

Keeping Your Cool: How Communities Across the Country are Reducing the Heat Island Effect

Webcast Transcript

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Welcome and Introduction

Slide 1 and 2: Introduction Slides

Operator: Good afternoon. My name is Janet, and I will be your conference operator today.

At this time, I would like to welcome everyone to the Keeping Your Cool, How Communities Across the Country are Reducing the Heat Island Effect. All lines will remain closed throughout the conference. If you should need any assistance, press star, then zero and an operator will come back online to assist you. Thank you.

I would now turn the call over to Ms. Victoria Ludwig. Ma'am, you may begin your conference.

Victoria Ludwig: Thank you. Good afternoon and good morning to everyone in the different time zones. Thank you for joining us today for EPA's webinar on the heat island effect, keeping your cool, how communities across the country are reducing the heat island effect. I appreciate you joining us especially since they understand there's an important sports game going on right now. So thank you, all.

We – my name is Victoria Ludwig. I'm the program manager for the EPA heat island reduction program which has been around since the early 2000. I will tell you more about that later, but the webinar that we're doing today is one of the many tools that we offer to states and local governments and non-profits and universities across the country to help them understand the heat island effect and mitigate the heat island effect.

So I hope that you learn a lot, and I'm not going to speak very long because I want to give most of the time to our presenters who are practitioners working with this issue on the ground and have some great success stories to tell you that hopefully, you can learn from. So quickly, I'll go over some – we will go – sorry.

Slide 3: Webcast Agenda

Victoria Ludwig: The agenda, as you can see, I will speak first that we'll have the practitioners from the cities of Louisville, Tucson and Los Angeles speak. At the very end, we'll do a questions and answers. You can type in your Q&A's during the – your questions during the webinar but we will actually do the sessions at the end.

Now, I'll turn it over to Wendy Jaglom with ICF Incorporated rated to explain a little bit about the logistics of how the webinar will work from the technology standpoint.

Slide 4: How to Participate Today

Wendy Jaglom: Hi, everyone. Thanks for joining today. On your GoToWebinar panel, you can open and close to that panel by clicking on the red box with an arrow as you can see on the

screen. Throughout the webcast, as Janet said, you'll be muted to minimize background noise. However, you will be able to submit questions and comments in writing.

If you have a question, you can use the GoToWebinar question pane, so please enter your question into the panel and hit send to submit. We will be compiling these questions and as Victoria said, we will ask them at the end during the Q&A session. When you send in the question, if you can please include the name of the presenter you would like to answer your question, that would be great.

PDF and audio files of today's session will be made available for download a few weeks after the webcast on the EPA state and local Website, and I'll send you all the links to the – to GoToWebinar so that you all have that. And if you have any technical difficulties throughout the webcast, feel free to contact me via e-mail at Wendy.Jaglom@icfi.com. The address is at the bottom of the screen.

And finally, at the end of the webcast, a pop-up window will appear when you exit GoToWebinar and we encourage you to please take a few minutes to respond to the optional questions and provide your feedback. It will help us inform future webcasts through the program. Back to you, Victoria.

Slide 5: What is Heat Island Effect?

Victoria Ludwig: Thanks, Wendy. OK, let's get started. I'm going to provide some basics of what the heat island effect is, what its impacts are and how it can be reduced. Starting off, the heat island effect is something that occurs in built-up areas, usually urban areas and because it's built up, because it's on urban area, it has oftentimes a higher temperature than the surrounding rural and suburban areas.

Research has shown that on average, for a city of about 1 million people, there can be a difference between the temperatures in the urban and the surrounding areas ranging from 2 degrees to 22 degrees difference. And actually, oftentimes, the higher temperature differential occurs at night.

This is the heat island effect. It – and it's caused by many things and it varies the exact temperature difference and the location of the heat island effect differs based on geography, topography, the season, day or night and there are differences in temperature in the air, as well as the surface. But in general, it's a situation where the urban built up areas are hotter than the surrounding areas.

Slides 6: What Causes the Heat Island to Form?

Victoria Ludwig: What causes it? The heat island effect as urban areas develop, vegetation and green areas are reduced in built-up buildings, streets, roads, those things increase and those are – that causes an increase in the temperature because without trees provided shade and releasing moisture into the air to cool the air, it causes higher temperatures.

And also, most conventional construction materials that are used for buildings and roads and parking lots, et cetera tend to retain the heat from the sun and they often store it. And then on top of that, geometry of how our urban areas are developed can cause the heat island effect because the geometry will cause what are often called urban canyons and this further complicates the issue because the heat cannot be released easily into the atmosphere because of the way it gets trapped in those canyons.

So it's the storage and the retaining of the heat from the sun, as well as heat from human caused, human materials like our air conditioners, our car engines, that also gets trapped in these built-up environments causing the heat island effect.

Slide 7: EPA Heat Island Impacts

Victoria Ludwig: Why do we care about the heat island? What are the impacts? It has several environmental impacts that I'll describe but also, there are human and social impacts, as well as economic. From an energy standpoint, because things are hotter quite simply, we have to spend more energy to cool them and you can see some stats here that EPA has collected showing that for every for example one – every 1 degree Fahrenheit increase in the summer temperature, you need to increase your energy demand by 1.5 to two percent more.

When the energy is coming from fossil fuels, this creates an increase in air pollutants as well as greenhouse gases. And just using more energy of course puts more pressure on our electricity grid, increases the peak period and has potentially impacts in terms of brownouts and blackouts.

The air quality in greenhouse gas emission impacts come from using needing to cool the urban heat islands more. One of the interesting ones is that it also increases ground-level ozone. Ground-level ozone is the bad ozone because when there's more of that, it's harder to breathe and people who have asthma have a harder time.

In addition to – there's some water quality issues and also, human health issues. You probably seen lots of newspaper articles over the years but what tends to happen is when there's a heat wave or an extreme heat event, the heat island effect makes that heat wave worse.

And the CDC recently released some information showing that between 1979 and 2010, the death rate as a direct result of exposure to heat was generally around 0.5 deaths per million people. So it is a very serious issue. It's a real issue and the heat island can increase those deaths.

Slide 8: Climate Change and Heat Islands

Victoria Ludwig: In addition to heat wave, we have climate change which has shown that there will be an increase in the number, intensity and duration of extreme heat events. So climate change is increasing the heat event, and then the heat island effect is exacerbating those heat events. So you have kind of an escalating process.

So they're interacting with each other, climate change, heat wave, heat island and causing the health and environmental impacts that I just mentioned. So if you try to reduce the heat island effect, you can also – you're also mitigating climate change and you're also adapting the climate change by helping to reduce your energy demand and improving the health of the residents and the quality of life in your city.

This graph is from EPA's new climate change indicators report which has a stat that from – I believe this is Noah that shows the increase in the number of hot days that are over the 95th percentile. The orange triangles indicate days that are hotter, and you see that there are quite a few of those. So just indicating the reality of climate change and how it's increasing temperatures.

Slide 9: Mitigation Strategies

Victoria Ludwig: But the good news is there are things you can do about the heat island effect. As an individual, you can do things but also as a community, you can do things. There are many things you can do but we will focus today on – I'm going to mention these four. These are the most common and the easiest for communities to implement.

You can plant trees and increase vegetation, green space, open space. You can install green roof on your commercial buildings and even houses. You can install cool roof and you can pave your roads in your parking lots and your sidewalks with cool pavements. I'll explain what each of those are and why they are beneficial. Each of these mitigation options has many benefits, environmental, social and economic and health – and public health wise.

Slide 10: Benefits of Mitigation Strategies

Victoria Ludwig: First off, trees and vegetation. When you plant trees and vegetation, you are reducing the need to cool the buildings in your city. That in turn reduces air pollution and greenhouse gas emissions. Trees and vegetation also sequester carbon. They increase the moisture in the air and they improve the quality of life overall in an urban area. They also help retain storm water and reduce erosion.

A green roof is something that involves planting either a small layer of vegetation on the roof or planting a full-blown system of trees and bushes but either way, you're increasing shade and you're helping to keep the air cool by releasing moisture into the air. The reducing of the temperature of the roof in turn causes less need for electricities and then you get all of these subsequent benefits that we've been talking about so far.

A cool roof is something that reflects the sun more so that it helps to cool the roof as well and this can reduce the amount of electricity that's needed to cool the building which in turn should lower utility bills. It also makes things more comfortable for the people in the building.

Cool pavements which can include many different things but in general, often are permeable pavements have many benefits especially in the area of storm water. It helps to reduce the of storm water that's flowing off into our waterways. An interesting side effect is that it can

increase the traction of cars because more water is being drained off the roads. This is a public safety issue. And then in turn, they also are cooler because they're permeable reducing the temperature in the area where they're located.

Slide 11-12: EPA's Heat Island Program

Victoria Ludwig: EPA as we're looking at this issue, we have had a heat island reduction program since the early 2000, and the goal is to work with state and local governments, non-profits, universities, all kinds of interested parties, the general public to improve – increase the amount of strategies that are being implemented the reduce the heat island effect.

Slide 13: Heat Island Program Resources

Victoria Ludwig: We encourage sharing of experiences, networking and we have technical assistance and tools that can help communities better implement the strategies that I just spoke about. Specifically, among other things, we have a Website which is chock-full of information that I would encourage you to look at. We have a newsroom where we keep track of the latest research and studies that have come out.

We have a database of case studies, examples of what communities have done in this regard. So if you're interested in learning about what's happening in your state, you can check that out. We have a compendium of strategies which is a guidebook that explains the basics of the heat island effect. It goes into detail about each of the four mitigation strategies I mentioned, and it includes examples of what communities are doing in terms of policies, laws, financial incentive, et cetera.

We have webcasts. Today is one obviously, and we have a newsletter that we put out every other month. You can sign up for that, no problem. Go to the address there. We will keep you up-to-date on future webcasts and also let you know about new studies and research and conferences and things related to the heat island effect.

Slide 14: EPA Contact Info

Victoria Ludwig: And if you have more questions, please feel free to contact me anytime. We're here to help. Thank you very much for your attention. Again, if you have any questions for me, please just type them in and we'll get to them at the end of the webcast.

Poll Question #1

Victoria Ludwig: Before we go further, before we go to our next speaker, we'd like to do a poll question which what you'll do is I'll give you a few minutes to answer and make a selection.

Wendy Jaglom: So the poll question should appear on your screen now and the question is which of the following heat island mitigation strategies are you most interested in learning about, trees and vegetation, green roof, cool roof or cool pavement? So go ahead and select your choice. I can see the answers are coming in now and I'll give you just a few more seconds to submit your answers and then, we will reveal the results.

OK, I'm going to go ahead and close the poll and reveal the results. And it looks like about a third of participants are interested in trees and vegetation, 30 percent in cool pavement, 20 percent in green roof and 17 percent in cool roof. So pretty even split across the board. And so that's our first poll question.

Victoria Ludwig: Great. Thanks, Wendy and thanks, everyone for answering. This is good feedback for us to help us guide our future activities.

Louisville Urban Heat Island Reduction

Slide 1: Title Slide

Victoria Ludwig: All right. Let's get into our first presentation. Maria Koetter is going to speak about the city of Louisville's work in the – with the heat island effect.

Maria is the city of Louisville's first director of sustainability and she wrote the city's first comprehensive sustainability plan called, "Sustain Louisville" which was put out in 2013. Maria's previous experience in the environmental field includes working with both government and Fortune 500 private sector clients.

Maria is going to talk about Louisville's very comprehensive approach. I hope you can learn from that. Maria, thank you for joining us. Go ahead, please .

Slide 1: Introduction

Maria Koetter: Hey, good afternoon, everybody and greetings from Louisville. It's really nice to get to speak for you today. First, just a couple of quick facts about our city. Louisville is actually structured with a merged city and county government with a strong mayor. We have a population of 750,000 and about 400 square miles. So that's you know, kind of keep in mind for the background of this conversation.

Slide 2: Office of Sustainability

Maria Koetter: OK. So I was actually appointed by the mayor and the Office of Sustainability was formed in 2012 and in that year, I wrote our city's first comprehensive sustainability plan which I'm sure if you're familiar with city sustainability planning, these six focus areas would look pretty familiar and within those six focus areas, we had 19 goals and then a number of starting initiatives that we had 63.

So the plan have about three over arching objectives, protecting the environment and reducing our carbon footprint. Louisville interestingly enough is a results of similar factors that in effect to urban heat island, we also have one of the worst carbon foot prints in the country and that is partly due as I said to being geographically located in a big River Valley.

So then, ensure the health, wellness and prosperity of our citizens and startedly great a culture of sustainability. So those are the three over arching objectives of our comprehensive sustainability plan.

So then just recently, we issued the one-year progress update which was everything that we competed in 2013, and some of the original 19 goals were strengthened and slightly revised, then we went down to 17. So the – now, we're looking at 17 main goals, and then the key change this

year was that we included all the baseline metrics where we could. And I think, that's very important to measuring progress in going forward.

Slide 3-4: Urban Heat Island Study

Maria Koetter: OK. So Dr. Stone, Dr. Brian Stone is a professor at Georgia Tech University and in 2012, he published a study of the top 20 cities with the hottest heat island effects, and Louisville sadly enough was at the top of that list. But as a result of this work, we were recognized in a bunch of national publications and of course, locally this was a very big topic. And this chart was basically what was published and really, you don't have to have any science backgrounds to look at this and understand that this is alarming and it was a call to action.

So as I said, when this slide hit the press, we – you know the folks from the city became concerned and Dr. Stone actually made a trip to Louisville to present his findings. He spoke at a number of community forums and at that time, the mayor had recently formed a tree advisory commission because we also struggle with tree canopy issues. And so, all these things came together very nicely.

Slide 5: Surface Temperatures

Maria Koetter: So this is – so the study began in January of this year and this is one of the slides that Dr. Stone has provided that shows the first analysis of our data and this is the surface temperature analysis. So the red squares show that over 95 square miles have surfaced pressure of 93 degrees or more on the day of this picture, this image which was 2010.

Then, over five square miles exhibited surface temperatures in excess of 100 degrees. So that's the red cells. So the orange cells, we had 95 square miles and the red squares were 5 square miles so you can see, this is pretty significant.

And one of the exciting or interesting things that we know that I think that's been interesting as this slide, you know we just presented this last week and again, the studies just began in January is that five of our six most significant hotspots are outside of the downtown core.

So I think that when you talk to people around the community about you know, the urban heat island, it's what those it mean to me? And we can show this slide and say, it does affect you, it's not just the downtown. So I felt that that was some really good information to have.

Slide 6: Urban Heat Island Grant Project

Maria Koetter: So the grant as I mentioned, well, the project is fully funded through private grant. We applied for and received a grant from a funders network for smart growth and livable communities and that program requires a one-to-one match. So we have the good fortune of a couple private foundations that sets up and were willing to also support and match that, and then – so we have a total budget on this project of \$135,000.

So again, it began with a surface temperature analysis and we got that you know, image from satellite imagery and from there, we are building – Dr. Stone is using some of the resources

locally which has visibility down to the two split interval and using that information to actually do a land cover assessment, and totally building out this model for the whole city which is as I mentioned, 400 square miles. So it's a huge undertaking. And then from there, he's weighing on the information about the climate models, he can do the temperature projections based on that.

So one of the other important things that we're looking at through this study is what are the health impacts of heat? We know that you know, to be a city of – a viable city and in the year 2015, we – it's bad enough to feel like more hot but we know that heat related deaths are significant a significant issue and are going to continue to get worse as you know, we see more severe summers in the years ahead.

So we are using and layering on to this study population vulnerability assessment because we have a large portion of our population living in lower income housing that is of course, the least energy efficient, housing stocks typically. So we want to make sure that people living in these areas actually are – that are impacted by the heat effect are identified and that we can physically tailor our heat mitigation efforts to those parts of the county and taking in to account, the population, of vulnerability and the risks associated with that.

So the outcome of the study is a heat mitigation plan. So part of the modeling is where the information is loaded in, and then the scenarios are going to be populated, and then one scenario is going to be tree planting. So these – again, these are the solutions that we're going to be looking to combat our urban heat island issue.

So one will be tree planting, another would be – tree planting and green roof, another would be surface coating so cool coatings including pavement, street sidewalks, building roof. And then, reflectivity of those aspects as well and we're also looking at waste heat. So waste heat in Louisville, we have a lot of mobile source emissions. Vehicles are significant issues and of course, that contributes to poor air quality. And then, just the way heat is generated by buildings specifically in our downtown area.

OK. So the mitigation plan then, we'll have this tailored solutions that actually will tell us if you plant these many trees in this part of town or this much cool paving or this much green roof, then you will reduce your heat island X amount or at least mitigate. So slow down the acceleration of our issue.

Then, it's really great that we included as part of this grand project, a portion of the funding to do robust community engagement because as you know try to teach people about something new and different and you know that everybody wants to know why should I care, but our plan here with the community engagement piece is to specifically target the folks living in those communities that are most vulnerable to heat stress.

So you know, it's not any good, it doesn't do the public any good if we know the data, we have to be able to share that and get that out there in the community. So at this time, you know we already have things underway. As I mentioned, Dr. Stone actually came up – and he was in town a couple of weeks ago and presented the preliminary findings of his study which is the heat grid map that I should a couple of slides back and we had a wonderful response.

We have several community meetings and I had arranged different stakeholder group meetings, and the crowd was full. So people are really interested in this and I think that's great and of course in the future as I said, we will be continuing to plan for our engagement strategy when we get the results.

Slide 7: Urban Heat Island Management Plan

Maria Koetter: So this project is a 14 months project. So we actually – 14 to 16 months. So the actual report and management plan will be issued next May. It's kind of what we're targeting. So we have some time between now and then to actually come up with our point and strategy and how we're going to actually use this project to mitigate our heat island issues. All right. Moving along, now, as I said, we – you know we have the initial slide that showed Louisville's heating is hotter than other cities but what is our baseline for improvement?

So having that information is going to be vital as you know to impact policy decisions and how you know, that we can play a role in being a leader with our own facilities and building then what – how we spend the citizen's dollars but we also want to look at things such as code, you know strengthening our building codes to promote energy efficiency and the cool roof and green will both do that.

Also looking at potential landscape ordinances to protect trees, reduce our urban heat impacts and of course, then, we're conserving water as well through trees and grand structures solutions which also help combat heat island. And then, you know obviously, we want to manage sprawl and promote density because that'll do good things as well with respect to the project.

Instilling heat considerations on all developments, you know some things we're seeing around the country are cities that are requiring a heat impact analysis for new developments. So showing the change of temperature from bare ground, ground or green space to develop. So once we get the plan, we're looking forward to implementing and as I said, we're already cataloging some of these policy changes and beginning to incorporate strategies in the budget.

Most importantly, to start the conversations around you know, what are we going to do. So I think if we start now, by the time we have the full data and document in the spring, we'll be well positioned to actually take steps. So of course, the fiscal year is of July 1, so by next July 1, you know my hope is to have monies earmarked to actually do implementation and lead as I said from the city level, and then incentive programs and different things like that, that we're looking at.

Slide 8: Tree Canopy Assessment

Maria Koetter: Oops, skipped a slide. OK, so here – so I just also wanted to mention a parallel project. At the same time that we writing ready the grant application package, the mayor as I mentioned formed the tree advisory commission and they have begun a tree canopy assessment. So that project is only a six months project and it's going to wrap up this fall.

So it was also funded – actually, publicly funded and as I mentioned that you know, we know that the trees are single solutions for multiple problems, air quality, water quality and heat. And so, the school district was an active partner with us in helping to fund that canopy study.

So part of the – another thing that I'm doing out of my office is offering a stipend program, a matching program for our MSD school district to help incentivize green infrastructure and anything to decrease urban heat island, as well as water quality and air quality.

OK. So the next thing you know that also kind of helps us this is that the tree commission is working on you know looking towards the future strategies in the next year or so to come up with a tree protective ordinance. And again, that's another example of something that must be a collaborative process and you don't want to turn into a political hot potato because it's really just about the good of the community and building a quality of life for the future.

And you know, kind of going back to the beginning of this process, I think when you are writing an application for a grant, it's – there's sometimes some challenges around that and obviously, finding the matching funds to do that were kind of part of the biggest challenge because we – as you can see, sort of the timeline I've painted, we – really, the stars aligned and we are able to get this project off the ground, the community input, the buy-in, the funding to make this project happen.

So and the knots and bolts, everything just kind of fell into place after the main hurdle was getting that grant application submitted. So I feel like we've been really fortunate that you know, the heat study came out when it did, the Office of Sustainability started when it did and the projects just fell on the place where we were ready to do this. And along with the findings of the tree canopy assessment which we're going to have by the end of this year, we're really poised to have a lot of data that's very current, very cutting-edge, even more refined and detailed than what the city's got two, three, four, five years ago.

So getting both of these studies in really close together I think is going to really position us to make a big impact and try to reduce our urban heating on and plan for the future. I think one of the things that we learned from Dr. Stone is that this does take a while in terms of specially trees, we all love trees but when you look at the growth cycle, it may take some time.

You know it's really rapid reduction strategy but obviously, that's something that we're seriously interested in. And then, if you like for us, going with cool roofs and cool pavement, coatings and that kind of thing will be something we will try to push as more of a near-term, you know even in the 2 to 3 year range that we can do this pretty quick results.

Slide 9: Thank you!

Maria Koetter: So that's pretty much where we are, where we've been and thanks again for giving me the chance to speak here. Here's my contact information and feel free to reach out if you have questions or anything that I can do to help. I'll be happy to support.

Victoria Ludwig: Great. Thanks, Maria. That was really interesting presentation because it's – I think it's great to see how you're doing it very comprehensively in terms of the heat management plan and starting from a study from – starting with the science and the research. And we look forward to continuing to follow your efforts, wish you luck in the future and maybe we can have you back in a year or so after you have implemented some activities, and we look forward to that.

Maria Koetter: Great. Thank you, us too.

Poll Question #2

Victoria Ludwig: Then, great. OK, before we go on to the next speaker, we wanted to do another poll question. So get ready to vote. Please let us know at what stage of the heat island mitigation process are you?

Are you not even talking about it yet? Are you starting to talk about it or develop a plan? Are you assessing the impacts? Are you identifying and selecting adaptation – mitigation and adaptation strategies or are you implementing strategies? So we'll wait a minute or so to let you vote. Please do that.

OK, thank you for voting. Let's look at the results here. We have – it looks like the majority of people are starting to talk about it or develop a plan, about 1/3. The second highest answer is not even talking about it. So we're really glad you're on the webinar today, 12 percent and 13 percent roughly equal our assessing the impacts and identifying strategies, and 21 percent are implementing strategies. That's great. Thank you for all your efforts and for answering.

UHI Mitigation – The Tucson Story

Slide 1: Title Slide

OK, great. Now, we're going to move a little bit west, a lot west actually in the country and hear what the City of Tucson is doing for the heat island effect. Our speaker on that will be Irene Ogata who is the City of Tucson's Urban Landscape Manager.

She's going to talk about what Tucson has been doing in terms of trying to mitigate the heat island and basically, an area that has scarce water resources. So it's a different perspective I think than Louisville. Maria has been involved in the urban heat island field for over 15 years. So Maria, you can start. Thank you.

Irene Ogata: Or Irene. Hello?

Victoria Ludwig: Irene

Irene Ogata: Yes, OK. So I'll go ahead and – thanks, Victoria for this opportunity to share one small story of how Tucson, that is a city in the far West and air is Southwest is tracking or tackling urban heat islands. So the story is Tucson is in the desert, the Sonoran desert to be specific.

Slide 2: The Story

Irene Ogata: So by definition of a desert, we're already in a climate that's hot and dry with less than 10 inches of rain. So this is about a glimpse into the future, what happens or what will happen if we do nothing today and what are the issues today that are tied to each other, and planting shade trees today can make a difference tomorrow.

When I first came to Tucson in the 70s, I have a home with an evaporative cooler and no air conditioning. So at night, I would cool the house by opening the windows and then, as the temperatures were dropping – the temperatures were dropping to about 60 to 70 degrees Fahrenheit.

Slide 3: It's Hot

Irene Ogata: Today, I do have air conditioning and at night, I don't really open the windows very much because the temperatures are in the 70s and 80s. So we know that it's hot in Tucson and actually in 2005, the record was 39 consecutive days over 100 degrees Fahrenheit. So if you look at the map on the right, it's a kinetic, a surface temperature in 2005 at 10:30 at night. The scale of the lower left is the temperature where yellow is the hottest and blue is the coolest.

And if you look at the lower left quadrant – lower right quadrant, this is the urban area of Tucson in the city and it's very easy to pick up the airport, the regional shopping center that has the

malls, expansive parking lot and large buildings, the Interstate I-10 and I-19, as well as the grid of roadways within the city because these are all yellow.

In contrast, you can see the Santa Cruz River in the upper right-hand corner, that's cooler and even though it's a dry riverbed, it does have ceric riparian vegetation so it is cooler. The Catalina Mountains on the right-hand corner has an elevation up to 9,000 feet and does have an Alpine biome so it's very cool.

But you also see in the lower left-hand quadrant some yellow and red, and this is really the bear earth desert and so, the desert is naturally hot. In 2000 – the 2013 assessment of climate change in the southwestern United States indicates that in the future, there will be less nighttime cooling and that the documentation since 1987 also indicates that heat and drought as the number one weather related cause of death in the United States. And in Arizona, we are the highest in the nation

Slide 4: It's Hot

Irene Ogata: These science assessments indicates cities will be getting hotter due to increased heat waves. I think some of these have been mentioned by both Victoria and Maria, increased energy consumption and these in turn, lead to increased stress on at risk population. So we do nothing in our urban Southwest heat islands, we'll be experiencing temperatures of 5 to 10 degrees higher by the end of this century, increased and more severe heat waves by a factor of two weeks.

Increasing temperatures will ripple into increase in air pollution. And we'll also have a decrease in rainfall within the urban areas but these rainfalls will be more intense, leading to greater flooding and damage due to aging infrastructure. That as Victoria said, there are actions we can take today and one of these is planting shade trees, and this is a practice being done by many cities.

Slide 5: Issues in the Southwest

Irene Ogata: Marie mentioned that they were doing it in Louisville, but here is the Southwest, planting trees also brings into play, our limited water resources. What do we know about water supply in Tucson? Tucson has two major sources of water, groundwater which is being depleted and also, being supplemented now by the surface water but our surface water comes from the Colorado River.

So it's pretty far away and it's coming via the central Arizona project, and there are early warning signs that this is a diminishing supply is there are no future increases in snowpacks in the Rocky Mountain. So for several decades now, Tucson water has this conservation ethic and it has included derogating large outdoor landscapes such as golf courses and ball fields with reclaimed water.

Ultimately, the goal is to create a cooler and more resilient community. So one strategy is to increase the urban force canopy but also continue the message of the need to practice water

efficiencies. So one approach by the city is to capture more local rainwater. In essence, a third bucket of water that can be used for outdoor landscaping.

Slide 6: Issues in the Southwest

Irene Ogata: The city is doing this by addressing rainwater in three smaller buckets. On the commercial side in 2008, the Mayor and Council passed a commercial water harvesting ordinance that required developers, commercial developers with 50 percent of the irrigation water needs for plants be supplied through rainwater harvesting.

On the residential side, Tucson water offers an incentive, a rebate of \$500-\$2000 for passive or active water harvesting on residential properties. And internally within the city, the Department of Transportation adopted a Green Street policy that requires all new and redeveloped roadway projects to incorporate as much green infrastructure as possible. And Victoria talked about the storm water benefits that this also provides.

Slide 7: Issues in the Southwest

Irene Ogata: The city has limited resources both in funding and staff, so what tools could we used to target tree planting to areas where they were needed the most? We had already done some select public rights of ways, tree inventories and quantify the value of public tree eco-services but this really didn't provide the information of what neighborhoods had the least percentage of tree canopy.

In essence, we had no private sector tree information. A few years ago, working with our Pima Association of Governments, that's our regional Council of governments, Josh Pope processed Aerial LiDAR Data and this now started to begin to provide that overall tree canopy data and we were now able to also link it to the City of Tucson's neighborhood.

Slide 8: Issues in the Southwest

Irene Ogata: Dr. Sharon Harlan at the Arizona State University was doing research on urban heat islands and intercity neighborhoods, and finding that lower income neighborhoods are hotter. The Arizona Public Health Services, a statewide agency utilizing the 2010 census block information mapped the disadvantaged neighborhoods with potential heat stress, vulnerable populations for both the City of Tucson and the city of Phoenix.

Slide 9: Data for UHI Toolbox

Irene Ogata: This census data includes information that we've already been talking about, the vulnerable populations. We know it's about the young and the old. So this data includes populations under age five, 65 and older, 65 and older who live alone and now, the lower income families that is incomes below poverty. In Tucson, you can see the four red high vulnerable census blocks that were mapped and now, we have this layer of information to add to our tools of information.

Slide 10: Planting Project

Irene Ogata: So the tools of information. Now we have several pieces of mapped information we can overlay. Again, in conjunction with the Pima Association of Governments. They put an interactive online map layering the information of this LiDAR canopy. The Arizona State health services map of vulnerable indexes, and then we were also able to acquire a surface temperature map from the University of Arizona as Dr. Eve Harper was doing her dissertation.

And we already have the City of Tucson's neighborhood designations. This tool is now available to non-profits, agencies, individuals, who may be interested in launching their own programs for applying for grants.

Information from this online tool helped to identify our vulnerable neighborhoods in the city. And in the fall of 2003, just last year, the mayor launched a tree planting campaign with the goal to be completed by the end of this year. The campaign invited businesses, individuals, schools and non-profits to participate.

Slide 11: Planting Project

Irene Ogata: A major partner with the City of Tucson is Trees for Tucson. They provide trees to homeowners at a very reduced rate. These trees are subsidized by Tucson Electric Power and Trico Electric Power. The goal is trees are planted to shade homes to help reduce electric consumption. Trees for Tucson has utilized this online mapping tool to also look at which neighborhoods they could target to reduce the urban heat islands, and they're pursuing this.

Other businesses and organizations that have contributed to funding the tree, planting trees is the Association of Realtors, along with the realty company itself and a car dealership. The city's transportation department has also partnered with TEP to remove trees under power lines. We often see those terrible directionally pruned powerline trees.

And so, TEP is removing them, and the city is replacing them with two trees that will not grow as tall and we are not planting them directly under the power lines. In essence, we're utilizing the practice of right tree in the right place, and water harvesting these trees as much as possible. This will greatly improve the coverage of the tree canopy without the directional pruning.

By connecting these issues of water and shade trees, the community gained tree canopy coverage without excessively dipping into the portable buckets of water. Outdoor shade trees are now utilizing rainwater harvesting on commercial and residential properties, and streets is implementing green infrastructure practices along public roadsides where there are tree plantings.

Slide 12: Planting Project

Irene Ogata: The green infrastructure practices in Pima County has been recognized by the EPA in their green infrastructure program and to date, the mayor's campaign has tallied over 9,600 trees, so we're well ahead of schedule. Developing these online tools, applying storm water

management and water harvesting education and outreach has been accomplished only through the involvement of a number of agencies and non-profits.

Slide 13: Acknowledgements

Irene Ogata: Without the assistance of the various individuals, these development of tools, planning of projects or implementation of practices would not have been possible. It has been because of the common interest of public, private, non-profit and individuals who have been interested in UHI mitigation, water resource reliability and social justice issues that the city is able to continue to improve existing programs and develop new initiatives.

Slide 14: Questions/Resources

Irene Ogata: Here are some additional resources and I guess our questions will be reserved until after David's presentation. Thank you.

Victoria Ludwig: Thank you, Irene, that was great. I think for those of us who are listening in from the East Coast, it's really interesting to hear your perspective coming from an area that has water resource scarcity issues and so – and you are doing a great job of addressing that.

It's a good example for others, similar communities and also, the aspect of bringing in social justice and environmental justice is an important issue that I think all communities are interested in. So it's great to hear your perspective on that as well.

Poll Question #3

Victoria Ludwig: Again, if you have questions for any of our speakers, continue to type them in to your screen. We'll answer them after David but before we get to David, I wanted to ask another poll question. If you could please tell us, which of the shade tree benefits mentioned by Tucson are the most important to your community?

Is it because you want to reduce storm water peak flows or because you want to filter air pollutant? Are you interested more in the transpiration to cool the air nearby? Are you interested in reducing the heat absorbed by dark surfaces, or are you interested in reducing building energy consumption? Please type in all that applies and we'll give the answers in a minute.

OK, thanks for voting. Here are the answers, 61 percent of you said you want to reduce storm water peak flows which at EPA, we know that that's an important issue right now for many communities. We – 29 percent want to filter air pollutants, 41 transpiration to cool the air, 58 to reduce the heat absorbed by dark surfaces and 38 to reduce the building energy consumption.

I think the lesson here is that shade trees have many, many benefits which is great. So you picked your benefit there. Thanks for answering.

Hot City, Cool Surfaces

Slide 1: Title Slide

Victoria Ludwig: Our final speaker-practitioner is going to speak about the experience of Los Angeles. David Fink is the Director of Campaigns at Climate Resolve which is a non-profit environmental group based in Los Angeles. Prior to his time at Climate Resolve, David worked as a consumer advocate and also helped run statewide ballot measure campaigns in multiple states. David, thanks for joining us and you can begin now.

David Fink: Great. Thanks so much and thanks for having me today and thanks, everyone for listening in. So yes, open up here. OK. So here we go, OK. So my name is David Fink, I'm the Director of Campaigns at Climate Resolve. We are a non-profit environmental group based in Los Angeles.

Slide 2: Climate Resolve

David Fink: And you'll see here, our mission is to make Southern California more livable and prosperous today and for generations to come by inspiring people at home, at work and in government to reduce greenhouse gas pollution and prepare for climate impact. So slightly misleading because we – although a lot of our work is focused on Southern California, we work at the state level here in California and we're working with a number of local jurisdictions throughout the state and even outside of California.

I just briefly want to talk a little bit about the work we do, and then I'll sort of move on, and two areas I just want to mention briefly. One of the things we do is we work a lot on climate messaging. So how do you talk about a climate change in a way that is relatable to people, that people understands who we work with, local governments, academic institutions, other non-profits on this.

And you know really, I don't want to talk too much about this. Maybe at the end if I have time, I'll go into this a little bit more and sort of through the psychology of it and everything but really, just want to hit on one main point which is you know, in talking about climate change which is absolutely a global issue, it's vital to talk to – bringing it down to the regional or local level, and relate it to people's day-to-day lives in a real and tangible way and offer solutions, and that's how people become engaged and understand how they can be part of sort of the solutions that are happening around them.

The other thing we do is we work on policies. So we work on legislation and campaigns, et cetera. And we do a lot of urban heat – or I'm sorry, climate change mitigation work but we're also very focused on climate at the patient, operating on sort of the premise that there's a certain amount of greenhouse gases that are already in the atmosphere.

So no matter how much mitigation we do today, if you're to pull the plug and stop emitting greenhouse gases 100 percent, there's still going to be some change. We're on a certain trajectory and it will take time for that to ark. It will take time for it to start to level off. And so, we need to make investments today that prepare us but not just prepare us for the change that's coming but also, have the benefit of the mitigation side.

Slide 3: Regional Heat Impacts

David Fink: And moving on to next slide. So here in Los Angeles, back in 2011, our previous mayor, Antonio Villaraigosa used some – our funds to commission UCLA to do a series of studies on the future impacts of climate change in Los Angeles. So what are the impacts going to be in Los Angeles between the years of 2014 and 2016.

The first of these studies came out in 2012 and was based on temperature. And so you'll see the slide here, there are parts of the city Porter Ranch which is in these Northwest corner of Los Angeles. The number of extreme heat days which are days of 95 degrees and above are going to go from eight to 30. In Solomon, the northern part of the city from seven to 25 and Woodland Hills from four to 16. So there are parts of the city that we're expecting to see an increase of extreme heat days by double, triple and in some parts, or quadruple.

So those are – that's really significant. Everybody knows what it's like when it's 95 degrees outside. Everybody knows how unbearable it is when it gets 100 and above. The other thing – the other important thing that came out of these series of studies is that the projected temperature increases are going to be four to six degrees throughout the city.

So I'll sort of circle back on that later but the really important thing here is again, bringing this down to the local level. You know not necessarily talking about this issue on a national or global level but you know again, people know what it's like when it's a 95 or 100 degrees above. These studies – these series of studies show what it's going to be like in every neighborhood and that type of information is something that's real and tangible and really sort of engages people and makes them want to start to make changes in their day-to-day lives.

And I want to point out, many of you probably saw the national climate assessment that came out a couple of months ago, and I thought they did a really good job of it's not just springing the issue but talking about regional impacts. So the studies that Maria was talking about earlier and the study I just mentioned that of UCLA which bring the issue down to – bringing impacts down to regional level.

Slide 4: National Climate Assessment

David Fink: Any part of the country you're in, if you go to the national climate assessment, you can click on your region and you can see what the impacts are going to be in your area. So I think that kind of information is really important in terms of informing not just the folks in your city, not just the citizens but also, local elected officials and policymakers.

Slide 5: Effects of Rising Temp

David Fink: So I won't spend too much time here. Victoria, Maria and Irene all hit on sort of the impacts of rising temperatures, greater peak electricity demand, more pollution, public health risk. And you all already heard about the heat impacts but I just want to put a fine point on this.

The number of deaths every year, the number of weather-related deaths, if you combine the number of weather-related deaths for all weather systems or all weather – all sort of weather types, so we're talking hurricanes, floods, blizzards, in a typical year, it's less than the number of deaths related to heat.

So heat is the sort of because – has sort of the biggest impact. And you know, heat is sort of the – is sort of the invisible killer if you will. You know the – with the hurricane – you know the hurricane is coming, you see the rains and the winds, the floods you know – if there's floods, you see the floods. Tornadoes, you see the tornadoes, you see the blizzard, you see the snow but heat, people underestimate the impacts of heat.

So when things heat up, people tends to not pay attention to sort of the, what's happening around them and this is part of the reason why it's such a – has such a great impact. And you know earlier, Victoria mentioned about how the urban heat island effect is actually worse at night and the reason for – one of the main reasons for that is all day long, the paved surfaces in your city are absorbing this radiant energy from the sun and when the sun finally goes down is when these surfaces finally release that heat. So there's less cooling at night.

Slide 6: Cool Roofs

David Fink: So the body is used to being able to cool itself more at night and when there's less cooling at night, it has this sort of greater impact. So here in Los Angeles, we recently passed a cool roof ordinance and just briefly, you'll see – most of you know sort of how cool roof works.

Slide 7: Benefits of a Cool Roof

David Fink: The – moving on, so the benefits of the cool roof here in Los Angeles – these numbers are based on Los Angeles. So residents will save money on the utility bills cumulatively up to \$30 million per year, decreasing greenhouse gas emissions to be put on a 40 metric tons of CO₂ per year, provide the healthier indoor environment, reduces likelihood of outages, aiding resilience and helps residents survive heat waves.

Slide 8: 2013 LA Ordinance

David Fink: Our organization began working with our previous mayor, Antonio Villaraigosa in January of 2013. And in – on March 13 of 2013, he directed the Los Angeles Department of Building Safety to write new building code regulations requiring residential cool roofs. The following month, the Los Angeles Department of Water and Power expanded an existing cool roof rebate.

So I just want to note, while we do have a rebate for cool roofs, I do not think a rebate is a necessity or even necessary. Los Angeles decided to expand the rebate because Los Angeles sort of – is sort of an earlier adopter in this area, but as I'll talk about in a minute, there are hundreds, if not over 1,000 products, cool roofing products that are cost competitive with a typical roofing product.

So the idea here in L.A. is that the – a year from now, the department will sort of reassess the market and potentially phase out the rebate at that time. And lastly, as we work through the city process last year, December 17, Los Angeles City Council unanimously approved the residential cool roof ordinance.

Slide 9: LA's Cool Roof Ordinance

David Fink: So before I talk about the ordinance, I want you to notice on the left, that is a picture of a cool roof. There's this misconception that a cool roof is just a white roof, it's a roof that is blindingly reflective. And today, there are like I said, well over 1,000 cool roofing products, many of which looks just like your typical roofing product.

You know the first thing I hear from folks when we take them out to a site where there's a cool roof is, it looks just like a regular roof which is exactly what you want to hear. So here is sort of the main part of the ordinance, and the ordinance applies to all new constructions and to re-roofs where the reroof is 50 percent or greater of the square footage.

You'll notice there's a few exceptions and in the bottom table, I just want to point out, thermal emittance and solar reflectance. Those are the two ways that a material is tested for its cool properties. So thermal emittance is the efficiency with which a material cools itself, and solar reflectance is a material's ability to reflect sunlight.

Slide 10: Cool Roof Rating Council

David Fink: The – again, I mentioned that there are well over 1,000 cool roofing products available. If you go to the cool roof ratings Council Website, you can see them, you can see the prices, you can see what they look like. The Cool Roof Ratings Council is a third-party independent rating rater. So they rate products. They are the only organization right now who does this for roofing products.

Slide 11: Cool Pavements

David Fink: Here in L.A. we've also been working to develop a cool pavement material the city can use in its asphalt slurry. So we've been working with Lawrence Berkeley National Lab, the Bureau of Street Services, a pavement manufacturer to develop this material. The – we've done a series of pilot projects. We're going to be doing another pilot project coming up in the next couple weeks.

We think we're very close to having a material the city can use, a material that meets sort of all the necessary standards. So there are materials that are already available that can go down in

parking lots and sort of a low traffic road but in terms of your very high traffic Boulevard, there are not a lot of materials out there that's why we're working to develop a new material that is durable enough and has sort of the property coefficient for breaking and safety.

And so, we were – like I said, we're sort of in the process right now. The next pilot will be going down in the next couple of weeks and hopefully, we'll have something ready by the end of the year. And sort of you know – lastly, I just sort of want to talk generally about sort of our approach and the approach we've been working with a number of cities on.

Slide 12: Cities of Tomorrow

David Fink: And you know, some of the ways we sort of talk about it is you know, instead of doing things the way we were in 1950, it's time to start building the cities of 2050. And you know, it's sort of not enough anymore when we're talking about systems, when we're talking about infrastructure building, it's not enough to build things that serve a single purpose.

So you know, talking about roads and roofs, it's not enough to build a road that just serves motorists, it should also have these other environmental and urban heat island mitigation benefit. You know it's not enough to build a roof that just serves as a barrier between the outside and the indoors. So it – you know any sort of systems were talking about, we are talking about infrastructure.

You know again, with the understanding that change is happening, change is coming and in most of our cities, it's going to be hotter and we need to start thinking about how our systems operate. And you know, sort of on a much broader spectrum, you know the way – you we're talking with – we're talking climate adaptation and the way we've – literally, the way we have survived as a species, the way we survive as individuals on a day-to-day basis and the way we survive as a society is to adapt to a changing environment.

Slide 13: Thank You!

David Fink: In the way we like to talk about it at Climate Resolve is you know, in the coming decades, we are not just working to survive but we want to thrive. And that's it for today, I want to thank you for your time and if anyone has any questions or would like to learn more about the work we're doing, please feel free to e-mail me and I would love to work together and see how we can assist you.

Thank you.

Victoria Ludwig: Thank you, David. That was a great way to end your presentation because it's a great way to – a good final thought to the webinar which is that we want to – we don't want to just survive, we want to thrive. And that's what we're trying to do with the heat island program and other things that we do at EPA with local governments and state governments is really to improve the environmental quality of our communities but more than that, make sure that it's a healthy, prosperous place to live and that people are happy in the community. So it's really great

to hear about what you guys are doing in Los Angeles. I commend you, and thanks for joining us.

Poll Question #4

Victoria Ludwig: We have one more poll question before we get to the Q&A session. So please let us know what you think about this question which is, which of the following do you find to be or anticipate being especially challenging when cooling your heat island?

You can choose all that applies. Is it understanding or explaining the benefits to leadership? Is it identifying feasible strategies? Is it designing and implementing programs and policies? Is it funding – finding funding and resources? Is it finding government, NGO and other partners? Please let us know what you think.

OK, great. Thanks for voting. Here are the results. We have the predominant – the highest number of people thought that the biggest challenge is finding funding and resources. Next up is the challenge of designing and implementing the programs and policies, and then after that, 39 percent thought that it will be most difficult to understand or explain the benefits to leadership, identifying feasible strategies is 28 percent and finding partners is 19 percent.

Well, I hope that you'll take a look at EPA's resources. We do have suggestions for all of the above and we're here to help you with your challenges. Thanks for voting, that's the last poll question.

Question and Answers

Victoria Ludwig: Now, we'd like to start the Q&A session. I think we've been getting a lot so thank you very much. There are questions for each speaker. And so, I'm going to hand it back to Wendy to pose the questions to our speakers.

Wendy Jaglom: Great. Thanks, Victoria. So the first question is for Maria from Louisville. The question is what – was the tree canopy assessment a study of existing trees? If so, what metrics were collected? Tree species? Diameter? Or was it a plan on where to plant new trees?

Maria Koetter: Oh, I'm sorry. I was trying to unmute, can you repeat the beginning of that question ?

Wendy Jaglom: Sure thing. So basically the question was: was the tree canopy assessment a study of existing trees or a plan on where to plant new trees? And if it was a study of existing trees, what metrics were collected, for example, tree species, diameter, that sort of thing?

Maria Koetter: Oh, OK, sure. So the tree canopy assessment is currently underway and it's an assessment of existing trees, but it's not an inventory, so it doesn't give us species, diameter or any of that but it includes planting scenarios to bring our canopy up to tree planting timelines and scenarios, as well as locations to get our canopy to 30 percent, 35, 40 and up to 45 percent. So it really is a plan to increase our canopies.

We're right now around 27-ish. The central business district of downtown is only eight percent. So we have a long way to go .

Wendy Jaglom: Great. Thank you. The next question is for Irene and the person acknowledges that Tucson has planted 9,600 trees so far and they asked, have you done an assessment of the impact and if not, are you planning to?

Irene Ogata: Right now, we have not done an assessment. One is because they're scattered pretty much around the city. Even though we've tried to identify the target neighborhoods, they don't always end up there and we don't have a metric to measure the effect of the increased canopy.

We are looking at that right now on how to do that metric, and even looking at some of Dr. Sharon Harlan's data. Doing that assessment side could entail a lot of different types of equipment. So we're not quite sure about that one as yet.

Wendy Jaglom: OK, great. Thank you. The next question is for David. David, how cost-competitive are the products and materials, construction, et cetera for cool roofs, cool pavement and the like?

David Fink: Well, I guess in terms of the cool roofs, they're very cost competitive. You know I can mention, if you go to the Cool Roof Rating Council's website, you'll see that there are well

over 1,000 products that are available and in terms of pricing, you'll see that clay tiles, shingles are right in line with most traditional products.

There are some—sort of your cheapest asphalt shingles—you can get slightly below what the cheapest or lowest cost cool roof materials are out there but that's about it. It's a very small percentage. So it is very cost competitive.

In terms of cool pavement, this is sort of a new area. The materials we're working on, we don't have a cost estimate yet. We should actually have that within the next week. So I don't have a definitive answer on that but you know, it is like I said, sort of a new developing area and there aren't a lot of products available right now.

Wendy Jaglom: OK, great. Thank you. OK. So now, we'll ask a question of Victoria and the question is, when you say that there are strategies that can be adopted by property owners to mitigate UHIs, are there any studies on the affordability of these tactics and do you see policy or incentives ahead that will drive adoption of these tactics?

Victoria Ludwig: Good question. At the heat island program, we have tried to keep track of research that has been done and studies that have been done on the economic issues and also, we tried to keep track of where funding is available for these measures. And so, I do know that there has been some recent examination of this in many cities.

In addition to what David mentioned, we do have rebates and tax credits, and there are—the ENERGY STAR program does have some information on their website as well about cool roof products that are—that have tax credits applicable to them because they are energy efficient. So if you join our LISTSERV, you'll get information about the latest economic studies and things like that, that come out. But we are paying attention to that, it's an important question.

Wendy Jaglom: Great, thank you. So next, we'll do another question for Maria. Can you elaborate on the land cover assessment portion of the project? What resources or tools were used and was there any involvement with the USDA i-Tree tool?

Maria Koetter: OK. So the land cover assessment – OK, sorry, getting off speaker. The land cover assessment is where Dr. Stone is using high-resolution imagery and data from our GIS Consortium here in town. So we're not using i-Tree in that way. I have heard that there's something out there that's commercially available or that's available that I've just recently heard about called i-Heat, but we're not really using that either. I thought that was interesting though.

So yes, it's pretty much GIS information and data that we have, like I said, from our local Consortium and it's down to the two foot level resolution. So it's very accurate and it's very detailed.

Wendy Jaglom: Great, thanks so much.

Maria Koetter: Did that answer the question?

Wendy Jaglom: I thought yes, sounds good.

Maria Koetter: Great.

Wendy Jaglom: Sounds great. So next question is for Irene. Regarding the GIS tool that was used in Tucson, is this tool available for other areas and would it contain the data layers on census—in other words, on vulnerable population and tree cover?

Irene Ogata: I don't think – well, the layers that are available here on Tucson are of course very specific to this region only, but I think the census information, other cities could definitely use the same sort of data because that's just census data, but you would have to create your own map utilizing your own resources.

If you have a GIS person who would be able to link the census data to the mapping, that would probably really help. So on that one map of the Arizona Health Services, it has on there, the layers that they used from the census. And you may want to see whether or not those also apply in your community.

The other one is that same slide also had Sharon Harlan's link on there and you can read her report to see which elements she found affected those heat neighborhoods, besides low income. And I think that, for us, helped to drive some of that social justice data collection. And I think the Arizona Health Services also were basing that map on some of her data.

Wendy Jaglom: OK, great. Thank you. The next question is for David and I think you started to address this in your presentation but the question is, how does the city promote residential cool roof in areas where historic preservation requires dark shingles on metal roofing?

David Fink: You know the – I guess there are sort of two things. One if a city felt like there were a number of historic buildings, where that was a concern, that could be an exemption in the ordinance. And the other thing I would say is that because there are so many products now, that shouldn't be too much of a problem.

And I'm sorry, just real quickly, one point that I wanted to make that I didn't make earlier during the presentation was that the urban heat island effect in Los Angeles contributes to about 4 to 5 degrees of warming on average. And like I mentioned, in the middle part of the century, we're expecting 4 to 6 degrees of warming in Los Angeles.

So a comprehensive urban heat island mitigation plan that focuses for L.A. on trees, cool pavements, and cool roofs, and actually reduces temperatures, reduces the urban heat island effect 4 to 5 degrees. So if we – with sort of this comprehensive program, we can actually offset the warming that's expected in the later part of the century.

Wendy Jaglom: OK, great. Thank you. One other question for Victoria, apart from learning what different communities are doing, is there information on which approaches have been most successful in practice?

Victoria Ludwig: Like I said, it depends on how you define success. We tried to collect the case studies, as I mentioned, and then we did these webinars as a way for the communities to talk to each other and learn about how they were successful and what that means. EPA doesn't—we try not to really promote one strategy over another.

I would say each of those strategies that I mentioned as a mitigation option for the heat island effect has pros and cons. There are many—it's complicated in terms of estimating the economic success, and it also depends, I think, on what your success could mean, what your main priority is.

For example, because Tucson has water issues, success for them is going to be different than maybe in Michigan where they have plenty of rain. And so, it depends on what your community's priorities are, but if you read the compendium of strategies, you will learn what has been successful for the communities that we mention in there, and that I think can give you an idea of which ones have been the most successful, because some communities also do measure their success. They quantify the temperature reductions that have occurred, although that is a complicated thing to do, but they do also measure success in terms of the reduction in electricity use and consequent GHG reductions. So I think if you look at those case studies, you'll get a good idea of what might be considered most successful in general.

Wendy Jaglom: Great, thank you. So next, I'm going to ask a question for all speakers. So whoever wants to jump in and chime in first, feel free. So the question is: have any of the speakers done or know of scientific research showing or proving the air quality benefits of urban trees and vegetation? Also, have any of you dealt with the issue of trees that actually negatively contribute to ground-level ozone formation? So a question about air quality benefits – yes, go ahead, please.

Irene Ogata: Yes, so I know the one about that air quality and the negative benefits. There are negative benefits but trees and – I think it came out of – you know I was just reading that this morning. Although the study itself even from the i-Tree has come out that some trees do emit volatile organic chemicals, the VOCs and when they interact with the nitrogen in the atmosphere and the UV light, that it does turn into that smog.

So it's a bad air quality. Some of those trees are like oaks and eucalyptus and other trees, I think like ash and something else are less emitters so they're much cleaner and they do not emit that VOC into the air. But I always say, because we have a lot of oaks downtown is that you have to weigh the benefits of everything, it's not just the air quality but the shade, the heat and even this one article was saying, you don't get rid of those high emitters but just be more careful where you plant them.

So you don't want to plant a whole mass of oaks along the roadways where cars are also emitting the VOCs, and just be more cognizant. As our research and our data comes up and we're learning more, we just have to start figuring out how to work with that. I don't know, did that answer it, some of it?

Wendy Jaglom: That's great, would anybody else like to chime in?

Maria Koetter: Well, here in Louisville, we are in and out of attainment with our air quality constituents of concern. So I know that we have a direct correlation between heat, you know the temperature of the summer in our ozone alert days.

So you know, it's proven that obviously, heat is a precursor and contributes to the formation of ozone. So we here, last year was not so bad of a summer. So we were really lucky with our ozone alert days. We had fewer than usual. So we definitely keep an eye on that as it relates to air quality.

Wendy Jaglom: Great, anybody else want to chime in before we move on?

Irene Ogata: You know I'm just going to add another thing. I know there was that question about i-Tree. So if you do an assessment of your trees and you know species and size of the trees, the i-Tree does have a model in which it does generate the air quality benefits. So if your community wants to take that on, and i-Tree is – the software itself is to the USDA. So it's a free software that any community can use, you just have to learn how to use it.

Wendy Jaglom: Great. OK, the next question I'll ask is for David. Do you know – are there any practical studies on use of cool roofs to mitigate the urban heat island effect. I know of one, the reader said, I know of one study in Spain on greenhouses, but the rest of these studies seem to be computer modeled. Are there any real life studies now or any up-and-coming?

David Fink: Yes, I would point to work that's being done by a Dr. Larry Kalkstein out of the University of Miami. He's a synoptic climatologist and he's looked at several aspects and some of that data or some of that research being on how cool roofs or cool surfaces and tree canopies can reduce the number of mortalities during extreme heat event.

So he's done some really you know, important work in this area and I think, you know his work would be the best place to go to see that data.

Wendy Jaglom: Great. And then, our last question will be for both Maria and Irene. Are your cities looking at how a future climate resilient palette of these issues might differ from what has traditionally been appropriate?

Irene Ogata: I would say that it will change only because our climate zone is changing, that we are getting warmer. One, as I had said earlier about the VOC emitting trees, that we'll probably start looking at that, which ones are higher and how will we figure out on planting them. But also, some of the – because we're hot and cold sort of determines the viability of the tree, that we may have less trees that we have today that are a little bit more cold tolerant.

We may not be able to – well, they may change. The heat is marching upward from the South. So our – yes, the pallet would change but it may take a while to that.

Maria Koetter: Yes, we're definitely seeing that in Louisville as well where our hardiness zone recently shifted and we are incorporating those trees that you know 10, 20 years ago when they

tolerate our harsh winters. So yes, we are really trying to include that in the mix of our resourcing plans for sure.

Wendy Jaglom: Great, thanks so much. Victoria, shall we wrap up or would you like me to ask some more questions?

Victoria Ludwig: I think it's about 2:30. So we probably should let folks go. Thank you all for your great – those are great questions that you asked and thanks to our speakers for answering them very well. I want to thank Maria, Irene, and David again for giving us your time today and helping us learn from your experience. I think it was – it'll be really helpful to people.

If you would like to read the presentations again, go to the heat islands website and the address is up on your screen. In a couple of weeks, we will have audio transcripts of the presentations, as well as PowerPoints so that you can see everything again or pass them on to others. And one reminder again is please sign up for our newsletter to keep informed on what's going on with EPA and heat islands and to learn about future webcasts as well.

And I just thank you again for joining us on this day. As I said, when a very important sports event was happening, we appreciate that. Before you sign off, there will pop up some exit questions which we hope you'll answer to help us learn how we did and make future webcasts better.

So thanks again on behalf of EPA and our speakers for joining us. We really appreciate it, and we hope you have a good day. Thanks.

Maria Koetter: Thank you.

Operator: And this concludes today's conference. You may now disconnect.

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