

CLIMATE INFORMATION NEEDS FOR HAZARD MITIGATION

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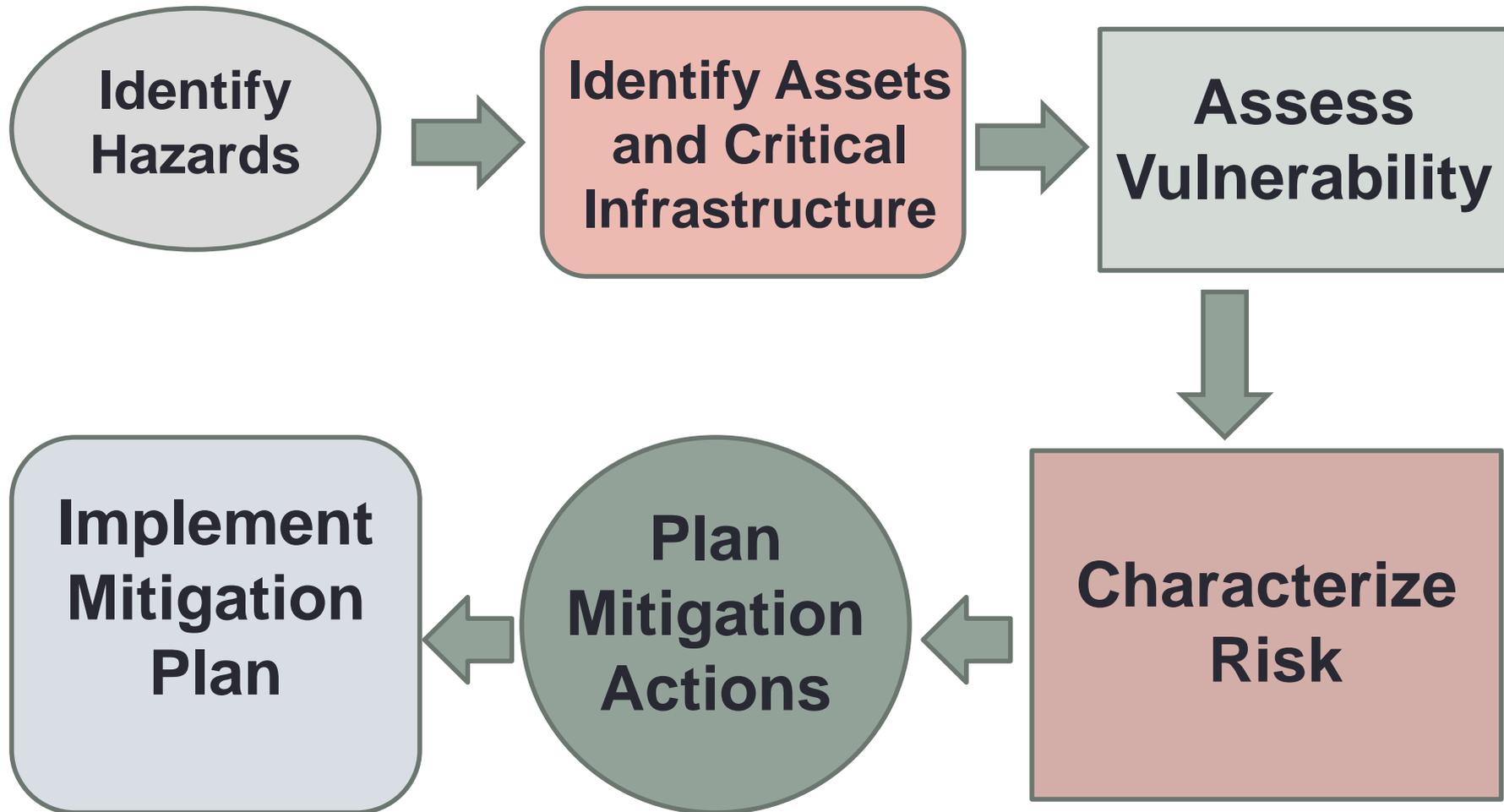
Background and conceptual framing

- The project is a NOAA SARP (Sectoral Applications Research Project)
- “Informing Emergency and Risk Management Climate Knowledge in Arid Regions”
- Initial purpose was to find out what climate information emergency and risk managers were using to decrease their vulnerability to climate hazards.

FEMA Hazard Mitigation Process

- Purpose:
 - Mitigate hazards
 - Decrease vulnerabilities
 - Increase community resiliency
- Mandatory updates of Hazard Mitigation Plans every five years.
- Ultimately, this planning process serves to decrease cost.
 - Cost to mitigate < cost to respond and recover in place of mitigation

How the Hazard Mitigation Process Works



Current Practices—Calculating Risk

- In Arizona, this process is done by using a *calculated priority risk index* (CPRI)
- In order to prioritize risk, the CPRI considers:
 - probability of event
 - severity/magnitude of event
 - duration
 - warning time

New FEMA Requirement

- Hazard Mitigation Plan updates must include Climate Change
- What does this mean?
- What actionable climate change information is available?

Coastal Communities

- Sea level rise projections already exist and are appropriate for the very large scale infrastructure projects necessary for mitigation against hurricane storm surges

Tornados

- Tornados at the EF5 level already occur, and infrastructure and building codes to mitigate from those threats that already exist are currently being implemented because the risk and vulnerability and level of destruction is known across the vulnerable areas.
- Infrastructure that can withstand an EF5 is the design requirement regardless of whether more frequent EF5s are projected or not. It only takes one, and the odds are already high for that to occur in any year.

Non-Hurricane/Non-Tornadic Extreme Weather

- Is much more difficult to mitigate against.
- Currently we prepare for the 100-year event.
- The 100-year precipitation event and 100-year flood is the design standard for infrastructure including all bridges, dams, culverts, levees, foundations, grading, and drainages virtually nationwide.

200-year event??

- Economically, few cities, counties or states can afford to upgrade their entire infrastructure to withstand the 200-year precipitation and flood event, much less the 500 or 1000-year event.
- Is preparing for the 200-year event sufficient?
- But, if the 200-year event is going to become the norm, then infrastructure changes will be necessary. California has already decided to change the design standard to the 200-year event, due to their extreme vulnerability to flooding.

Economic Reality

- Most states don't have the money to move to a 200-year flood standard on the basis of a "possibility" that these events could become the norm.
- Public infrastructure is much more difficult to replace or retrofit than adjusting building codes that put the burden on the builders and homeowners.

So what do we plan for?

- We had interviews with the Coconino County and Flagstaff, Arizona Hazard Mitigation Planners, followed by a workshop.
- Our purpose was to determine what extreme weather hazards they experience, what impacts those events have, and what information they need to plan mitigation strategies to reduce losses from those events.

Extreme Weather Events

Coconino County & Flagstaff, AZ

- **Winter storms**

- Snow storms – blizzards - multi-day events
- Rain on snow

- **Drought – leads to wildfires**

- **Monsoon – heavy rain events**

- Local context: heavy rain on burn areas

Extreme Weather Impacts

- Flooding
- Flash flooding
- Transportation shutdown - roads blocked, closed, washed out, cut-off (erosion/debris flows)
- Loss of supply lines – food, manufacturing
- Loss of power – and water
- Medical emergencies
- Economic losses - tourism

What do they do now?

- Currently they plan for imminent extreme weather events as forecast out 3-7 days by the NWS.
- That's enough time to manage a response to the immediate threat.
- It is not enough time to prevent the losses.

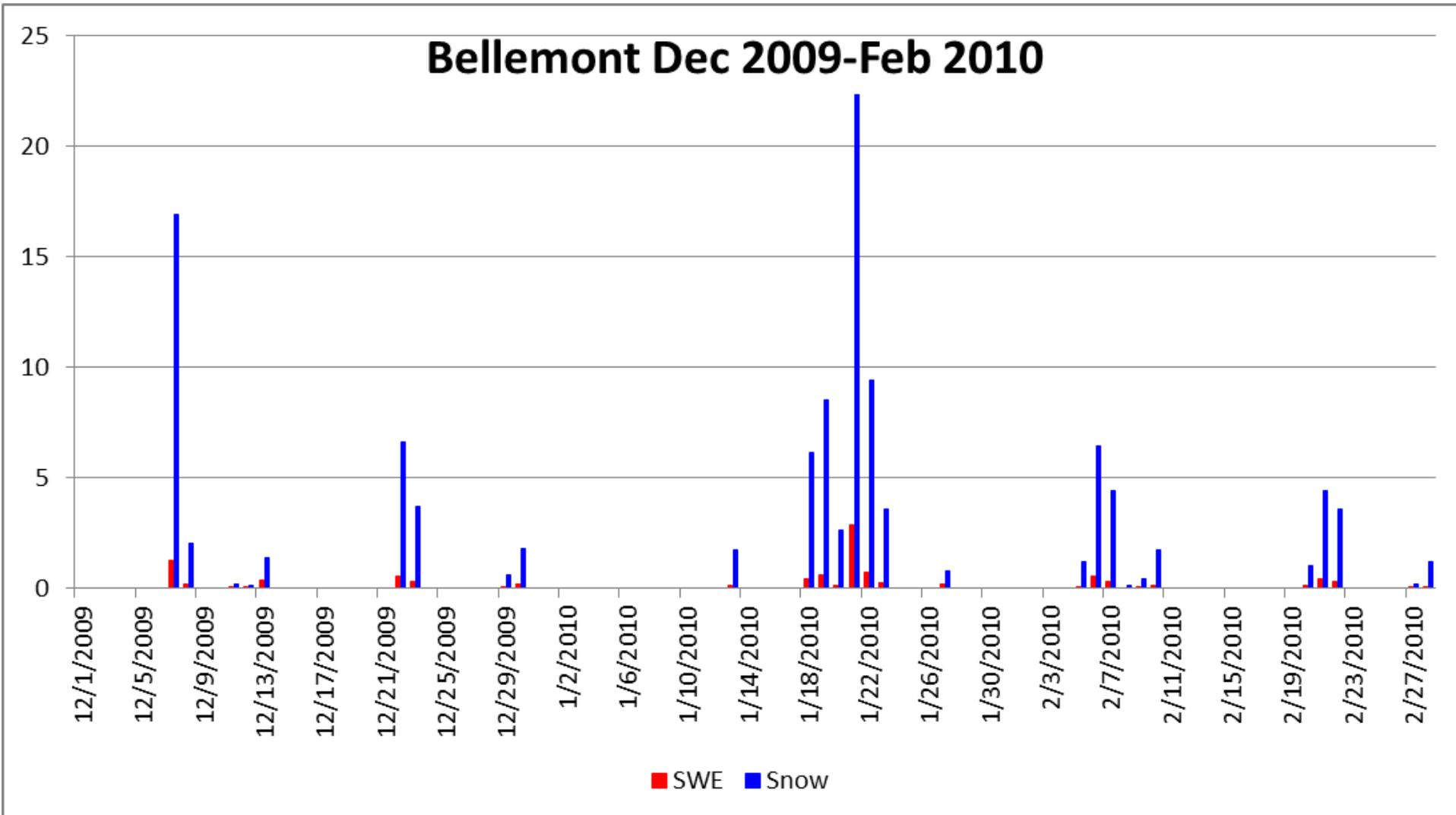
What information do they use now?

- For planning, they have the historical climate records of how much rain or snow fell.
- Current planning is based on the most extreme event that has occurred in the past.
- The number of extreme events is relatively small, and there is **no significant trend** toward increasing intensity or increasing frequency.

What information do they use now?

- Each planner has their own perception of how bad those historical extreme events were, partly based on how long they have lived in the jurisdiction.
- Few of the planners or first responders can equate the amount of rain or snowfall to the impacts of the event.

January 2010 Northern AZ Blizzard



Why don't we use the record extremes?

- One reason FEMA is requiring climate change to be included in the plans is that NOAA and others say climate change will cause more intense and more frequent extreme events.
- So we need to base our planning on what we expect to occur in the future, not what occurred in the past.
- But – *“How much more intense and how much more frequently?”*

So what do we plan for?

- The time horizon for mitigation is within the 2-, 5-, and 10-year window that coincides with both the Hazard Mitigation Plan update and the election and budgeting cycles for the jurisdictions.
- Planners need actionable information on what severe weather to expect in that time horizon.

The Information Gap

- Currently no forecasts, predictions, outlooks, projections or other guidance exists in the 2-10 year window.
- In the absence of information from NOAA, the planners will make their own best guess, which is an **uneducated guess**.

The Information Gap

- They know the climate information currently available does not meet their need.
- They recognize that:
 - NOAA has skill in making local forecasts from now through the next 3 days, and 6-10 days, and even out to 30 days.
 - The seasonal outlooks are a bit more broad brush, but there's some skill there as well.
 - The long-term climate projections are even more vague and regional.

They are looking for climate guidance

- The planners know you currently have no skill at this time interval or you would already be providing the information.
- But, “your guess” is better than “their guess”.
- You have to start somewhere, and they want to work with you to develop guidance and improve the skill over time.

How important is the guidance?

- The participants identified “insufficient information regarding hazards” as one of the “major barriers” to planning for extreme weather events.

Communication and Comprehension

- Digestible information – plain language – 4th grade level recommended. Both the planner and the decision-maker (probably a politician) need to understand the information.
- Infographics to convey the most important information. – Make a connection between the weather event and the potential impacts.
- Technical details supplied as appendix or links.

What do they want?

- Climate guidance for their region on what types, frequency, duration, and magnitude of extreme events to expect in the next 2-10 year window.
- The state/county/local experts can provide the local context of what the regional guidance is likely to bring to the jurisdiction.

What do they want?

- Annual updates to the guidance as methods are refined and skill is developed.
- The updates will increase their confidence in the process and the guidance as you develop more skill in this time interval.

How do you do this?

- Scale down the larger models temporally and spatially?
- Look for changes in necessary regional circulation patterns?
- Project potential changes in available precipitable water due to warmer oceans?
- Closer look at long-term circulations associated with the development of ARs?
- Teleconnection interactions?

The Challenge

- This climate information gap will not go away.
- The need for climate guidance at the 2-10 year time interval will only grow.
- You are the best equipped group to tackle this problem.
- The community that needs this information are willing partners and they understand the uncertainty associated with new products.

Thank you!

- We stand ready to help define the parameters or assist with the communication with the planners.

For more information:
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