



**American Meteorological Society: Exclusive Session for Communities on Extreme Weather
January 8, 2015
1:00PM-3:30PM
The Sheraton Downtown, Valley of the Sun Room C**

Panelist Introductions:

- Larry Brazil, Riverside Technology, Inc.
- Lawrence Buja, National Center for Atmospheric Research
- Gregg Garfin, Institute of the Environment, University of Arizona
- Matei Georgescu, Arizona State University's Julie Ann Wrigley Global Institute of Sustainability
- Mary Hayden, National Center for Atmospheric Research
- Amir Jina, University of Chicago
- Gerald Meehl, National Center for Atmospheric Research
- Tim Owen, National Oceanic and Atmospheric Administration

Session Notes:

Question 1: Over the next 5-20 years, what impacts from extreme weather and related events should cities/towns in Arizona expect?

- Risks on power transmissions.
 - It is to be determined whether or not the grid can handle the traffic for power demand.
 - One of the biggest risks is the supply and demand of power.
- Dr. Garfin: We are in a situation where conditions in the Pacific Ocean favor drought.
 - The climate of AZ is prone to extreme weather.
 - Cities need to be prepared for drought, flood, heat, precipitation, storms, haboobs.
 - We've also seen funnel clouds with tornados.
 - In the higher country: hail and snow, bigger issues.
 - Wildfire and flooding downstream.

Question 2: As municipal sustainability professionals what is the message that we should be taking back to our policymakers regarding the impacts that climate change may have on surface water supplies like the Colorado River, and its delivery networks?

- Dr. Brazil:
 - Increase in temperature, the jury is still out on precipitation primarily in the Colorado River Basin.
 - Currently running scenarios with warmer than normal temperatures. Some ensemble scenarios for both below normal, or above normal standard temperatures.
 - When temperature goes up, evaporation goes up, transpiration goes up, and demand for water therefore increases.



**American Meteorological Society: Exclusive Session for Communities on Extreme Weather
January 8, 2015**

1:00PM-3:30PM

The Sheraton Downtown, Valley of the Sun Room C

- This will also increase the amount of water that will need to be put towards various uses.
 - Water scarcity might be more severe than what we're currently seeing. We will see reduced aquifer levels. The main driver of this will be higher temperatures.
-
- Dr. Hayden: In terms of public health, it's very important to start preparing.
 - Continue with preparation, need to undertake global level assessments.
 - If we don't prepare for temperature increases now, we will increase the number of individuals within our vulnerable populations.
 - Need top down and bottom up action.
 - Not sustainable if not community driven.
 - Dr. Garfin:
 - Surface water supplies are vulnerable to increased temperatures and prolonged drought.
 - Need to be prepared for shortages in the CAP system.
 - Developing policy solutions.
 - Dr. Jina:
 - We are looking at mean precipitation change and temperature change.
 - There is no certainty on the distribution impact. There's actually a lot of uncertainty involved though studies try to capture this as much as possible.
 - Easily communicable ideas: Examples include the number of extreme hot days. There is a 5% chance that this is going to be very significant.
 - On messaging, making something that is compelling for the way that we think about the climate today.
 - Relating to current perception of climate.
 - Health impacts: looking at the way that extreme temperature changes. In many cities mortality is related to cold days, though this is not applicable to AZ.
 - Heat days will increase, increase in mortality expected.
 - An increase in energy expenditures per capita will occur, and AZ has the highest per capita projected increase.
 - This is the way we will have to adapt to a decrease in labor productivity, as well as decrease mortality rates.



**American Meteorological Society: Exclusive Session for Communities on Extreme Weather
January 8, 2015
1:00PM-3:30PM
The Sheraton Downtown, Valley of the Sun Room C**

Question 3: Many of the communities depend on tourism for continued economy vitality. This is usually dependent on Arizona's attractive winter climate. How will the tourism industry be affected?

- Dr. Meehl:
 - Has answered a question like this before.
 - There's a lot of psychology that goes into this.
 - If it's warmer in the winter that may not be a bad thing.
 - However, there would be changes in infrastructure/water usage that would affect how the economy is sustained.
 - For the high country, there would be changes in winter tourism for skiing/water based recreation.
 - Study: For every 1% drop in Lake Powell, visits fell by 5%. Losses of jobs, loss in personal income. Very location specific impacts.
- Dr. Buja:
 - The general story is that we mitigate greenhouse gases, bring temperatures down, and adapt, etc.
 - In some societies around the world, for example Northern India, nighttime temperatures don't come down enough considering the limited available cooling infrastructure.
 - There's a physiological impossibility built into this.
 - Looking at economic vitality and the agricultural sector, the increasing heat could have a big impact.
- Dr. Jina:
 - We are not sure of behavioral changes that people are actually going to make.
 - In order to study this, we would have to decide on a level of comfort/discomfort for people to base decisions on.
 - One important point is reduced labor productivity, people work less on hotter days.
 - In the tourism industry → there could be the extra cost of sustaining the service sector.

Question 4: How will extreme weather changes in other areas of the country impact Arizona and its communities?

- Dr. Meehl:
 - Precipitation projected to become more intense but with more time between storms.
 - Tradeoff between how much rain occurs when it does rain, and the time between storms.
 - Observed change in very heavy precipitation.
 - This has been increasing in the Northeast, not so much the Southwest.
 - Year to year, decade to decade increase in intensity.



American Meteorological Society: Exclusive Session for Communities on Extreme Weather

January 8, 2015

1:00PM-3:30PM

The Sheraton Downtown, Valley of the Sun Room C

- Dr. Jina:
 - For better or worse the economic system is tightly integrated.
 - Thinking about supply chains in Japan, and how shipping/production is affected.
 - Sea level rising, increase in intensity in tropical cyclones.
 - Any shocks to different parts of the U.S. will cause issues in Arizona. Aid for disasters comes from federal spending which could've been spent on infrastructure, etc.

Question 5: Explain how a city/town can use climate/weather models and integrate them into planning to make better planning/policy decisions.

- Dr. Sailor:
 - There might be goals for a certain city that work to mitigate certain extreme patterns, but they may not work for every city.
 - We need to try to understand what causes the variation in heat across a large metropolitan area. If a city is interested in trying to understand what policy would work best, we will need to be quite contextual about it.
- Dr. Georgescu:
 - Vegetation on green roofs is a good example of this.
 - Theory: Remove water from the soil, transport it through plants where it will make its way into the atmosphere, having a cooling effect.
 - If we employ the strategy in an extremely humid area, the atmosphere is already very moist.
 - The cooling effect will therefore be significantly reduced.
 - There is not enough attention paid to targeted strategies.
 - In some places, the built environment might be slightly cooler compared to natural areas.
 - Focus on urban heat island effect is often directed to reducing daytime temperatures, without much consideration for the higher effect, the nighttime effect.
 - We should be focusing on targeted adaptation. Versus untargeted adaptation that can lead to unintended consequences.
- Dr. Hayden:
 - Very much interested in the human side of this.
 - Developed a map with the City of Houston, Department of Healthcare, called "Beat the Heat" in Houston.
 - In this map you can click on these small city regions, also provide maps for cooling center, hours of operation. This is targeted to the Census block group.
 - This is something that the public could use, or community organizations.



**American Meteorological Society: Exclusive Session for Communities on Extreme Weather
January 8, 2015**

1:00PM-3:30PM

The Sheraton Downtown, Valley of the Sun Room C

- In Phoenix, cooling centers are operating during the day, but not always at nighttime.
 - Tools for public and decision makers, Extreme Heat Climate Inspector. This tool provides a general overview of specific cities, and one can explore changes in temperature, heat indices.
- Question, Dick Powell, City of Casa Grande:
 - One of the big questions in planning is this the new reality?
 - Is drought going to continue on for years and years?
 - Bring new water into the state? The Columbia River, runs to the Pacific.
 - If you steered that excess water off, it'd be a huge impact. I
 - If we're really in this dire situation as it looks, and we can't forecast any major changes, should we get something done regionally to address this?
- IPCC is working very hard to bound the uncertainties to know whether or not this exists.
 - The 20th Century was probably wetter, even if the 21st Century is normal, adaptation has to be made because of infrastructure that was constructed earlier.
- Dr. Georgescu:
 - Not necessarily needing to increase the quantity of the water that we have.
 - But we should make more judicious decisions about the water that we do have.
 - Who is quantifying water loss?
 - We should be using what we have in a better sense.
 - It's really a matter of cost.
 - Conservation, reuse of water is always something that comes to mind.
 - Desalinization is always quite expensive.
 - Are you willing to pay a much higher price for water? Energy intensity for a desalinization plant is a lot.

Question 6: Local level government policy makers are not, shall we say, excited to attempt to deal with global and long term issues because they are unable to show success during their term, and are still subject to the negativity of vocal naysayers.

Skipped because of the time constraint

Question 7: If a local municipality's policy makers were to support three things to move their cities into a better resiliency stance regarding climate change, what would those three things be?

- How do you balance with other adaptation options?
 - Amelioration of droughts, know where you are.
 - What kind of info, economic or other can make this "real" for people.



American Meteorological Society: Exclusive Session for Communities on Extreme Weather

January 8, 2015

1:00PM-3:30PM

The Sheraton Downtown, Valley of the Sun Room C

- Outreach and education is something that is very important.

Question 8: What are the myths vs realities of climate change/extreme weather events? What is the other side of the climate argument? What types of information does a city/town need to provide to deniers to handle the climate question?

- Models that separate human and natural influences on climate. Can use modeling tools to explain that the effect is indeed human. Both warming and cooling.
- When cold spells happen: Variability happens throughout the year, week, month, etc. But the general trend is warming. This is a common argument against the general consensus, but this is big picture forecasting.
- Some of the strategies: Look back in time, hundreds of years. Hardcore skeptics are difficult to convince.
 - What kind of ranges should we be planning for that we've seen before in the past?
- In terms of the hardcore skeptics: One of the strategies would be to look at the practical realities of what is happening with higher level policy.
 - We know that regardless of belief in climate change, binding climate policy is going to be set internationally and nationally.
 - The idea that there is some sort of policy uncertainty exists, but it might be better not to wait until the policy is enacted, and begin changing now.
 - Preemptive decisions to make the policies at the local levels in line with national and international levels.
 - What does the science community say that is going to affect policy to affect businesses/govts, and what do these businesses and govts do?

Question 9: How can AZ cities and towns adapt and be more resilient to extreme weather events and the impacts of these events? How can they transition to a better more prepared state? Where do we need to be more flexible and capable of making quick decisions?

- Vulnerability assessment and risk analysis.
 - This is important for communities to accomplish.
- There was a study conducted in the mid-2000s on county comprehensive plans.
 - With one exception no counties had risk analysis or vulnerability assessments.
 - Understanding what vulnerabilities are, and where the risks are.
 - Being able to track data, and having monitoring and early warning.
 - It's a fundamental important thing.
 - Be flexible and capable in making quick decisions.



**American Meteorological Society: Exclusive Session for Communities on Extreme Weather
January 8, 2015**

1:00PM-3:30PM

The Sheraton Downtown, Valley of the Sun Room C

- Low probability, high impact, extreme storms, big fires, floods. Things that require quick decisions are these extreme events. Drought you can see coming down the road.