

RECLAMATION

Managing Water in the West

Conveying Climate Change and Variability: Climate Change Communication Toolbox

Research and Development Office
Science and Technology Program
Final Report 2015-01-3533



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Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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14. ABSTRACT (Maximum 200 words) Climate change analyses and results may incorporate concepts that are difficult to convey to various audiences. This Science and Technology Program scoping project interviewed over 60 people to identify communication needs and determine potential solutions to meet those needs. This project was coordinated with Reclamation's Office of Policy to formulate a Climate Change Communication Toolbox to address some of these needs. This report summarizes interview responses as a foundation for further research and coordination for effective climate change communication.					
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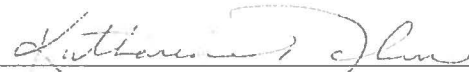


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Disclaimer

This scoping project was to interview Reclamation employees and stakeholders about their needs for climate change information tools. Interviewees ranged from those very involved with climate change analyses to those who did not consider these impacts in their work. This does not represent the extent of resources available in Reclamation, nor does it reflect on Reclamation's responses to the challenges in climate change and variability considerations.

Responses in *italics* are verbatim, reflecting the interviewee's opinions and should not be construed as any official Reclamation position or policy. Responses have been anonymized.

Executive Summary

Problem

Climate change and variability is a sensitive and complex topic. It is difficult to convey the science and analyses to lay audiences such as stakeholders and decisionmakers. Yet this audience needs to understand the basic terms, assumptions, science, and analytical processes involved in climate change and variability. Without clearly understanding climate forecasts and modeling analyses, planners, stakeholders, and decisionmakers can not effectively plan, participate in, or take informed and balanced actions to manage water and related resources in the Western United States.

Understanding the most effective way to communicate climate change and variability "basics" could provide a foundation for Reclamation's reports. Climate change analyses constantly evolve, and thus we need to develop communication strategies for future research, analyses, and planning. Research is needed to identify issues in communicating climate change information and analyses.

Method

To identify any potential needs, obstacles, and opportunities in communicating climate change analyses and results, I interviewed over 50 people within Reclamation and over 10 stakeholders and experts from outside agencies¹:

- Climate change experts (the West-wide Climate Risk Assessment Team [WWCRA], 2016 SECURE Report Team) and other environmental compliance, planning, and technical experts within Reclamation
- Technical Service Center (TSC) Group Managers and selected TSC experts (e.g., biologists, engineers, hydrologists)
- Selected stakeholders who participated in basin studies

Interviews were conducted via email, in person, over the phone, and in conference calls. Questions varied but focused on:

- How the interviewee used climate change information
- Challenges and successes in communicating climate change information
- Ways to improve communication

¹ Respondents were granted anonymity, and as some responses were from groups, exact numbers of individual respondents can not be provided.

Conveying Climate Change and Variability

I analyzed responses to determine common themes in these responses to develop a needs document, which the WWCRA team reviewed. Sample responses are quoted in *italics* in Section 3. Research Results. I also performed a literature search, researching suggestions for clear communication, issues with communication. In partnership with TSC and regional climate analysts and writers, I drafted a Climate Change Communication Toolbox².

Summary of Results

While responses varied by group, interviewees noted a lack of communication, training, and awareness about the specific climate change analyses and methods to incorporate these results into other technical analyses, engineering, and planning.

Results showed that Reclamation analysts and planners need to more clearly communicate complex topics involving climate change to both:

- A technical audience of climate scientists and other analysts to use that information in resource-specific planning analyses and engineering design
- A lay audience of stakeholders, decisionmakers, and other participants to fully understand the implications of the science

A descriptive flexible, shared library of explanations, terms, acronyms, graphics, spreadsheets, etc. would be useful, as long as it was not prescriptive. Analysts and authors should be able to adapt and modify any of the communication tools developed. Several groups have already developed tools and definitions, but finding this information is difficult.

Next Steps

Other Reclamation writers, planners, and analysts are interested in developing the Climate Change Communication Toolbox as a living, dynamic document that would meet the communication needs that interviewees delineated.

To meet other needs, such as identifying resources and tools for analyzing climate change and variability and incorporating analyses into planning, other efforts are recommended.

² Available from the Office of Policy—contact Katharine Dahm, kdahm@usbr.gov, 303-445-2495

Contents

1. Problem.....	1
2. Method	2
3. Research Results	2
3.1. Needs that Could Be Addressed by Communication Aids.....	3
3.1.1. Need for Clear Communication	3
3.1.2. Suggested Content to Cover in a Toolbox	4
3.1.3. Use All Avenues of Communication	8
3.2. Suggested Approaches for a Climate Change Communication Toolbox.....	8
3.3. Climate Analysis Needs Beyond Communication Aids.....	9
3.3.1. Climate Change Data, Tools, and Analyses	9
3.3.2. Utility and Relevance.....	12
3.3.3. Role of Climate Change in Reclamation’s planning	13
3.3.4. Stakeholder Engagement	14
3.3.5. Outlines and templates	15
3.3.6. Funding.....	16
4. Conclusions and Next Steps.....	16
5. List of all Data Sets.....	17

1. Problem

“When working with stakeholders, we have found that clearly communicating the analysis and research is critical to avoid conflicts and come to agreements. Clear and thoughtful understanding of these complex issues allows stakeholders to go back to their principals and convey this information accurately. This helps decisionmakers in their processes, as they are typically not climate change experts.”

Jim Prairie, Hydrologic Engineer, Upper Colorado Region, Reclamation.

Climate change and variability is a sensitive and complex topic. It is difficult to convey the science and analyses to lay audiences such as stakeholders and decisionmakers. Yet this audience needs to understand the basic terms, assumptions, science, and analytical processes involved in climate change and variability. Without clearly understanding climate forecasts and modeling analyses, planners, stakeholders, and decisionmakers can't effectively plan, participate in, or take informed and balanced actions to manage water and related resources in the Western United States.

Understanding the most effective way to communicate climate change and variability “basics” could provide a foundation for Reclamation's reports. Climate change analyses constantly evolve, and thus we need to develop communication strategies for future research, analyses, and planning. Consistent and clear language and graphics for common research elements could be developed to:

- Help Reclamation's and partners' climate change analysts and other analysts know about and use existing resources more effectively
- Identify areas where further communication about climate change analyses methods and results could help Reclamation plan and adapt more effectively
- Save researchers', planners', and analysts' time by not requiring them to reinvent explanations of basic concepts and definitions

Research is needed to identify issues in communicating climate change information and analyses.

2. Method

To identify potential needs, obstacles, and opportunities in communicating climate change analyses and results, I interviewed over 50 people within Reclamation and over 10 stakeholders and experts from outside agencies:

- Climate change experts (the West-wide Climate Risk Assessment Team, 2016 SECURE Report Team)
- Environmental compliance, planning, writing, and technical experts in Reclamation's regional and area offices
- TSC Group Managers and selected TSC experts (e.g., biologists, engineers, hydrologists)
- Selected stakeholders who participated in basin studies

Interviews were conducted via email, in person, over the phone, and in group conference calls. Questions varied but focused on:

- How the interviewee used climate change information
- Challenges and successes in communicating climate change information
- Ways to improve communication

To develop a needs document, I analyzed responses to determine common themes in these responses and performed a literature search, researching suggestions for clear communication. The West-wide Climate Risk Assessment Team reviewed the needs document. TSC climate analysts and writers drafted a Climate Change Communication Toolbox in response to these needs.

3. Research Results

Interviews focused on how Reclamation analyzes and communicates climate change impacts to Reclamation actions and how Reclamation incorporates those potential impacts into analyses, designs, and planning. However, some interviewees also addressed analyses and communication about determining the potential for Reclamation's actions to affect greenhouse gas emissions or other potential climate processes.

Interviewees varied in their engagement and understanding of climate change information. Although responses varied more by individual than by group, in

general, interviewees who worked with climate change analyses noted a lack of awareness about the specific climate change analyses and methods to incorporate these results into other technical analyses, engineering, and planning. Stakeholders and others who used climate change information noted a lack of clear communication and training. Some interviewees who did not work with climate change cited uncertainty and further complexity as reasons not to consider climate variability or climate change projections in their work.

3.1. Needs that Could Be Addressed by Communication Aids

Interviewees identified specific needs for help to communicate climate change concepts, analyses, and information in engineering designs and technical analyses, as described in this section.

3.1.1. Need for Clear Communication

3.1.1.1. Summary

Interviewees expressed frustration at communication difficulties and indicated that a repository of sample language and graphics that they could use would help them to express climate change concepts. While initial interviews did use the term “standard,” further questioning and input revealed that “standard” was a misnomer, as each text would need to be adapted to the particular program. Examples and language to adapt to a particular study was deemed to be essential, and language and graphics should be easy to incorporate into other documents. No interviewee insisted on a published “standard text” when asked to clarify.

3.1.1.2. Sample Quotes from Interviews

Clear Communication

- ❑ *“We need to be clear and understandable to a variety of audiences.”*
- ❑ *“And, as always, messages need to be somewhat tailored to your audience. Are they researchers or practitioners?”*
- ❑ *“I understand that we have data that points to climate change, other than that the details seem to be lost in the multitude of different interpretations.”*

Need for a Toolbox

- ❑ *“The toolkit should focus on providing general guidelines with examples of effective communication methods and techniques to avoid common misunderstandings.”*

Conveying Climate Change and Variability

- ❑ *“Having a communication toolbox would save time and money by helping analysts, planners, etc. start with “clay to be shaped” for their specific documents, rather than starting with “blank pages that need to be reinvented each time.”*
- ❑ *“In general, any boilerplate climate material would aid the climate experts in preparation of reports. However, the need is still there to keep the information simple so readers are not confused (easier said than done in the climate modeling world).”*

Language

- ❑ *“As each study and application differ, a standard one-size-fits-all approach or a mandatory approach would not be feasible.”*
- ❑ *“For every study, the tools used and the approach taken must be tailored to the questions that the stakeholders would like answered.”*
- ❑ *“My reports could use standard summary language on the use, uncertainty, and limitations of usage. This could also include a short introduction and overview of how the results were derived.”*
- ❑ *“Standardized language and graphics for these topics could be useful for basin studies and other reports that rely on outputs from GCMs.”*
- ❑ *“I think that our Impact Assessment and Basin Study reports would benefit greatly from a library of standard language on our program, analysis methods, and uncertainties.”*

3.1.2. Suggested Content to Cover in a Toolbox

3.1.2.1. Summary

Interviewees reported that key terms and concepts used in climate change and variability analyses can be misunderstood by both lay and other technical readers. Confusion can result when stakeholders, other analysts, planners, and decisionmakers do not fully understand the climate processes, data used, analysis methods, and planning approaches. General introductory explanations would be very useful.

Content suggestions ranged from very specific requests (e.g., explanation of period change, downscaling, and stationarity) to general ideas (e.g., an FAQ, a glossary).

In the related effort, the Climate Change Communication Toolbox addressed these specific requests. The Toolbox now addresses five main areas:

- Reclamation-specific language
- Advice on how to communicate climate change information
- Climate change concepts
- Climate change analysis
- Planning and decisionmaking approaches

Currently, the Toolbox has examples from several peer reviewed studies from Reclamation and other agencies, with proposals to address gaps. The Office of Policy is addressing other suggestions such as a glossary and acronyms list.

3.1.2.2. Sample Quotes from Interviews

Reclamation-specific language

- ❏ “[T]he SECURE Water Act (WaterSMART, Basin Studies Program, West Wide Climate Risk Assessment and Impact Assessments, Basin Study and Impact Assessment Programs and Objectives, and SECURE Reports to Congress).”
- ❏ “Reclamation’s Bias Correction and Spatial Downscaling (BCSD) methods, with enough information for the approach to be generally understandable in each report, with a reference to our 2011 BCSD report for more information, Description of Reclamation’s Hybrid Delta ensemble method for developing “period-change” timeseries for designated points in the future (rather than a reference to the Oklahoma Yield Studies, maybe we need a more generalized reference on this method.”

Advice on how to communicate climate change information

- ❏ “Ensure that reports are structured for a variety of readers’ interest and level of detail (executive summary with bottom line, main report with more information, appendices with technical information).”
- ❏ “Give the motivation first! Start broad and then justify that message with the complexities.”
- ❏ “Need to be engaging from top to bottom without being too broad or too technical and not losing information.”
- ❏ “Discourage the use of acronyms, since they make documents unapproachable to non-technical audiences.”

Conveying Climate Change and Variability

- ❑ *“Some words that mean one thing in the scientific community—and something totally different to the general public—include: error, uncertainty, albedo, positive trend, positive feedback, and confounded.”*
- ❑ *“Clarify assumptions. Do not just provide numbers without backup info. On the [Basin Study], the wording of the [X number] MAF average shortage projection—was oversimplified, and the resulting response from some was too dramatic. [That number] was an average, and everyone took this number as ammunition to argue for limiting any further river water development. Lesson learned: there are ramifications for numbers so be careful with messaging.”*
- ❑ *“Vet explanations with non-engineers and non-scientists to ensure they understand.”*
- ❑ *“Translate complex information into what people can digest. Don’t start at the complicated level.”*

Climate change concepts

- ❑ *“[S]uggest big-picture language for inclusion in various reports.”*
- ❑ *“Certainly at an appraisal-level of analysis, big-picture is about as detailed as you may get. Specific feasibility reports will need more tailored language specific to either the effects of climate change on alternative development, or in comparing and ranking standard types of alternatives (both structural and non-structural) where climate change may play a large role in acceptability of various types of alternatives. Any of our technical reports could use these tools. That goes for our requests for funding documents as well.*
- ❑ *“Climate change vs climate variability”*
- ❑ *“Climate vs. weather—what are the odds? Help public understand that these are predictions and there is uncertainty and what will happen may be something different.”*
- ❑ *“Distinguish between concepts such as climate versus weather and projection versus prediction.”*
- ❑ *“Effects of greenhouse gasses on global atmospheric, oceanic, and terrestrial bio-geophysical processes.”*
- ❑ *“Visualize measurements—what does a metric ton of carbon look like?”*

- ❑ *“Consider incorporating/building upon the FAQs prepared for the National Climate Assessment” “[Explain] why temperature and precipitation changes are necessary but not sufficient climate change inputs to fully comprehend the future impacts.”*

Climate change analysis

- ❑ *“People struggled with technical obstacles---difficulty understanding how we got the downscaled climate hydrology and the different steps.”*
- ❑ *“Difficulties with interpreting and understanding impacts of climate indices and signals (PDO, temperatures).”*
- ❑ *“Canned language on how we calculate what emissions our projects will create—how we looked at it and evaluated the threshold.”*
- ❑ *“Downscaling availability, methodology, and information”*

Planning and decisionmaking approaches

- ❑ *“Reliability, resilience, and vulnerability”*
- ❑ *“Social cost of carbon”*
- ❑ *“Probability vs. likelihood”*
- ❑ *“Scenarios and how they are chosen.*
- ❑ *What are the error bounds and how do they vary?”*
- ❑ *“Apply significance criteria –how to pick significance criteria and consistently apply it across scenarios.”*
- ❑ *“Documenting the range of available climate change scenarios and the pros and cons of each scenario could be presented in a “boilerplate” manner and included in any planning document. This would include information on why or how each scenario could be used and why one scenario in a given analysis is more appropriate to use than another. Additionally a diagram of the climate analysis process that is easily understood by a lay reader and that can be explained by non-technical staff could be developed and used in a variety of planning efforts. An understanding by non-technical staff could be useful during times when the climate staff are not available to explain what is being transmitted on paper.”*

Conveying Climate Change and Variability

Glossary and Bibliography

- ❑ *“A glossary of terminology and a bibliography with links to resources would also be helpful.”³*

3.1.3. Use All Avenues of Communication

3.1.3.1. Summary

Many interviewees noted the need to go beyond a printed report. They suggested that Reclamation should use the communication avenues that stakeholders and others were using (e.g., social media).

3.1.3.2. Sample Quotes from Interviews

- ❑ *‘Reclamation should consider using social media to get climate change information out to the public (Twitter, facebook).’* [Note that this comment is referring to Reclamation’s analyses, study results, and scenario planning.]
- ❑ *“Need to use press releases, and social media to reach stakeholders.”*
- ❑ *“When we use these media, explain that there is more information available and direct the reader to that information. Prepare talking points that people can review ahead of time, so people can speak with a unifying voice.”*

3.2. Suggested Approaches for a Climate Change Communication Toolbox

3.2.1.1. Summary

Interviewees expressed concern that a static, published toolbox could be outdated too quickly to be useful. As climate change studies and Reclamation’s use of their analyses and results evolve, the communication toolbox would also need to be continually adapted. Interviewees suggested that a dynamic, shared library could provide a useful resource for Reclamation to effectively communicate climate change concepts.

Moreover, interviewees communicated the need for Reclamation-wide input, over a variety of disciplines and communities of practice. A single author would not be able to keep up with all of the innovations, reports, and explanations that Reclamation is developing to communicate climate change. Therefore, any toolbox would need to encourage all Reclamation climate change experts, technical experts and engineers, and planners to contribute suggestions and approaches.

³ The Office of Policy maintains a glossary, and the Toolbox contains a bibliography.

3.2.1.2. Sample Quotes from Interviews

- ❑ “[C]limate science and the methods for incorporating climate change into hydrologic studies are dynamic research areas that are constantly evolving.”
- ❑ “Therefore, we expect that any standardized language that is developed will need to remain a living document that can be updates as new approaches are implemented.”

3.3. Climate Analysis Needs Beyond Communication Aids

While interviews focused on needs for effective communication of climate variability concepts, analysis, and planning, many needs about climate change information and analyses emerged in the interviews. Although these needs can not be addressed by a communication toolbox, they could be covered by other ongoing efforts. Coordination throughout all of Reclamation’s climate analyses actions is essential to ensure that planners, technical experts, stakeholders, etc. can effectively integrate climate change information and analysis into Reclamation’s communities of practice.

Note that Reclamation is engaging in educational efforts. For example, many of these interviews took place before Reclamation’s Research Office provided a region-wide training and presentation about climate analysis resources (Climate Change Seminars) and the Office of Policy published technical guidance.

3.3.1. Climate Change Data, Tools, and Analyses

3.3.1.1. Summary

Interviewees indicated the need for practical and reliable data and analysis tools. Concerns about integrating climate change into analyses revolved around data availability, analysis tool functionality, relevant analyses, and handling uncertainty.

Interviewees (mostly those heavily involved in climate change analyses, such as the WW CRA team) noted that Reclamation and others have developed a myriad of various spreadsheets, glossaries, graphics, explanations, etc. By contrast, responses from interviewees who had tangential involvement in climate change analyses indicated a low level of awareness of Reclamation’s resources. This demonstrates a need for education about tool availability and for easier access to these materials already available within Reclamation.

Interviewees familiar with climate change analyses identified a number of clearinghouses for climate tools. For example, Reclamation’s climate webpage <www.usbr.gov/climate> is a portal to available climate information from a

Conveying Climate Change and Variability

number of programs around Reclamation. Other, Reclamation-specific information includes:

- WaterSMART: Basin studies, Impact Assessments, SECURE Water Act reports
- Climate Change Literature Synthesis
- Water Management Video series and other educational efforts
- Research efforts on uncertainty, extreme events, addressing scientific conflicts within decisionmaking
- Office of Policy’s sharepoint, with images, definitions, and acronyms.⁴

Interviewees noted other agencies and partnerships had resources as well (e.g., one response cited *“The Wisconsin Initiative on Climate Change Impacts (WICCI) has a tremendous amount of resources related to climate change and climate change analyses. Many resources are available online at www.wicci.wisc.edu.”*)

Software and tools are also available. Regions have developed spreadsheets and are using software such as visualization software that can build generic figures, plots, and tables that could be populated from a database link. An interviewee explained *“One of the strengths of this tool [Tableau, a visualization software] is the figures and data do not need to be static but rather users can interact and change the figures/plots in a pre-prescribed fashion. The figure can be designed to be end user friendly.”*

Interviewees also identified successful examples of climate change communication:

- ❑ *“Reclamation’s report, SECURE Water Act Section 9503(c) – Reclamation Climate Change and Water 2011 covered all the western states in which Reclamation has facilities.”*
- ❑ *“The Upper Rio Grande Impact Assessment is clear and readable and is well understood by the Upper Rio Grande community.”*
- ❑ *“Reclamation (2014) Upper San Joaquin River Basin Storage Investigation Draft Environmental Impact Statement”*

⁴ This research project is fully integrated with those efforts—as interviewees noted specific needs, the Office of Policy’s WWRA efforts and the TSC Manuals and Standards Climate Change Communication Toolbox project developed definitions, acronyms, and a draft toolbox to meet those needs.

3.3.1.2. Sample Quotes from Interviews

Data Availability

- ❑ *“Climate change projection scenarios are a complex process and knowing which of the CMIP3 or CMIP5 (or both) projections for future climate change impact analysis to use at this time is problematic because neither data set has been proven as a better technical reliable source of climate projects than the other. Both datasets were translated from global climate model projections over the contiguous U.S. from the World Climate Research Programme's Coupled Model Intercomparison Project.”*
- ❑ *“Boilerplate reference lists, links to important climate change publications and data from models would be a big help. We don't even know where to look for model data, right now. We already use my own report boilerplates for water quality monitoring reports, but any long-term monitoring program would benefit from tables of running averages for parameters such as temperatures, flows, etc., including references, as mentioned above.”*

Tools

- ❑ *“There seems to have been a lot of efforts to develop climate planning tools. One great resource would be a summary of those tools so groups don't always have to start from scratch.”*
- ❑ *“Our current climate and hydrology modeling tools lack the capacity to simulate the impacts of extreme events such as droughts and floods reliably.”*

Appropriate Analyses

- ❑ *“What are the numbers we should be thinking about? Plus/minus how much potentially? Is there some type of broad-based info that is reasonably accurate and useful, or is it always going to be highly site/time specific?”*
- ❑ *“[This] Region needs to determine which analysis is more appropriate to undertake the one for extreme events or to concentrate on the daily, monthly and annual water supply scenarios. An appropriate decision up front in the study formulation would prevent going down the wrong path and having to redo the analysis.”*

Conveying Climate Change and Variability

- ❑ *“Climate change projection scenarios are a complex process and knowing which of the CMIP3 or CMIP5 (or both) projections for future climate change impact analysis to use at this time is problematic because neither data set has been proven as a better technical reliable source of climate projects than the other.”*
- ❑ *“Determine how Reclamation should address the social costs of carbon. CEQ references are not clear, and the EPA calculator is more for rule making than for comparative analyses that are needed for environmental documents.”*

Handling Uncertainty

- ❑ *“It already gets complicated pretty fast and adding the evaluation of uncertainty to the mix would compound the level of effort in our designs and analyses.”*
- ❑ *“The effort to undertake different analyses is complex and variable for different parts of [this] Region given the large range of uncertainty.”*
- ❑ *I tend to simply incorporate uncertainty in future hydrology and sediment loads, whether that uncertainty be climate based or otherwise.*
- ❑ *We use present day facts—what we collect in the field. We do not speculate. We don’t do the climate change projection analysis. . . Trying to factor in long term climate change becomes speculative and political, so we stay out of that realm.*

3.3.2. Utility and Relevance

3.3.2.1. Summary

Most technical analyses and engineers do not currently engage in climate change analyses, even though climate change analyses are now being considered in planning, dam safety and flood risks, and streamflow projections. Interviewees cited various reasons, including not seeing the relevance to their analyses and not being able to quantify the climate model results’ uncertainty in terms of their analyses. The significance, modeling assumptions, and scientific uncertainty involved in climate change analyses need to be explained clearly so that climate change analyses can be incorporated into other technical models.

A subset of Reclamation planning does incorporate climate analyses, primarily under WaterSMART (e.g., Land Conservation Cooperatives, West-wide Climate Risk Assessments, and Basin Studies). Basin Studies have been conducted since

2009 and 22 studies have been initiated in basins contained in all but two of the 17 Western States. These programs are being well received—as one stakeholder responded: *“The scenario approach helped provide a range of futures, and you could look at the results for policy changes in different futures. This is a huge step for people to see—they could see where the differences would be in the scenarios. For all the models, all the scenarios, this is what we need to address—this is the gap between supply and demand. Then we were able to see the problem and explore potential solutions. We were able to focus on options to implement (conservation, augmentation, policy). Thus we were able to get to adaptation actions.”*

This potential disconnect within Reclamation points to the need for more education and partnerships between specific Reclamation projects and the climate analyses. WWCRA is working on these efforts.

3.3.2.2. Sample Quotes from Interviews

- ❑ *“I could see the potential benefit of a qualitative consideration in the discussion, but it has yet to be relevant to projects that I have been involved in.”*
- ❑ *“My major challenge is that I am not a climate scientist and have not taken the time to fully digest the climate change data to form my own interpretation. My understanding is that there are models for climate change out there, but there is no way to determine how accurate they are or extract useful quantifiable information. You might as well throw a bunch of random “what if” statements into the analysis.”*

3.3.3. Role of Climate Change in Reclamation’s planning

3.3.3.1. Summary

Interviewees also discussed the need to integrate climate change science and analytical results for effective long-term planning. Responses from planners indicated that while climate change planning should not be separate from other types of planning, adding climate change projections and scenarios can effectively communicate potential futures and allow for effective planning and engagement.

3.3.3.2. Sample Quotes from Interviews

- ❑ *“Connect to management and planning—get more engagement from stakeholders and decisionmakers and planning.”*
- ❑ *“Scenario approach was useful. This helped provide a range of futures, and you could look at the results for policy changes in different futures.”*

Conveying Climate Change and Variability

- ❑ *“Incorporate climate change analyses into a planning process, a what if scenario, which is what the basin study did, you can get people to think about how to manage in that possible future.”*
- ❑ *“Understanding the importance of combined socioeconomic-climate scenarios and the role of transient analysis in long term planning.”*
- ❑ *“I think we should emphasize that these are planning documents describing methods to adapt to our best estimates of our future, including changes in human development, population, and human development (although I also believe that each study should have baseline model runs that isolate the impacts of climate change from the impacts of development, so the water managers can better understand their degrees of freedom).”*
- ❑ *“Use many approaches. Reclamation prefers a top down (Global model to local model) approach, but a bottom up approach (at what temp or precip does the system break and how likely is that to happen) may be more useful”⁵*

3.3.4. Stakeholder Engagement

3.3.4.1. Summary

Stakeholders and Reclamation planners emphasized the need for using climate change information to inform “the bottom line” of the decisions to make and actions to take. They also applauded Reclamation for incorporating review processes for stakeholder understanding and clarifications and asked for that to continue.

3.3.4.2. Sample Quotes from Interviews

Relevance

- ❑ *“If stakeholders are trying to make decisions from our results they are really only interested in the final expected effects to their system. I've been in meetings with stakeholders and watched their eyes glaze over when you discuss the details, then they ask, “So will I have more or less water?”*
- ❑ *“The technical components were not useful for the work we were doing, were not going into the weeds. We needed to present: we are going to grow, population growth will increase water consumption needs. If water availability will decrease, then what water management practices can we engage in? Urban growth patterns and natural resource availability and*

⁵ This is a direct quote, reflecting an interviewee’s understanding. Reclamation does not have a prescriptive approach to consider climate change in planning and therefore no preference.

consumption. Incorporating water and climate-related issues made our project relevant to a wider audience.”

Reviews

- ❑ *”It was good that the authors of the chapters [of Basin Study] allowed the Basin states representatives to review the documents and to submit comments. Many comments were accepted, which made the language more easy to understand, and the figures more easy to read.”*

3.3.5. Outlines and templates

3.3.5.1. Summary

Interviewees discussed the need for outlines and templates. Reclamation reports could follow an outline that would capture the thought process involved in determining the range of scenarios and evaluating potential actions consistently under these scenarios. Interviewees indicated that they could use advice in explaining the thought processes involved in developing methods and approaches to incorporating climate change analysis.

Although interviewees saw this as a need, the Climate Change Communication Toolbox effort decided not to pursue outlines and templates of reports. The Office of Policy provides outlines and other guidance, such as the technical guidance for incorporating climate change in planning studies and the WWCRA Climate Projection’s sub-team’s selection of climate information report. Many planning studies and environmental compliance studies already have outlines.

3.3.5.2. Sample Quotes from Interviews

- ❑ *Less precanned language and more of an outline and a structure. Tech folks could follow this rubric and explain how they solve the problem in the analysis”*
- ❑ *“Having a general format highlighting standard planning protocols related to climate change to consider would be helpful.”*
- ❑ *“Provide a rubric or outline for explaining methods: what is climate change? How did we analyze it? What are the uncertainties and how did we address each one?”*
- ❑ *“If have templates—save as template files rather than word or graphic files.”*

Conveying Climate Change and Variability

3.3.6. Funding

3.3.6.1. Summary

Funding availability and methods to estimate costs for climate analyses are other concerns.

3.3.6.2. Sample Quotes from Interviews

- ❏ *“The biggest challenge is have enough funds available to conduct the necessary climate change analyses. While we have embraced it, the cost estimate to conduct this work is not easily predictable.”*
- ❏ *“The portion of the [Project] budget that comes to [this] Region is insufficient for managing this program under ‘normal’ conditions, and when increased monitoring is required for understanding the shifts we are seeing in these reservoirs, the program will be unable to respond.”*
- ❏ *It should be done for [Project] but there are limited funds.*

4. Conclusions and Next Steps

As Reclamation continues to incorporate climate change information in planning and analyses for the decisionmaking process, ensuring effective communication will be key to working with stakeholders and accurately understanding potential implications to and impacts of Reclamation actions. The Climate Change Communication Toolbox developed under the TSC Manuals and Standards program and in partnership with the Office of Policy is a good starting point to meet this need.

Other Reclamation writers, planners, and analysts are interested in further developing the Climate Change Communication Toolbox. We envision a living, dynamic document that would meet the communication needs that interviewees delineated. This toolbox will be based on the research results from this research project. This effort should:

- Invite review and contributions from Reclamation staff
- Develop a process for continual updates and reviews

Other efforts (both ongoing and potential) could meet needs that the toolbox could not, such as identifying resources and tools for analyzing climate change and variability and incorporating analyses into planning.

Suggested next steps for further research include:

- Conducting follow up investigations to determine the levels of awareness for climate change tools
- Identifying data and analysis needs for various Reclamation communities of practice
- Providing a continually updated list of data, tools, and other resources that could meet these data and analysis needs

5. List of all Data Sets

Original interview responses were collated in a word document, and an anonymized version is available upon request to Deena Larsen, delarsen@usbr.gov.

The literature search, collating good ideas for communication and potential graphics and text to use as a starting point to explain climate change concepts, is embedded in the Climate Change Communication Toolbox on the Office of Policy's sharepoint, <https://dosp/policyandadmin/WaterSMART/WWRA/SRteam/Shared%20Documents/Forms/AllItems.aspx>. Contact Katharine Dahm, kdahm@usbr.gov, for access.