur is arguably a climate change conflict in the sense that nomads and farmers were coexisting moderately well, not without tension but moderately well for many years, where the farmers would allow the nomads and their herds to use their wells because there was enough water. And then drought comes along for a period of time, and farmers do what anybody would do in that situation. They had wells on their land and they fenced them off and they didn't let the nomads use them. So then the nomads had a problem. The nomads wanted to use the water and you get a conflict that then escalates into the conflict that we all learned about as Darfur, that we learned about in the region with all of the other horrible consequences including genocide.

That's how these conflicts are likely to come about. Climate change is not going to create brand new conflicts; it’s going to take existing situations that are tense, but hopefully manageable, think Israel and its neighbors, think India and Pakistan, think lots of other places like that around world, and it’s going to make them much more dangerous. It's like putting a vise on existing crisis. There's no guarantee it will flame up but it makes it more likely.

Greg Dalton: And one thing that you talked about in your book which was interesting, obviously, Syria, Turkey, Iraq and the news a lot lately, there's actually some water tensions going on there underneath that may be contributing to some of the tensions there. Let's talk about that.

Andrew Guzman: Yes. So Turkey is engaged in a large water project, which is intended to do sensible things along, it's southern boarder, basically provide water and better conditions for millions of people in Turkey. But the countries south of Turkey received enormous share of their total water supply from the Tigris and Euphrates Rivers that come out of Turley. It knows – so that's already a stressor, right? The developments in Turkey are going to use up more water so there'd be less for the south.

Then layer climate change on that and suddenly it's not as fixed amount of water that has to be shared. It's a diminishing amount of usable water that has to be shared combined with Turkey doing something to hold up the water. And it's not hard to see how there's a conflict because if you're in Iraq, it's really important that you get more water from Turkey.

Greg Dalton: If you're just joining us, we're talking about climate change with Andrew Guzman, Professor at UC Berkeley Law School, and Richard Joseph Jackson, Professor at the UCLA School of Public Health. I'm Greg Dalton.

Let's talk about one more historic incidence. Andrew Guzman, you write about the Spanish flu which killed between 40 and 70 million people during the great World War I, and then we'll pivot to how those sorts of things may happen in a climate disrupted world.

Andrew Guzman: Sure. So the flu obviously emerges the way flues emerge which is always a little bit mysterious but a virus becomes capable of passing from human to human and is lethal. But what World War I did for the flu was it created a set of situations that made I easy. So it gathered very large numbers of mostly men and boys in military camps, it gathered large populations in cities that its people came from the country to the city to work in the war time industries.

And so large sets of people in less sanitary conditions than before, mixing immunities, and the flu was able to travel quickly in those populations. And then you take those same people and you move them around because when the soldiers leave the military camps where they're trained, obviously, they get on boats to go over to Europe, they go to camps in the U.S. They're in constant movement. And so out of a flu that has thought to have started in Kansas, we get the Spanish flu which travels all over the world and ends up killing two to three percent of the world's population.

You can't really reverse engineer whether it would have happened absent the war but the likelihood of containing it would have been higher. And then the question is – the relevance of that to climate change is as people get displaced from their homes, where are they going to go?

Were they going to go into cities and maybe they're going to go into refugee camps, replicating that reality where you have large numbers of people, poor sanitary conditions, different immunities and constant movement.

So it's not going to make a virus spring up, it's not going to cause a virus to leak from an animal species to humans, but if such a virus comes along, as it happens from time to tine, we will have all the sort of dry straw and kindling ready for the flame to erupt, and then that virus will be able to spread much more quickly and more effectively than it would absent climate change.

Richard Joseph Jackson: I want to reflect quickly on what Andrew just said. I worked in India-Bangladesh border on smallpox eradication in the 1970's. And people saw the conflict on that border as a religious conflict, Hindu and Muslim. But in truth, it really was about resources. And it is very fragile with the Brahmaputra River depending on the Himalayan Glaciers, the Ganges depending on them as well. When that begins to change with the rising sea level in the Bay of Bengal, it may be called a religious conflict but it's really going to be exactly what you're talking about; it's going to be about climate and energy and water.

Greg Dalton: And those Himalayan Glaciers, the water towers of Asia, are dwindling.

Richard Joseph Jackson: As are the glaciers in America. The Sierra snowpack isn't getting any bigger. It's getting smaller, and that's where we get a lot of water.

Greg Dalton: We'll come back to California impacts in the Sierra. First, I want to ask about the avian flu, the swine flu, avian flu. We've seen a couple of these recently. I don't know if they rise to the level of epidemics or pandemics. But in the case of the avian flu, decisive government action by the government of Hong Kong to slaughter fowl quickly probably stopped that from getting really bad.

So Richard Jackson, are we better prepared these days than in the case of the Spanish flu or the case of the Khmer where they didn't have technology? Or is the international health system ready to deal with climate-heightened pandemics?

Richard Joseph Jackson: Our surveillance system detects stuff going on as much, much better. The ability to analyze a virus and see what type it is far better. The information moves around the world. I would say some of the obstacles have really been political. The countries that are remaining with polio, Nigeria, Pakistan, are the ones that have the most civil unrest and the most difficult places for people to work.

So I think the labs are better, the analytic abilities are better; we'll probably have better antivirals. But we better have better methods because people are going into environments where you're exposed to animal; we call them zoonoses, animal infections of various kinds. They spread readily. I think the other issue with this is the governments have really got to cooperate worldwide; the labs have to be cooperating worldwide. I think it's much better but it's – people are moving around so fast, it's very difficult.

My students went to see the movie *Contagion*, they said, "Oh, Dr. J., is that how you imagine it would be?" I said, "Oh, no. I imagine it would be much worse."

Greg Dalton: Worse than Hollywood doomsday movies. Okay. I thought you are here for a nice evening in Lafayette today, and boost you up. So water impacts, too much water, too little water. Let's talk about waterborne diseases and how that may impact public health either after disaster. Dr. Jackson.

Richard Joseph Jackson: Does anyone know what the leading cause of death in California was in the year 1900? It was malaria. There's a malaria cemetery up in Sacramento. And the central valley of California was loaded with malaria and lakes and swamps. Basically, engineering helped this go away in the construction of the Delta and many other things.

By the way, one of the earliest public health programs in California, the Vector Control Program – and there's a couple of pennies on every one of your tax bills because they are kept sacred and protected.

And you want to be out killing the mosquito larvae in February and March, that's when you control it. Spraying chemicals in the environment in August and September is worthless. So the prevention programs have been put in place.

On the other hand, we're seeing new, not really new, but species of mosquitoes that we call vectors that are pretty good at carrying malaria, dengue, West Nile virus are moving farther and farther north. So the insect vectors are changing over time. Could we be facing this? Yes. I think, again, with many of these people that are already fragile are going to be at greater risk.

Greg Dalton: And how about someone who lives in Lafayette or Piedmont or Mill Valley who thinks

"Well, I'm not by the water. I have a comfortable lifestyle. Maybe I'll be insulated from these climate impacts," is that true or folly?

Richard Joseph Jackson: It's somewhat true. I'd rather be there in Africa, in Sub-Saharan Africa. So what are you going to get? You're going to get a water shortage in California when as the Sierra snowpack disappears. That's 35 percent of our water. You're going to see food prices spike because half of the world's population lives in the water base in the Mountain Glaciers, all of which are going away.

So food prices will spike which if you are wealthy, is higher prices. If you're middle class in a global sense, you have a real hard choice. You've got to decide how our kids get scarce resources than a shelter or food, food or water, food or health. If you're poor, in a worldwide, it's not an American sense where poor is not as poor as it is globally, if you're poor in a global sense, you can't buy food. And that doesn't go well. So absolutely, you're better off wealthy, you're better off in a wealthy country, which has more resources. You're better off farther from the equator. One shouldn't confuse a relative performance with an absolute performance.

It won't make you feel better when other people have it worse if you're suffering too, if there's economic difficulties in the United States, significant economic difficulties, if there's a significant conflict – not conflict – I don't mean violent conflicts but political battle over resources. If there are more storms like Hurricane Sandy that our tax filers are funding, if the Midwest is in drought as it was this last year, diminishing our food supply and our economy. All those things are going on, as they will be. It will be true that we will be better off that Sub-Saharan Africa but we will not be well off.

Andrew Guzman: Let me state something pretty strongly. If you ask the average person who's a health professional, they talk about somebody in a white coat. And the difference in life spans of Americans from 1900, it's increased 30 years. Five of those years have come from white coats, the things that doctors and nurses and surgeons do. The other 25 years have come from public health programs, and I would incorporate immunization as that program, but the rest of it is infrastructure. It's how you provide people with clean water, clean food, safe environments. And those are the things that really have generated the enormous benefits. Those are done as public enterprise. They're not done as individual enterprise.

And public enterprise has got to think about what's the well-being of the whole population. You're not well if your poor brother-in-law has got tuberculosis. You're not well if your cousins got some enteric disease, intestinal disease, as being spread by bad water. And so for 100 years we understood that we're only as well as our community, and we seem to forget this, armored in air-conditioning in a nice car, that our health is dependent on everyone else's.

Greg Dalton: And does the public health establishment in the United States, is it getting funding to do research and communications around this connecting the climate disruption with public health or has that been cut off by Congress because it's so political?

Richard Joseph Jackson: You know, I was in a world of political people after year 2000. And we were, frankly, not allowed to speak about climate change even though we were the CDC. And we were under orders not to speak about it. One of my colleagues actually got fired for asserting that climate change was a public health issue. That has gone away. And I think the reality is science is best when people can argue about it. And to make it illegal or wrong for someone to speak about something they're worried about from a public policy standpoint is outrageous to me.

Greg Dalton: So what should California do to protect its citizens and recognize the potential risk to human health from climate change? Andrew Guzman.

Andrew Guzman: Yes. I think the answer here is simple but a little bit unsatisfying. There's only one remedy, and that's reducing the concentration of greenhouse gases in the atmosphere. And the only pragmatic way to do that that we're aware of now is to reduce our emissions.

Now, no one entity, not even China, frankly, by itself, can fix this, but it can't happen without the United States. And so it's true – I mean, it's harder to think in terms of California. California can impact United States. California is being a model for United States in important ways. It is leading in important ways. But I actually think the fight is in Washington D.C. And the fight is get the United States of America up off the couch, getting its own house in order, and then going out into the world and persuading other countries, especially Europe who's pretty persuadable, China is a little hard to figure out, Russia, Japan, India. If you get those fixed, you've got over 70 percent of greenhouse gas emissions in the world. You get those six countries on to the table and you get them thinking about a serious, meaningful plan to reduce emissions. That's the only path to a solution.

And the thing about it being the only path is you shouldn't confuse that with it being an easy path.

But until the United States decides to do this, it won't happen because Europe doesn't have the international political power or influence to make it happen. China doesn't have the will to make it happen. China doesn't have international credibility to make it happen. The United States is the only country that can do this. And as long as United States decides to not take action, it won't happen. The President the other day spoke about climate change was terrific. The things he wants to do are exactly the right things to do if the President has to act alone as he does at the moment. He can act internationally in limited ways. It will be far better if the federal government in its entirety were behind this. It would open up a much wider set of things for the government to do internally, and a much wider set of things to do internationally, and would actually give us a chance of finding a way to turn down the rate at which emissions are growing.

Greg Dalton: He didn't really talk about it as a public health issue. And many people don't. There's still a perception that climate is about grandchildren and polar bears. It's not about me and my lungs today. So could that framing help provide some more political momentum? Richard Jackson.

Richard Joseph Jackson: I read through the President's statement yesterday. And the first paragraph or two is about asthma and lung disease. So 40 years ago, and the people in this room will agree with this, there were people in Los Angeles that probably didn't know there were mountains. Planes would turn around because they could not see the runway. And I'm not exaggerating.

Greg Dalton: And he did reference his time in college in Los Angeles when he couldn't see that. Yes.

Richard Joseph Jackson: Right. So the average blood lead, lead was in the gasoline, the average blood lead was about 22 in Americans in the 1970. It's now less than 1. So by getting rid of lead in gasoline, we are able to put it in the catalytic converters. The catalytic converters have caused an enormous improvement in air quality. Of course, we have five times as many cars so it's not as good as it could be.

I want to make a big point here. California has very much been on the cutting edge of a lot of the improvements we have seen in air quality.

And you'll notice that cars are still going along. We're doing pretty well. We have decent cars. About two-thirds of all of our greenhouse gases is coming from buildings. And California has basically flat lined its electricity consumption since the 1970's because of increase in efficiency, refrigeration, air-conditioners, et cetera, increasing insulation, better windows. These policy standards that we put in place are now being imitated around the world. We are very much a leader, and I hope we continue because it's really important.

Greg Dalton: If you're just joining us on the radio, Richard Joseph Jackson, Professor at the UCLA School of Public Health. Other guest today at Climate One is Andrew Guzman, Professor at UC Berkeley Law School. I'm Greg Dalton.

Let's talk a little bit about the dark side of some of the clean energy technologies. It's possible that nickel metal hydride, lithium ion batteries for electric cars could have some health impacts. The chemicals used to make solar panels that are on my roof and many others in the audience have some pretty nasty chemicals. So we might be trying to solve the climate problem while also creating some public health problems. Dr. Jackson.

Richard Joseph Jackson: By the end of the 1970's, the United States was putting about $6 billion into energy research. In the 1980's, it dropped to nothing. And we did nothing for energy research for almost 20 years. We are way behind. We absolutely, absolutely need really powerful, really effective batteries to store energy in.

So your roof is producing lots of electricity on a sunny day like today, but you need to be able to store that and be able to use it. So our technology is really backward. I would completely agree with you that our batteries are inadequate today. Our solar panels are too expensive and aren't generating enough, and need to be more benign. But we often stumble in the beginning of any new technology until we get it right but we cannot back away from doing this.

Greg Dalton: Right. I don't mean to say we should back away. Sometimes there's a shadow side. Andrew Guzman.

Andrew Guzman: That's true. The economist in me wants to say, "You'll never get anything when they're tradeoff. There's no free lunch." One of the few luxuries we have, I think, when talking about climate change is that the problem is so acute and so immediate that we almost have to ignore or, at least, we can be confident that some of the costs connected to certain solutions are smaller than what we get from implementing them.

So I don't, in any way, want to deny that any solution you propose is going to come with cost, including – our carbon tax comes with an economic cost. It's a myth that there's not going to be cost. But the key is that the cost is worth paying. What you're getting for it is worth the price. That's true in an environmental context, at least within the scope of my knowledge about potential solutions, the ones I'm familiar with. To the extent that there are environmental consequences, there always are, they're smaller than the environmental consequences of business as usual. And so we have to pick the best among the options in front of us. And it would be insane to wait for one that is free.

Greg Dalton: Is it true, Andrew Guzman, that agricultural productivity may actually increase in a warmer world where suddenly corn can be grown in Canada?

Andrew Guzman: No. I don't think that's true. It is true that there will be some increase in productivity in some places but it seems pretty clear that will be swamped by agricultural losses

elsewhere.

And there are several things going on. One is just the climate, meaning temperature and precipitation, will change in various places. In some places it will get more friendly, so Canada and Russia are obvious candidates for that, and there will some of that. It will get less friendly in other places like the Central Valley perhaps.

But there are other stuff going on too which is we have – we don't live where we live by accident. We live where we live because there's water, basically. And when – now I'm going to go back to mountain glaciers. When the glaciers – we live, as I said, half of the world's population or so lives in the river basins formed by mountain glaciers. That's not an accident. When those glaciers go away, the value of living in those river basins will be dramatically lower. Where the people are in the same place the food is growing. Not exclusively but half of the world's population does some agriculture. That agriculture can get much more difficult. And that's not because the temperature and rainfall in those places will changes. It's because the water that get from the glaciers will change.

And so it's true that changing temperatures, rising global temperatures will mean places that get warmer and happen to get more friendly rainfall will grow a little bit more. It's true. That will be offset by places that grow less. But more important than either of those things, it seems to me, is that we have built up our entire global civilization on the premise that the rivers will flow where they've been flowing for the last 250,000 years, and that won't be true anymore.

Greg Dalton: Let's talk about oceans. Oceans are warming, they're becoming more acidic, and there are actually some disease. There are some researchers shows that there are some food-borne diseases because of warming oceans. Richard Jackson, tell us about warming oceans and potential human health impact.

Richard Joseph Jackson: Well, the big thing that scares me most about warming oceans is its expansion to sea level rise. Our fisheries are really being depleted in a very rapid phase. There are certain organisms and fish that do very well. Jellyfish do quite well in acidic oceans. And we'll probably see more fishes that we don't like to eat very much. We, doctors, are telling people all the time, eat more fish, don't eat so much red meat. So a lot of – we've been fairly – we've been very insensitive to the – we've taken it for granted just as we've taken for granted the atmospheric ocean over our heads. The fluid ocean around us, we have also taken for granted. There are organisms that actually – the color organism survives more effectively is more infective in warmer waters than it is in colder waters. So we're going to see a change in some of these as well.

Greg Dalton: And let's talk about sea level rise. We've seen from Hurricane Sandy, Super Storm Sandy, this surge and what that can do. It can basically close the New York Stock Exchange for a couple of days and pour the Atlantic Ocean into the New York subway. I talked to a person yesterday who said that coastal retreat, moving back from the coast, is – forget about healthcare or social security, et cetera, the cost of coastal retreat is going to bankrupt, could bankrupt this country. A pretty strong statement. Andrew Guzman.

Andrew Guzman: I don't know if that statement is true. It might be true but it's –

Greg Dalton: Underestimated magnitude of the impact…

Andrew Guzman: Yes.

Greg Dalton: – of coastal –

Andrew Guzman: I mean, it doesn't take a lot for things near the coast to go wrong. And this is true of – the most obvious thing is if you imagine your house on edge of the water. Obviously, if the water goes up, that's a bad thing. But it's true in other ways too because water systems can cease to work if the ocean gets too high because instead of water going out into the ocean, water has this nasty habit of flowing down hill, and so it'll come in land instead. Agriculture systems can get backed up because salt water comes in instead of fresh water going out.

So a lot of these can get messed up. And it's certainly true that land can get lost. I don't know – I confess, I have not looked carefully at the geographic land loss likely in the United States for credible rise in ocean. But it will be some and there'll be some in San Francisco although San Francisco won't be the place that makes the news because it'll worse in other places.

Greg Dalton: Richard Jackson, you've written a lot about resilient communities.

Richard Joseph Jackson: I've done a public broadcasting series on designing healthy communities, four hours. We had a town hall meeting at Lincoln Center about a month ago talking about the impact of Superstorm Sandy on the New York area.

And we had a psychiatrist, we had a couple of high school students, we had an urban planner, we had pediatrician, we had Paul Goldberger of the New Yorker and Jane Brody of New York Times, a health reporter. And I completely underestimated, as a person, a Jersey boy who now lives in California, the psychological impact of Superstorm Sandy. People were still psychologically traumatized by the vision of seeing water pouring into the subways. And as a kid, we'd go to the Jersey Shore, and Jersey Shore was a poor man's paradise, I'm not kidding. You'd go down there, you'd put your feet up, and it was just heavenly to be there for a couple of weeks. That's all gone; all those houses are ripped up. They're going to rebuild the Jersey Shore but they're going to build hardened condos, 12 feet off the ground that no working person is going to be able to afford to live in. And I think these larger changes – we underestimate the psychological impacts because it's the way we are. But believe me, they're just as important as these physical impacts.

Greg Dalton: If you'd like to hear more about that, you can look at iTunes, the Climate One podcast which includes the conversation with former New Jersey governor, Christine Todd Whitman, who is with us at Climate One recently, and the former governor of Colorado talking about fires and rebuilding – living differently with forest and also with the ocean.

So on the psychological impacts – we talked about posttraumatic stress syndrome. Is there a posttraumatic stress syndrome for climate-driven events?

Richard Joseph Jackson: PTSD is far more common than we were told. We probably – every one in the room has some version of it from some very difficult event you had. You can manage it, somewhat, if you intervene between about 6 and 12 weeks. What happens is the brain sets up a certain repetitive pattern. So the psychological loop, if you will, the electrical loop, begins to mimic in the neurons, in the axons in the body. So there are things you need to intervene with a person going through posttraumatic stress.

That said, Mindy Fullilove, Professor of Psychiatry at Columbia, said, "In truth, people will never get over this." And people that have been through hurricanes and floods will tell you 60 years later of the trauma of seeing all the family pictures and the contents of their house being lost. We tell people you need to care about where you live, and then when it's gone you say, "Oh, you don't need to care about that so much. Get over it." And this is going to be a very difficult thing that we're in for.

Greg Dalton: What should California do to build resilient coastal communities? Richard Jackson.

Richard Joseph Jackson: One is we sure shouldn't be building any place that a reasonable person would say if you get one to two foot sea level rise, it's going to be under water. Two is, and New York City is now proposing it, Mayor Bloomberg proposed $16 billion of berms and gates and other things around Manhattan. Well, that's downtown southeastern part of Manhattan. And they're going to have to put a seawall that's going to go all the way around it. Well, they have to do that to keep the water out of there. Number two, there ought to be parkway, and there ought to be creational, and there ought to be bicycle routes, and there ought to be things that for 99 percent of the time you can use and enjoy, and for the one percent of the time, that it saves your life and be glad that it's there.

So I think any kind of decision – the state of North Carolina now makes it illegal to consider in a real estate decision the fact that climate change is happening. And it's totally ridiculous. If you're buying a house, you need to be – you're told if you're in an earthquake zone. You ought to be told if you're in a sea level rise zone.

Greg Dalton: So you have the outlawed science. Okay. Andrew Guzman.

Andrew Guzman: So after Hurricane Sandy – or recently Mayor Bloomberg has this idea. After Hurricane Sandy I heard the mayor of Hoboken, New Jersey speak about similar ideas. And my reaction to this is if I'm the mayor of Hoboken, New Jersey, I'd say the same thing. But it's a terrible idea.

So imagine that the way we approach climate was this: the federal government said, "Okay. Well, we're going to put a climate tax. All of your income taxes, a few dollars are going to go into this fund. And we're going to pay it out to local communities to build seawalls." This would be the stupidest strategy to combat climate change that you could imagine because the seawalls aren't going to stop climate change.

They're going to be an incredibly expensive way to, in a minor, dull the impacts of climate change for a small number of people. It's not going to stop food prices from going up. It's not going to stop water shortages. It's not going to stop drought. It's not going to stop most of the impacts. It will keep a few square miles safe from one thing. It is a crazy strategy.

Now, I get that if there's a flood and the water is coming to your house and you got sandbags, you're going to put sandbags in front of your house, I understand that. But the idea that we would adapt a public policy in which we would invest primarily or even heavily, frankly, in adaptation is a foolish strategy because as long as our emissions are growing, especially as fast as they are globally, there are no seawalls that are going to solve this problem. We might put off some portion of the damage for a brief period of time. We will be far better investing the same resources in reducing our emissions through any number of mechanisms.

Again, there's tradeoffs. It's true that if you don't build a seawall somewhere, that place is a little more exposed. But if you use those resources in some other way to reduce emissions, you reduce the exposure of the other 7 billion people on the planet.

Richard Joseph Jackson: So the doctor and the economist are going to get an argument right now. [Laughter]

Greg Dalton: Oh, good.

Andrew Guzman: About time.

Greg Dalton: About time, yes.

Richard Joseph Jackson: In medicine, all the time, we know that every last patient is going to die. And we still go ahead and we do the best to get them through the next month, year or decade of their lives and make their lives as comfortable and reasonable as possible. Is Hoboken not going to be under water in 100 years? You bet it's going to be under water and no seawall is going to turn it around.

We need to do everything we can to prevent this long-term effects. We ought to be reducing our carbon pollution of the atmosphere. And by the way, we need to stop CO_2 loading and call it pollution because that's what it is, and methane, all the stuff coming out of the wells that we're fracking and all the rest. We need to get control over it and do what we can. On the other hand, people need to live somewhere and we ought to be able to figure out ways that we can make their lives comfortable and work well as well.

Greg Dalton: Andrew Guzman.

Andrew Guzman: If I may. So that's all true. And if there's no budget constraint, then let's cut greenhouse gases dramatically and let's provide all of the adaptation we can. That's absolutely right. But if we have limited resources, which, I posit, we do, we have to make choices.

In your patient example, if you have a patient who's exposed to radioactivity everyday, you wouldn't say to that patient "Here, take this medicine that helps with radio activity." You would say, "Get out of the radio activity." That's what I'm saying, is we can't put Band-aids on these problems in the hope that – an ever increasing set of problems. The problems get worse and worse. And I do it – my hands are moving up linearly but in fact, it moves up exponentially as temperatures go up, as average global temperatures go up.

We can't put Band-aids on this problem and think that if as the problem gets bigger and bigger and bigger, we can just use bigger and bigger Band-aids. We need to get at the emission of greenhouse gases. And to the extent we have a budget constraint that should be the number one priority, not because the harm that adaptation seeks to prevent is not important, but because we will prevent more harm with mitigation than we will with adaptation.

Greg Dalton: Reducing greenhouse gases seems beyond the reach of even very powerful people in government at the state or city level, or even national level, and that seems beyond them. What is within their grasp is seawalls and things like that that they can get their arms around, cleaner power plants, and there's a term called managed retreat. And the idea of what you've been talking is basically managed retreat. We gradually pull back from the coast and the rivers, and seed some land to fresh water and rivers as that happens.

Andrew Guzman: So the thing that's, I think, most important to understand is that climate change is not a body blow that we have to absorb. It's turning the whole system upside down. And so we can't retreat 100 miles from the coast or 100 yards from the coast and then be done. We retreat from the coast, and then the next day we're in exactly the same place we were the day before.

So we might postpone things and we might provide some protection but as long as greenhouse gas emissions are growing faster and faster every year, and the greenhouse gas concentration which is

now tipped over 400 recently, 400 parts per million, as long as that's going up, this problem doesn't go away. This problem gets worse and worse and every incremental increase is worse than the last. The only solution is to reduce greenhouse gas emissions. It's not that adaptation isn't useful or relevant, it absolutely can make a difference, it absolutely can reduce harm, but I'd rather spend a dollar on mitigation than a dollar in adaptation.

Greg Dalton: Andrew Guzman is a professor at UC Berkeley Law School. Other guest today at Climate One is Richard Jackson, Professor of Public Health at the UCLA. I'm Greg Dalton.

What do each of you do to manage your own carbon footprint? Richard Jackson.

Richard Joseph Jackson: I think there's a bunch of things we can do but I am ashamed of the fact that I fly on airplanes too much. So I'm just going to acknowledge that. I think –

Greg Dalton: Do you buy carbon offsets for that?
Richard Joseph Jackson: I do but I'm a bit suspicious sometimes whether anything really happens.

Greg Dalton: Well, for your conscience than anything, really –

Richard Joseph Jackson: Yes. I'm guilty of that a few times. I think, occasionally, I like some red meat but in, general, I'm trying to eat very little of that. I don't own a car living in Los Angeles. I bike or use public transit at all times. I think California desperately needs a high-speed rail lines so that people don't need to be in airplanes. It's about 20 times more energy efficient to move up and down in a high-speed rail line as they've done in Europe, and we need to have it on the east coast of the United States. I think we're just changing our house now and putting in R40 insulation. I know this is tiny stuff but at least it's what I can do to make my own home energy efficient. And we've changed our appliances for those that are energy efficient.

Greg Dalton: I interviewed Paul Hawken once and he said there's no such thing as inconsequential action; there's only consequential action. So little things matter. Andrew Guzman, what do you do to manage your own carbon footprint?

Andrew Guzman: I'm not so far off both on the confession. It's true that I fly more than would be ideal. And it's a set of very familiar actions, many of which have been stated, and I bet the ones I add, when you do as well.

So the one that strikes me as – most difficult is not the right expression but I try to eat less meat because meat is a pretty source. Heat the house in the winter. I live in Oakland so we don't have air-conditioning. I don't use air-conditioning but I don't really – I can't really claim much moral high ground for that reason [Laughter]. I try to drive less. I've got an old car. One of the odd things is if you buy a car, a more fuel-efficient car or a hybrid car or something, that makes sense. If you have an old, it probably makes more sense to keep the old car because it takes a lot of energy to build a car. I have an old car. Things like that.

I've spoken at a couple of schools about my book, and I get asked the question of what one should do. And the answer is pretty much the same environmental message you give anyway which recycle, use less energy, use less water. So I try to do those things but I feel the same way. It feels important and yet inconsequential.

Richard Joseph Jackson: Can I just stay with water because people run water but 19 percent of all the electricity in California is used to move water? And so –

Greg Dalton: Most of it is over to Tehachapi Pass going down south.

Richard Joseph Jackson: But it's still a huge amount of electricity. So anything we can do to minimize that use. I want to say one more thing because I teach a class on environment and health but also on climate change to health. And I am very sensitive about not depressing the hell out of my poor students because these issues are frightening and they're depressing. And I've seen a big change in the students in the last five to ten years.

The best and brightest are – most of them are vegetarian, they're very, very aware of that they buy. They won't buy clothes that are made in a sweatshop. In fact, many of them do go out of their way to buy used clothes as well. My best students don't have cars. They bike or they walk or they use public transportation. They're extremely aware and they know that they're not going to impact the world very much but they at least want to feel in concert with their values even if they're not changing the world.

Greg Dalton: Richard Jackson is Professor at the UCLA School of Public Health. Other guest today at Climate One is Andrew Guzman, Professor at the UC Berkeley Law School. I'm Greg Dalton.

I'll just tell briefly about a time when I was on an airplane going back east and Virgin Atlantic, fabulous airline. They have the screen in front of you. You can order a sandwich and a carbon offset. So I thought, okay, this is great. I'm going to a climate meeting or a sandwich, carbon offset, a drink. And the stewardess comes and says – did I say flight attendant – and say, "Okay. Here's your sandwich, here's your drink. I just can't find this other thing, carbon offset. I can't see it." [Laughter] I'm like, "Don't worry. It's just addressing my conscience." And suddenly she's like "Oh. You're the first person that's ever ordered that."

[Laughter]

So much for that. Let's have our audience questions. Welcome to Climate One.

Female Participant: Thank you for your thoughts today. So given the recent popularity of hydraulic fracturing, both the fact that it's taking place in 38 out of 50 of our states, what are the known implications to human health?

I've heard horror stories of what it does to human body, drinking water in one of these fracking zones. Is that true?

Greg Dalton: Richard Jackson.

Richard Joseph Jackson: Oh, boy. One is methane is probably the best fossil fuel that we can use. This is the gas you get out of the hydraulic fracturing. Two is this water and fluids and sand, enormous amounts of sand, are forced down these wells at pressures of 19,000 pounds per square inch or more. There isn't a escape of methane into the atmosphere when this occurs. There is release of these chemicals and polluted water into the ground, big battles about whether that can be dumped in a local river or whether it's put into an impounded pond as well.

Industry are argues that none of the flaming faucets that you've seen in the movies, they did that, it's from old wells from in the past. There are very different kinds of wells where they're using old oil wells and try to pull out, distillate real oil versus methane wells that they get from shale. The biggest thing I – a couple of things I worry about; one is it's stupid to stick these in between a home and a

school yard, and some of these are going in with absolutely no regulation. It should be regulated at the national level by the federal government.

Right now we have an exemption under the Clean Water Act and the Safe Drinking Water Act that prevents the fluids coming out to be regulated by the government, it's called Halliburton Exception, and it was put in place in 2005.

Greg Dalton: And *Gasland 2* is coming out soon on HBO. *Gasland* was a movie where people first saw fossils being lit on fire. So you can look for *Gasland 2*. Let's have our next audience question.

Male Participant: Yes. Thank you very much, by the way, for the wonderful program and the great comments. I'm really finding it helpful. Professor Guzman, I'm a Cal graduate, and I'm very proud of Cal, and usually or sometimes we manage to lead the way, and often it's the students that do the leading which is very interesting.

So I noticed recently that the – in the last student election, the ASUC elections which were a couple of months ago, about 10,000 students participated, I think, plus or minus, maybe 12,000, they overwhelmingly voted to support a referendum that asks the university to divest its fossil fuel investments. And I applaud the students for doing that. And so the question becomes would you, as a faculty member, support that idea and, also, are other faculty members supporting that idea?

Andrew Guzman: So yes is the first answer. The rest of the answer is I'm not sure. This is not something that, to my knowledge, has become – what you're saying, I agree with to the extent I'm familiar with it but it doesn't seem to become an issue that faculty are discussing which presumably means it's an issue that the administration is not currently pondering in a serious way.

The divestment question, I think – Bill McKibben is one of the driving forces between this. And as I understand his view though I may – if I'm misrepresenting it, I apologize to Bill McKibben. But I think his view, which I would share, it's unclear what consequence divestment has on the behavior of large companies, but it can't possibly do any harm to the effort of encouraging more climate-sensitive activities. And if nothing else, it's a politically meaningful act that draws attention to the problem, which bites. If that's the only thing it does, it seems like it's worth it.

Greg Dalton: When I interviewed Bill McKibben, he said, "We're not going to morally bankrupt Exxon Mobil. We're going to" – he said, "We're not going to bankrupt Exxon Mobil. We're going to morally bankrupt them." So it's symbolic. Let's have our next audience question at Climate One.

Male Participant: Thank you. I have a theory about a significant greenhouse has mitigation measure. And I'm looking for your comments and thoughts. I know that rainforest destruction or deforestation, the greenhouse gases generated from that are almost equal to the worldwide greenhouse gas that's generated from transportation. And my thought is, at least theoretically, if we could focus on eliminating deforestation, we would also help eliminate the number one cost of species extinction and also save one of the primary CO_2 absorbers on the planet. And just your thoughts. Do you think that's a valid theory or impractical or whatever?

Greg Dalton: Andrew Guzman.

Andrew Guzman: I don't think there's any doubt that deforestation is a big part of the problem. Stopping deforestation has a bunch of challenges. One is very often the forest are being removed for a reason, like places for people to live or some other reason. But the problem that's more interesting intellectually to me is deforestation, if it's happening in a country that is – Brazil is a moderately,

sort of medium to upper income country but it's not nearly as wealthy as Europe of United States or Korea.

In a country that is less wealthy, stopping deforestation is expensive. And so there's a question about whether there's a sensible way to transfer resources from wealthier countries to poor countries to combat this or in other ways, combat things that are contributing to climate change. And it would be terrific if we could find a good way to do that. The central problem in simple terms is what you'd like to do is you'd like to know how the country would behave if you didn't pay them off and then to the extent they behave better, pay them but that how they would behave is impossible to observe. So the country that you're trying to, let's call it bribe, the country you're trying to pay has an incentive to represent that it was going to do all these horrible things, and then get you to pay them to do what they would have done anyway which deters the people who may be willing to pay.

So there's a difficulty in that arrangement. If you're going to overcome that problem, it would be great because it probably is a reasonably cost effective strategy if you can keep forest in tack. There's a bunch of other things you can do that would improve outcomes, and that would be probably be worth paying for in that way.

Greg Dalton: Richard Jackson.

Richard Joseph Jackson: So ten years ago when I started talking this, about 20 percent of the CO_2 increase that we've had was due to deforestation. In my lifetime, the CO_2 level of planet earth has gone from 300 to 400 parts per million. I no longer can say it's 20 percent. It's now 10 percent, and it's not because we're doing less deforestation. It's because we're producing so much more fossil fuel emissions.

One of the complete sucker bats, if you'll pardon me, is this planting of enormous amounts of land, deforesting and then planting corn and soy, particularly corn. U.S. is importing corn ethanol, which, from an environmental standpoint, from a health standpoint, from an energy standpoint, makes no sense.

The other thing we need to do around deforestation, I really feel very strongly about this, is if you create urban spaces that people want to live in, that are safe, that function well, the pressure to have people move out of urban spaces is much, much less. And by the way, family size goes down as places urbanize.

Greg Dalton: Carbon footprints. Lots of good things happen when people move into the cities. Let's have our next audience question at Climate One. Welcome.

Male Participant: Great. Thank you. I really, really enjoyed it. What do you say to doubters, those who don't think it's happening?

Richard Joseph Jackson: I think there are two categories of doubters, which is, I think, the nice word for it. One are people who have either a prior commitment that does not allow for reconsideration, or that have a financial interest in being a doubter. And so those people, you can't talk to.

I think the much larger population of people who view themselves as skeptics are people who either haven't looked at any evidence, and then to those people you'd say, "Well, the theory of climate change is pretty clear. The data on it that is the increasing temperatures is irrefutable. And then look around the world. We can navigate around the polar – over on the North Pole for the first time

in hundreds of thousands of years. So the physical evidence is there."

And the last piece I use to try to pursue them, my favorite, is pick a university that you like, that you think is a serious elite university. Go to their website, type in climate science, you'll find something. Click on a few links and you will very, very quickly, within three or four clicks you will get to whatever is going on at that university. And it will be things like how does blah-blah-blah reduce climate change. What is the consequence of blah-blah-blah on climate change? You won't see anything that looks like "Is climate change real?" It just doesn't exist.

So you got to decide who you're going to listen to. And if you want to listen to people who are a scientist, then you go anywhere on the internet where there's real scientist. This debate isn't happening that way. It's a settled issue. The question is what to do about it. And then, obviously, questions at the edge are about lots of important things but not about the fundamental question of is it happening and are humans making it happen.

Greg Dalton: Richard Jackson.

Richard Joseph Jackson: So 40 years ago, people were arguing about whether smoking really causes cancer. And there was a huge smoke screen, if you will, put up by the industries saying, "Oh, yes. The jury is still out. We don't know this for sure." These same firms were then used by the lead industry to say lead is an essential element, which is not true. When California actually – we moved our cigarette smoking from 140 packs per person to under 40 packs per person. We have saved $120 billion in healthcare cost by making these changes. And the doubters were paid doubters all the way through that. I think this issue is the same one.

Suppose we all go out, we have an efficient car, we save money, we have an efficient house, we walk a lot more, we exercise, we're on bikes, we use more transit, we smile more, we get to know our neighbors, we grow food in the backyard, we have trees around out house, and it turns out we're wrong, and we got happy for no reason.

[Laughter]

Greg Dalton: Let's have our next audience question. Welcome.

Male Participant: What are your positions regarding desalinization plants?

Greg Dalton: Andrew Guzman.

Andrew Guzman: We're going to need more water. To me, it's a matter of the economic efficiency of the process. There will be more desalinization than there is now because the value of it will go up. I don't know, in detail, how big that leap will be. But to my mind – it's possible there's something here that I don't appreciate, but to my mind, it's just an economic question. At what point is it cost effective to take the salt out of the water? Sometimes that's true. There is desalinization now and there will be more when water is more valuable, more expensive. But more expensive water is not a good thing, just to be clear.

Greg Dalton: It's also very energy intensive to do that.

Richard Joseph Jackson: You can throw a baseball – a good athlete can throw a baseball across the Colorado River, which is supplying a third of all the water in Southern California. There will not be enough water for – there are a lot of reasons. And we're going to have to recapture all the water that

snow will no longer be held up in the glacier. So one of the big things that's going to happen is we're going to have to capture a lot more gray water, used water. And people don't want to think about it. They say, "Oh, I don't want to drink out of a toilet," but it can be treated to the point – astronauts drink their urine. I mean, we can treat water so that we can capture water. We no longer – your grandchildren, when you say, "We used to water the plants and flush the toilet with drinking water," they're going to say, "Oh, come on. The next thing you'll tell me is that people used to smoke on airplanes." So we've got to adapt to the 21st century.

Greg Dalton: Let's have our next audience question. Welcome.

Male Participant: Hi. I'm curious at what point or to what extent does adaptation exacerbate the emissions problem, building cement, walls to protect against water or distilling water, that type of thing.

Greg Dalton: The idea that we can somehow build walls and go on with out addiction to fossil fuel.

Andrew Guzman: So every time we get out of bed in the morning, we contribute to the problem in a sense. Everything we do emits greenhouse gas in one-way or another. So that's just part of a reality but it's fair point that cement is a big source of greenhouse if you're building the walls with cement. I'm not sure that that would deter me if I thought adaptation was going to make a difference because one of the dilemmas that is always true is anything we talk about is a teeny contributor, well, almost anything.

So the American contribution is about 16 percent of global greenhouse gases. The power plants that President Obama was talking about, regulating collectively are something like 40 percent. So even if you shut all those down which, of course, would mean we wouldn't have power, you'd still only be addressing whatever 40 percent of 16 percent is, 6 percent maybe. So the numbers get small and so you have to do things across the board in order to be effective.

So if, in fact, seawalls were to generate, to my mind, important, permanent, meaningful protection in a cost effective way, I don't think that would stop me. But it's true that if we do things that require energy, we will be releasing greenhouse gases.

Greg Dalton: Welcome to Climate One. Let's have our next question. Yes.

Female Participant: Yes. I've been focusing on what ABAG, the Association of Bay Area Government, is trying to do locally. And I'm focusing on this question locally. And particularly our communities, over in the – what's happened in Danville.

And they are trying to get building, new housing, fill in, in fill, in the close to BART stations in the center of the towns as opposed to building out farther and farther a single storey homes with big lots. And I consider this a fairly enlightened area compared to some other parts of the country but I'm amazed at the opposition, how strong it is, how organized it seems to be, how vocal it is saying that this is basically a communist plot, this is because of UN resolution number, I don't know what. And so I'm wondering if you have any insights on this. I'm worried about it.

Richard Joseph Jackson: We absolutely need transit development. Particularly, when we're older, we have more difficulty getting around, thinking we're going to forever drive cars and solve all of our problems that way is wrong. Every meeting in Los Angeles starts with the following statement; I'm sorry I was late. The traffic was stopped all the way along.

When Disneyland opened in 1955, there were 7 million people in the state. There are 37 million people in the state. And the area is getting smaller with climate change. We have to have transit. And it's foolishness for Lafayette not to have density nearby that people can walk the line and go the city when they need to. I'm sorry. I feel very strongly about this one.

[Laughter]

Greg Dalton: And he used to live here. We have a time for one last question. Welcome to Climate One.

Female Participant: That would be me. I appreciated your comments tonight, and I appreciated the question that was put to you about actions you're taking to reduce your personal carbon footprint. And to me, there's a parallel question, and I just want to make a quick comment and ask a question about it.

And that's that I sense quickening of people coming together to take action. They try to shape policy, they try to stand up and say, "We see it coming. We want to act." For me, I would say you can Google 350 Bay Area, a lot of activities happening. And the Citizen Climate Lobby is another area, very constructive citizen action.

I'm wondering if you have any comments on that role because we need to take big, bold steps right now. If you have any favorite recommendations for us about how we join together in addition to doing things personally. Thank you.

Greg Dalton: Richard Jackson.

Richard Joseph Jackson: In the video series, I visited about 15 cities. When you see change – and there are models for this, it's about seven percent of the animals that are herd, the fish, the birds, begin to turn. They're often – and all of a sudden, the whole group begins to move. So don't be discouraged if 93 percent of the people think you're a crackpot. You're worried about the things that are really important. And I think that spending together and talking about things that are desperately important to our future is the absolute conversation we need to be having in our society.

Greg Dalton: Andrew Guzman.

Andrew Guzman: So I think there are a lot of different groups that are doing great things. 350.org is the most obvious one and is a terrific organization, not least because Bill McKibben is the guy driving it.

And one of the things I've discovered with this book talking to people is just how much is going on locally in the Bay Area. And all of which is terrific. I don't have favorites among the many things that are going on but I think – I underappreciated when I wrote the book, how powerful this bottom up approaches. I think the changes are small in the same way that turning down your heat is a small – I guess down your heat is a small thing but the message it can deliver by saying, "Well, look, we're able to reduce a city's greenhouse gas emission. So it's not impossible. We're able to communicate to a broader population, what's at state and what's going on.

And all politics are local, as they say. That is how politics change. So I still think the answer is in Washington D.C. but what I've come to appreciate is that Washington D.C. is more likely to get that answer from a series of local efforts, and so all of these kinds of organizations are part of that process.

Greg Dalton: And I'll mention two local organizations, Cool the Earth is a group based in Marin for kindergarten through eighth grade. They have in-school programs that they come to your school and it's about actionable things kids can't do, get their family to do with measurable carbon reductions. Alliance for Climate Education is based in Oakland. They've educated almost a million high school students around the country with presentations starting with do just one thing specific actions that high school students can do.

We have to end it there. I'd like to thank Andrew Guzman, Professor at the UC Berkeley School of Law, and Richard Joseph Jackson, Professor at UCLA School of Public Health and former Director of the CDC's National Center for Environmental Health. Thank you all for coming here today. And guys thank you for coming to Climate One.

[Applause]

[END]