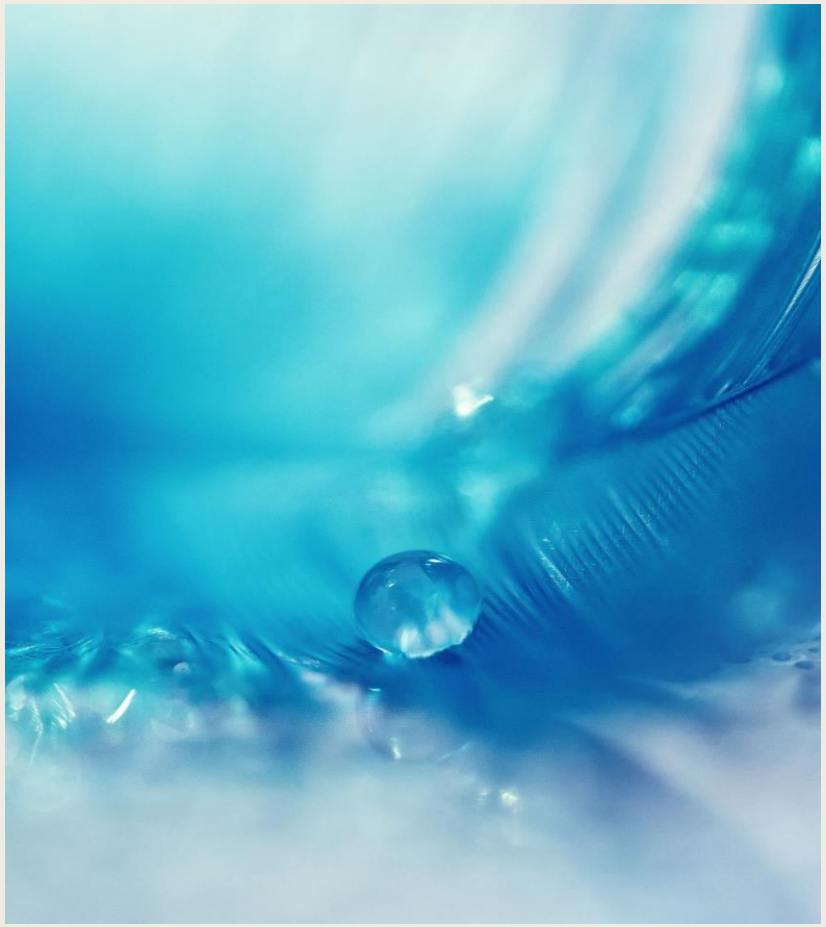

CLIMATE PROJECTIONS & WATER RESOURCES: ADDRESSING BARRIERS & ADVANCING SOLUTIONS FOR EFFECTIVE DECISION-MAKING

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Intro

- I’m going to talk about the results and key findings from a listening session study the FloridaWCA conducted using a moderated panel discussion format last spring
- Goals of the session were to:
  - *Inform the State of Florida’s development of future rainfall projections for use in climate-related vulnerability assessments.*
  - *Identify factors relevant to water resource management decision-making to address changes, challenges and vulnerabilities in the region.*
- We aimed to provide *insights into current challenges and solutions* in incorporating high-resolution climate forecasts, including rainfall data, into water resource management decision-making.
- Let’s get going….

Methods

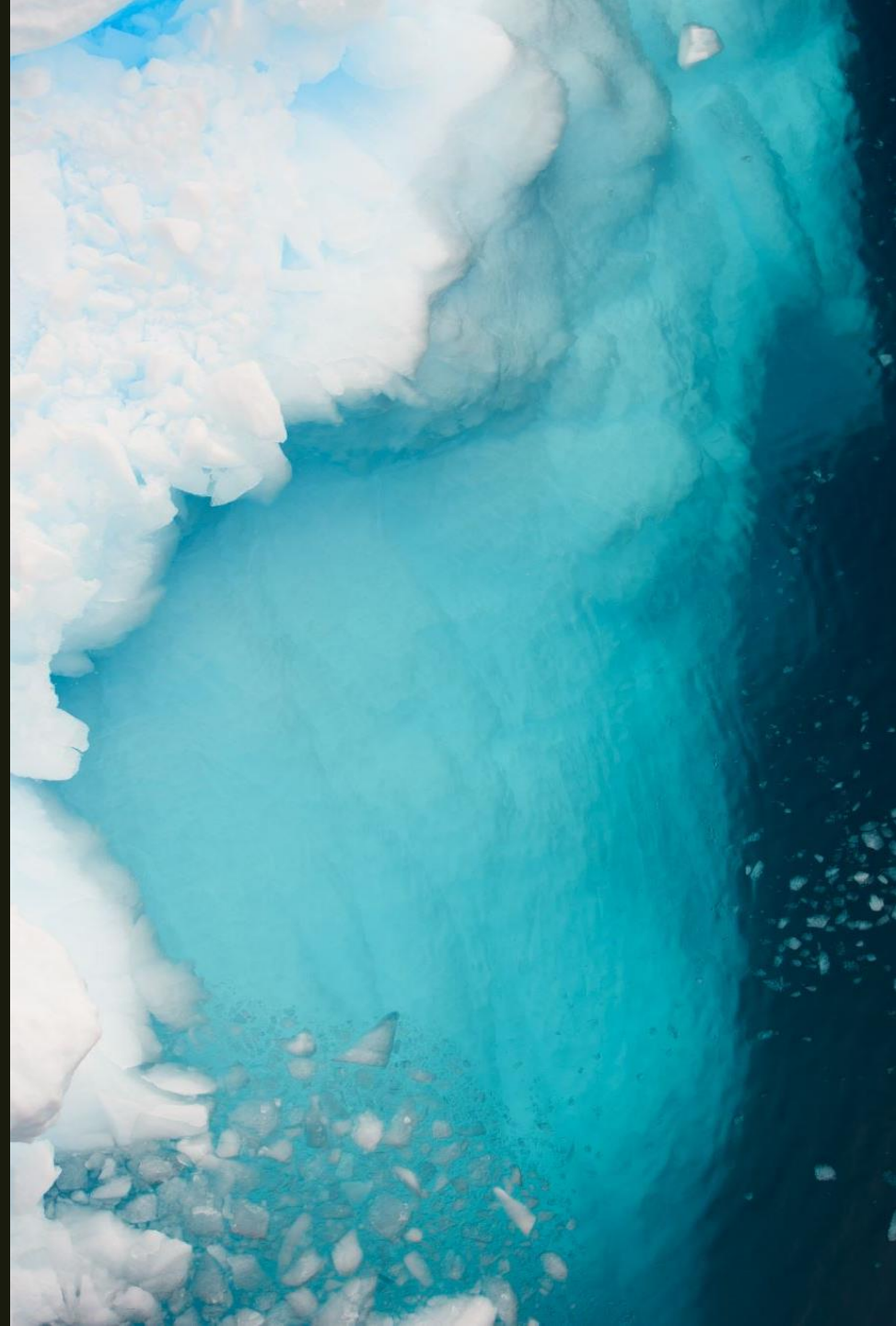
- Methods involved a listening session to include panelists and more than 100 participants representing scientists and practitioners in the climate and water resource management sectors in Florida, combined with a virtual stakeholder participation activity (Mentimeter)
- Session and Mentimeter responses were recorded, transcribed and analyzed using the constant comparative technique looking for common themes and sub-themes.
- Illustrative quotes are included where appropriate to illustrate and elaborate on themes.
- “Water resource managers” or “water managers” are proxies for combined panelist/participant responses.

Due to ongoing and recent and dramatically changing rainfall patterns

- Managers use multiple data sources – more is more when constructing models; Florida's geography means there is little ability to rely on other states' resources
- They conduct complex linking and use of diverse datasets and consultants in unique-to-the-organization ways that *cannot be replicated or compared*. The use of data becomes unique to the organization.
- "One of the drawbacks, one of the barriers, one of the things that makes this challenging, is that this data is *very complicated*."
- "It is not a lack of data, but rather the *absence of a standardized approach* to confirming and customizing the data according to each organization's as well as locally relevant requirements."

Climate change and resilience planning – a now moving target

- Climate change alters the stability of rainfall occurrences, making it hard to plan, going forward, accurately for water storage, as extreme rainfall, no matter the cause, directly impacts water supply levels
  - *Rainfall patterns are already influenced by seasonality, temperature, atmospheric pressures*
  - *Historical data may become less effective due to extreme weather events that deviate from historical rainfall patterns and skew the results*
- “We don’t know how the climate is going to adjust that of those probabilities of rainfall occurrences and so {we need} some way to understand that change as we look forward, and more importantly, how its going to reflect in the hydrology of water management {and} water resource systems in South Florida I think is really critical.”

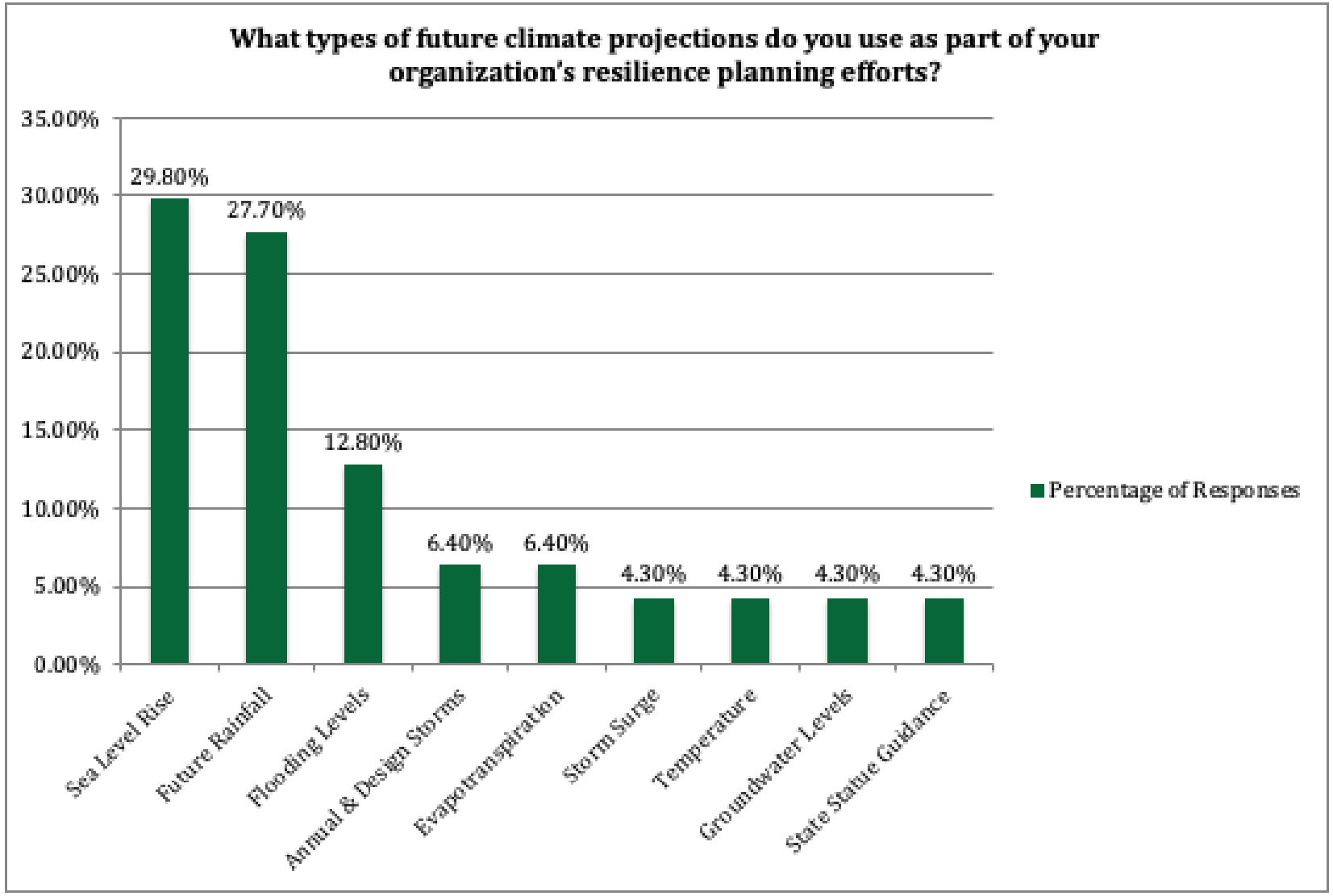


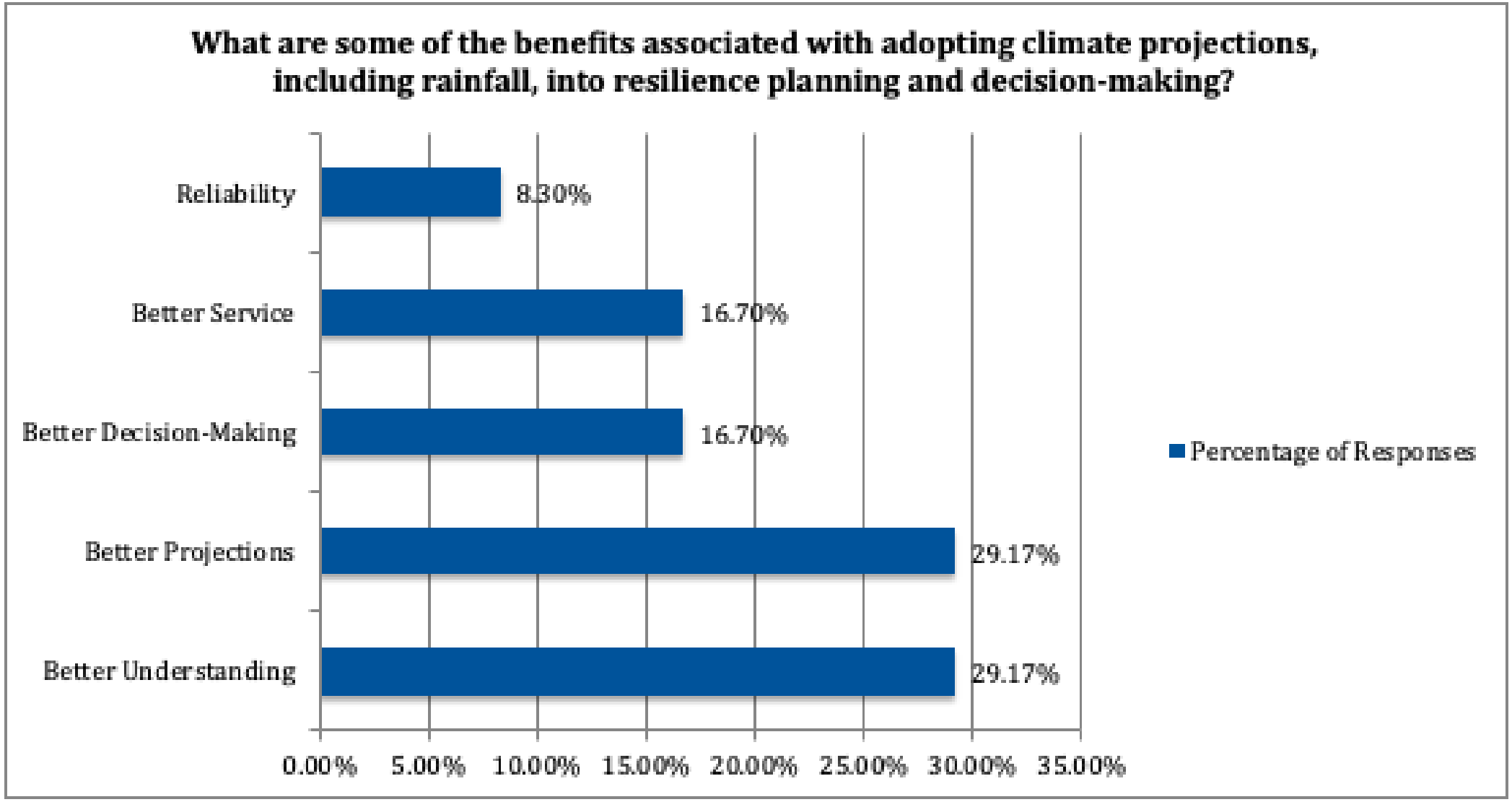
So, what do they need?

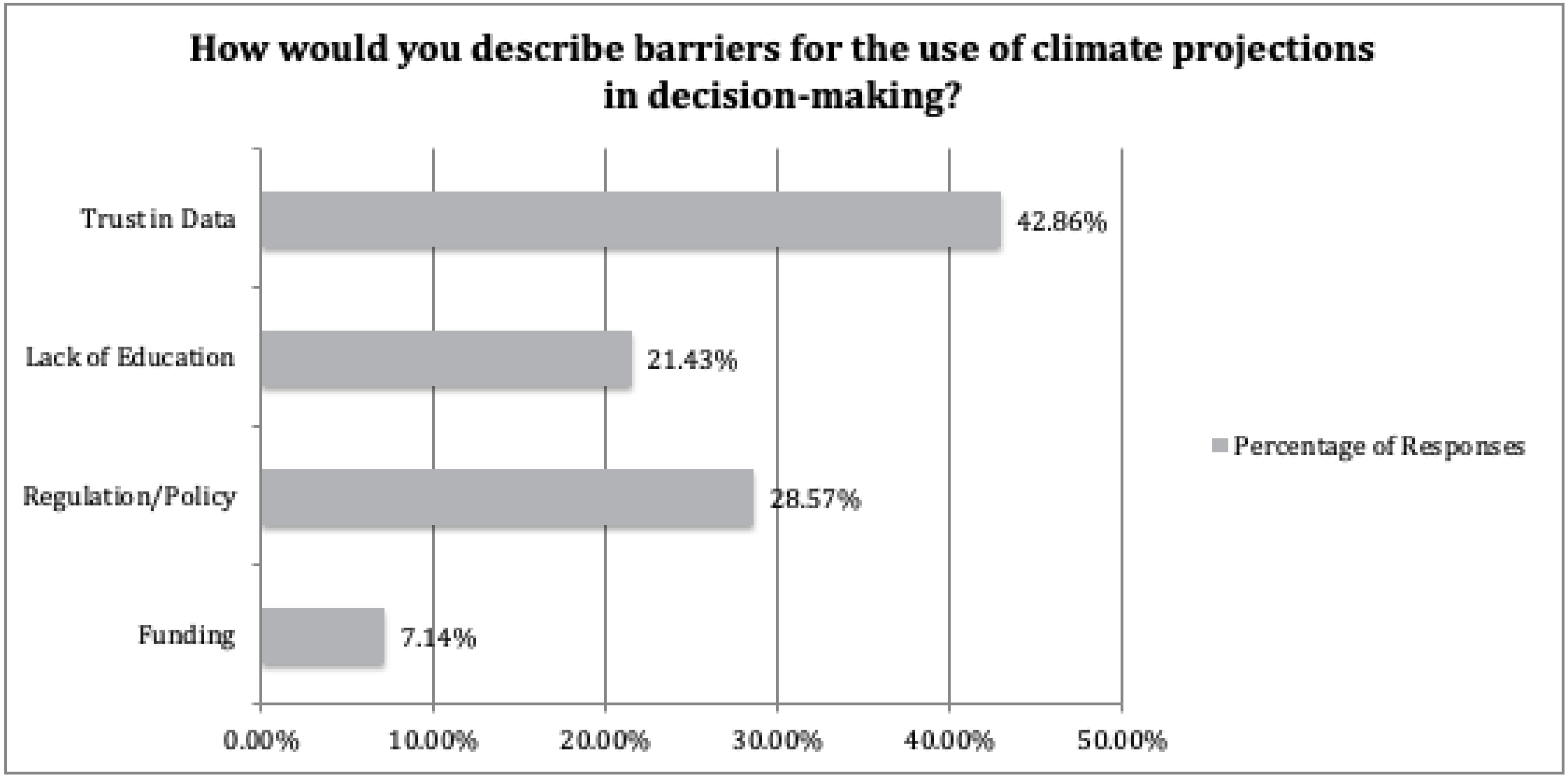
- Since past trends can no longer provide accurate predictions for future rainfall…
- Impact of human migration on water supplies is *unknown…*
- Floods and droughts disproportionately impact the most vulnerable…
- It is imperative to strengthen infrastructure to withstand stronger wind gusts, reduce heavy vulnerability to power outages and effectively manage rainfall
- It is implement/strengthen green infrastructure solutions to safeguard the *entire* state, not just vulnerable coastal areas

Water managers' needs

- One way to think of climate science/rainfall projections and their potential influence to improve decision-making is as a product that needs to be produced, packaged and "sold"
  - *In such a scenario, we would look for ways to improve its adoption via making it more available, easier to use*
  - *We would provide translation and training to encourage uptake in practice (public health model) by users*
  - *We would find out what users want, what challenges and barriers they face, and what features they need*
  - *We would standardize features and specifications for ease of use and compatibility*


What types of future climate projections do you use as part of your organization's resilience planning efforts?
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
29.80%
27.70%
12.80%
6.40%
6.40%
4.30%
4.30%
4.30%
4.30%
Sea Level Rise
Future Rainfall
Flooding Levels
Annual & Design Storms
Evapotranspiration
Storm Surge
Temperature
Groundwater Levels
State Statue Guidance
Percentage of Responses


What are some of the benefits associated with adopting climate projections, including rainfall, into resilience planning and decision-making?
Reliability
8.30%
Better Service
16.70%
Better Decision-Making
16.70%
Better Projections
29.17%
Better Understanding
29.17%
0.00%
5.00%
10.00%
15.00%
20.00%
25.00%
30.00%
35.00%
Percentage of Responses

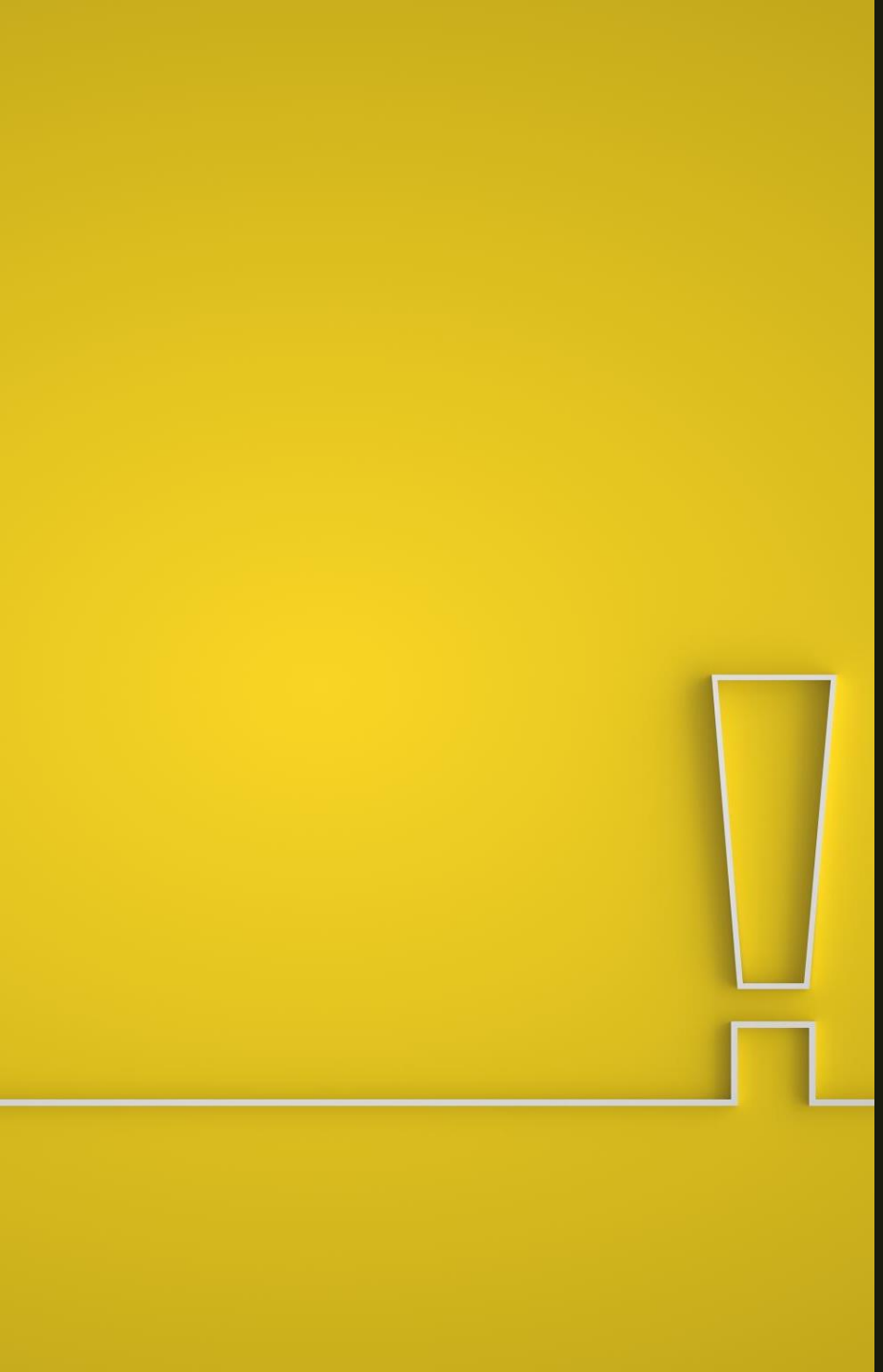

How would you describe barriers for the use of climate projections in decision-making?
Trust in Data
Lack of Education
Regulation/Policy
Funding
42.86%
21.43%
28.57%
7.14%
0.00%
10.00%
20.00%
30.00%
40.00%
50.00%
Percentage of Responses

Build communication and confidence with projections

- Water resource managers like to use “what if” climate scenarios and structured decision methodology for decision-making
  - *Fosters transparency around, and helps validate, decisions*
  - *“This form of decision-making has the added benefit of gaining buy-in and trust from community members.”*
  - *“You can have the best data in the world, but if people don’t have a lot of confidence in how it’s being used…..it doesn’t really help you.”*

What decisionmakers (senior execs, board, regulators, voters) want to know and need to support

- *(Want)* What are the financial implications linking acceptable risk and levels of service from both a water supply and financial perspective – what are the tradeoffs?
  - *"If this [climate situation] is a situation, what is the corresponding investment needed to solve the problem?"*
- *(Need)* Gradually implementing adaptive strategies, rather than all at once
  - *helps engineers see the most urgent issues and projects and prioritize multiple strategies and incentives*
  - *helps the internal decision-makers and the public understand they do not need to take all actions simultaneously*



To “get it right”

- Scientists and engineers must provide decisionmakers with the best available data and associated uncertainties, along with recommendations on how to best to interpret these uncertainties (“side effects”)
  - *Inaccurate projections would lead to significant costs and they themselves are accountable for infrastructure and adaptation efforts to work, not to mention water quality and quantity that do not meet consumer demand.*
  - *“I just can’t look at sea level rise. I can’t just look at riverine or stormwater run off. It really has to be one holistic view, and I think everybody here would probably echo that.”*
- Sharing data and techniques is critically important
  - *Common standards can drive adoption and adaptation faster*
  - *Need for conduits, connectors, translators who can interface among all the players making decisions (engineers, scientists, consultants, investors, elected officials, fed state county and municipal staff, etc.) that are doing this*

Recommendations

- *In need of a holistic approach - cross-sector, scientist to stakeholder, funding agency to funding agency consensus on data types, layers, specs, etc., combined with guides and standards as to how to combine datasets and methods*
- *incorporation of uncertainty and advanced dynamically adaptive strategies to address evolving and rapidly evolving conditions –*
  - Updates and standardized regs
  - Availability and accessibility of tools, guidelines, translational guides
  - Education/training
  - Funding

Recommendations

- Collaboration and cooperation are essential to prevent service disruption, unnecessary disruption of time and resources and reinventing the wheel
  - *Need to assess and monitor water managers' knowledge and awareness levels*
  - *Research risk aversion in this population*
- Need to study the science of combining diverse data sources, characteristics, organizations, networks, nuances – a job for generative AI?
- Need a better understanding of how practitioners and scientists currently utilize, combine and tailor the available data
- Expand research on how to advance effective scientific/government/professional decision-making under uncertainty of various possible futures

We are all at a crossroads

- Need to consider a wide range of future scenarios, rather than trying to predict one specific outcome (especially rainfall projections in Florida)
- Use robust decision-making, or something like it, to consider *various possible futures* when making all assumptions, investments and decisions
- Build better bridges across individuals, organizations and sectors that do not share common training, attitudes, communication styles, motivations and incentives, let alone values and measures for success
- Consider really moonshoting, grand challenging, shorten-the wait-type solutions borrowed from other industries and sciences

Two final things

- Need to recognize we are in a fight for the future, and this is not just a career building exercise for all of us
- Is this business as usual, where we let comfortable organizational and disciplinary norms and standards of practice & pedagogy drive what happens?
- Or are we actually trying to solve this thing?

Acknowledgements

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