Brian Stone: Yes. Thanks, Neelam. Let me – I'm just pulling up my slides here and making sure I get everything or needs to be. Should I have control now of the slide?

Lauren Pederson: If the top of that comes up, there you go.

Brian Stone: Yes. Because that's going to – I'm just looking for the advanced area. I'm not seeing that.

Lauren Pederson: And can you make it full screen in presentation mode?

Brian Stone: Let's see. Yes, there we go. OK, I see it. Well, I have my own, so I'm just advancing on my own. I think that will work OK. Are you seeing that advanced?

Lauren Pederson: It's not advancing in the portion that you're sharing. There you go. That's it.

Brian Stone: It's advancing now?

Lauren Pederson: Yes.

Brian Stone: OK. Well, then I'll take. I'm very sorry for the little technical issue there.

Slide 1: Title Slide

So I'm Brian Stone. I'm a professor of City and Regional Planning at George Tech in Atlanta. And my work is focused on climate change at the urban scale and so urban heat island information is a key piece of that. And I'm thrilled to be able to talk to you, the folks on this call today, because you are the ones who really are on the ground able to put these policies in place.

Slide 2: Overview

So I'm going to be talking about a few overview points here today to learn the difference between global scale and local scale climate change. Neelam gave a great overview of heat island effect. And so I just want to briefly differentiate that from what happens at the global scale to avoid any confusion, to learn trends in extreme heat around the country, and then why we should be concerned particularly in state and local government about the extreme heat, and how the heat island effect is driving that to result in infrastructure impacts. And then – and then what we see across these in terms of their attempts to plan for heat management today.

Slide 3: Global Temperature Anomaly

So this first graph is the global temperature anomaly and it's probably familiar to most of the folks on the call. And this is showing essentially evidence that the global greenhouse effect of course is occurring at the global scale. Temperature anomaly is just a deviation from a long-term average so that zero line on the graph is the 1950s to 1980s average global temperatures. And we see pretty rapid increase, particularly in the latter half of this period, and we know that that is being driven principally by the accumulation of greenhouse gases in the atmosphere.

Slide 4: Drivers of the Urban Heat Island

Cities of course are subject to the global greenhouse effect, as the whole planet is. But they also have that superimposed and what's happening in terms of land use changes. And so these are the major drivers that Neelam talked about so I won't spend a lot of time on this. But these issues are important, that these are driven by land use changes as opposed to be driven by changes in the composition of the atmosphere.

Slide 5: Heat Island Effect > Greenhouse Effect

So we've asked the question with my own research group at Georgia Tech about what are the differences between cities and the planet as a whole in terms of how rapidly they're warming. And what we see here is data from the 50 – essentially the 50 largest cities across the United States. And we're graphing temperature change within the cities themselves, that's the red temperature trend line. And then we're graphing temperatures in rural areas outside the cities and this shows a number of interesting trends.

The first thing we noticed is the orange trend here matches very well the global temperature anomalies. These rural areas are warming much as we see across the planet as a whole and that's being driven by greenhouse gases.

The red temperature line of course is warmer in all years and that's because of the urban heat island effect. The basic difference between the red and orange lines here is evidence of the urban heat island effect. And then we have these arrows that tell an important story.

If we look at the two arrows on the left side of the slide where the short arrow, which is showing essentially the contribution of the global greenhouse effect warming within rural areas and cities in the mid-1970s, and then the longer arrow which is showing the relative contribution of the urban heat island effect. And what we in every year even more recently where there are arrows of the same size is that most of the warming that's happening in the cities is actually a part of the urban heat island effect.

The global greenhouse effect is a major driver and it is becoming increasingly important, but urban heat islands are significant drivers of climate change in the cities and so they give us a set of tools that we can use to manage heat.

Slide 6: Heat Island Effect > Greenhouse Effect

The other point illustrated by this graph is that urban area is not only hotter than rural areas. They are warming up much more quickly. And so if we actually graph this, this what we see here, we can compare the global rate of warming and this is computed on a decadal basis, the amount of warming per decade over this 50-year period.

Slide 7: Average Warming per Decade (°F) (1961-2010)

If we look at all the cities in our days, the 50 cities, we see what we call an amplification rate of about 50 percent. And that means that cities, most large U.S. cities are warming up at about 50 percent more rapidly than rural areas nearby and 50 percent more rapidly than the planet.

What's important to note is that there are some cities of small number that really the heat island is growing much. These tend to be slow-growing cities of '70s on the Rust Belt areas of the country. If we look at just the cities where heat islands are growing, and that's about 70 percent of all the cities, we see an amplification rate of about 100 percent.

Well that means is that these cities are heating up at double the rate of the planet as a whole, double the rate of areas around it. And so that raises some significant issues for the timing of climate changes happening more rapidly in cities and the intensity of the effect with respect to heat.

Slide 8: Changing Heat Wave Characteristics

So we expect as average temperatures increase over time in the cities that we'll sort to see more extreme heat event like heat waves, we certainly see a lot of evidence of that this summer. But if we look over a much longer period, which is more reliable, we look at again at 50 years.

What we find is that all these heat wave characteristics tend to be moving in a direction that is problematic for cities; the number of heat waves per year, the duration of heat waves, the timing to the first heat wave every year, and heat wave intensity. All of these things are moving in direction that will create significant public health and infrastructure challenges for cities. And so I want to talk about that just briefly in the few slides.

Slide 9: Recent Heat Wave Mortality

Heat wave mortality. The public health toward heat waves tends to be really underestimated. We see some recent events globally. Europe in 2003 had a prolonged heat wave in which it's now estimated that more than 70,000 people died, and of course at a single summer. And that's obviously a huge death toll, that's the deadliest weather-related disaster in a developed part of the world ever. The Russian heat wave 2010, over 20,000 people died.

These other bars here to show you, you know, in terms of relative magnitude of this threat and not all these things are weather related, but the tsunami in Japan, 9/11, Katrina. These are events that received a lot of press coverage in the media. But the heat waves tend not to receive as much coverage, particularly after the heat subsides and they're very deadly.

Slide 10: Untitled

In addition to that, the infrastructure impacts are substantial. And again heat waves are kind of accelerating; the timer or the heat island effect is accelerating the time to which we have to deal with this in cities. Softening tarmac at airports, we have buckling rail lines and roadways. We've seen plenty of this actually this summer in heat waves, and so this again is a tremendous challenge for cities that we have to deal with in the present period.

Slide 11: Untitled

Most critical is your logical infrastructure. In 2003, the same year as the European heat wave, we had massive blackouts. Some of you on the call might have been in the blackout zone in the Northeastern U.S. About 50 million people lost power. This only lasted for about 24 hours, but had it been prolonged it's easy to see how the United States can start to approximate events that happen in Europe or Russia, places where they don't have widespread air conditioning like we do. This can be very dangerous, particularly if you're losing the kind of infrastructure not just in terms of cooling but water delivery.

Slide 12: Trends in Electrical System Failures

And these trends can be increasing over time, the number of blackouts across the United States per year, as shown here. And this has more than tripled over the period that you see. So the likelihood of extreme heat wave with a prolonged blackout in the major U.S. cities is certainly increasing.

Slide 13: Climate Action Plan

Just to follow up a couple of slides here, climate action plans are the principle mechanism that most cities and states address climate change in their planning. There is an example from Portland, Oregon, which is an excellent climate action plan. This pie chart shows the range of strategies in these plans and they tend to all focus on reducing greenhouse gases, which is critically important and we need to do.

Slide 14: What Actions are Cities Taking to Counteract Rising Levels of Extreme Heat?

But again, as I mentioned, in the last 50 years most of what's driving warming in the cities is the heat island effect, so we need to really be addressing those greenhouse gases and the heat island effect. So we look at climate action plans for the largest cities across the U.S. to see how the strategies that are being adopted, whether they are focused on things that we're going to hear about later in this call, like albedo enhancement, which is just to increase reflectively cool roofs and cool paving, vegetation strategies like green roofs, tree planting, and then efficiency strategies which not only reduced greenhouse gases but can reduce waste heat emissions in the cities.

Slide 15: Climate Management Strategy by Type in Climate Action Plans

So we scoured the plans, and we found that actually very few cities and states are focused on these issues in a climate action plan. Of all the cities that actually had plans, and they all had greenhouse gas mitigation strategies, but only about 25 percent had heat island mitigation strategies. And so if we're going to be dealing with extreme heat in the near term that is our most effective set of strategies and that's exactly what you'll be hearing about today.

Slide 16: Key Conclusions for Cities

So just to conclude my major points, the pace of temperature change in the scale of cities is actually much more rapid than we're seeing it as a planet, and that's not always widely understood. Every measurable characteristic of heat waves are moving in a problematic direction. Heat waves account for more weather related death in all other forms of extreme weather combined. And most climate action plans are not incorporated in them the types of strategies that would be most effective to manage heat in the near term.

Slide 17: Resources from the Urban Climate Lab

And then just for your own information, this final slide I'm of course plugging my book that Neelam mentioned; I appreciate that. But this is actually written directly for folks in government and local and state government as well as other practitioners. And it's designed to highlight the range of strategies that are going to be discussed today. And the a few more technical favors if you're interested in delving down deeper.

So with that, I will conclude and I – and I look forward to questions at the end of the talk.

Neelam Patel: Great. Thank you, Brian.

Poll Question #2

And so I think we've set the tone that heat can be addressed to help us in the medium to long-term in dealing with our infrastructure, to help with a lot of the health issues as well as other environmental issues. And so as you think about, as we get warmed up for implementation, we do have – would like to know about some of your challenges, if you put challenges that you anticipate for cooling your heat island. Please check all that apply.

And your responses to this will also help the presenters focusing on some of the challenges that you anticipate or that you're already experiencing. So if we can see the results to this particular question?

And finding funding and resources is one of the highest rated answers. And I do think that it will be interesting to see how – to hear from our case study presenters how they actually partnered with different organizations and integrated cooling their communities to other initiative. And I see the other as understanding and explaining the benefits. Hopefully, some of the information that we've provided will help with that.

But if you have additional ideas, please do submit them through questions or during the access survey. And then lastly, again, designing implementing program, so what kind of policies you might foresee in your communities or what type of pilot programs or ordinances. Again, these are the exact things that our presenters are going to talk about.

So with that, if we can have Brendan? Brendan Reed from Chula Vista will talk about his interesting program that takes heat island mitigation and implements that through an adaptation plan.