Pacific Islands Sea Level Rise Adaptation Science Dialogues
Meeting #1: Initial Researcher Focus Group Sharing and Discussion

Sea Level Rise Dialogues Meeting #1 Summary

Thank you to the sea level rise researchers and faculty who joined in and contributed to the first SLR Dialogues meeting hosted by the Pacific Islands Climate Adaptation Science Center (PI-CASC) and Hawai'i Sea Grant on May 17, 2021.

Sea Level Rise Dialogue Meeting #1 was the first of a series of three Dialogues focused on strengthening and improving cooperation among the community of practice for modeling sea level rise impacts in Hawai'i and the Pacific Islands.

Researchers and science organizations working on sea level rise science in Hawai'i and the US Affiliated Pacific Islands (USAPI) provided presentations and written summaries on research, resources, science tools and products, capabilities, and outlook to meet the following goals:

1. Gain a shared understanding from research groups working in the region of recent, ongoing, and proposed research, products, science tools, and partnerships, and how the work is informing planning and adaptation efforts, related to sea level rise impacts
2. Initial discussion and identification of areas for improved cooperation and synergy among research groups and science boundary organizations (to be further developed through meetings #2 and #3)

For more details on the information shared, please reference the research presentation summary document. Research summaries include project locations, project partners, model details, purpose, metadata (and access to), outcome/questions answered, funding sources, and accessible datasets.

Workshop Format

Workshop attendees participated in an afternoon of interactive virtual dialogue following the research presentations. Organizers facilitated information sharing through active dialogue, Zoom chat, and the use of Padlet, an online platform that provides space for virtual surveys and discussion. All attendees were provided equal opportunity to contribute responses to our three Padlet survey topics: 1) Opportunities related to overlaps, gaps, and synergies; 2) Potential areas for improved cooperation among researchers, stakeholders, and geographies; and 3) Roles boundary organizations play in increasing the impact of your work.

Dialogue and padlet results are categorized below into high-level topics that stood out in the discussion. Each topic includes a description of challenges/comments and a list of related solutions/suggestions noted by participants.

It is important to recognize that certain sea level rise challenges are unique to the Pacific Island regions.

For example,

1. Sea level rise researchers conducting work in the Pacific Islands represent local, regional, national, and international geographies and dozens of organizations. Communication and information sharing is poor across this global network, with some exceptions.
2. The Pacific Islands include the most remote areas in the world. Transporting equipment and people needed to conduct research is time consuming and expensive. Often research is conducted with no access to resources common elsewhere, such as internet service, electricity, or technology.
3. The majority of the Pacific Islands are lacking technical capacity and baseline data. The data required to develop requested/needed small scale, high resolution inundation forecasts at different time scales is basically non-existent in the majority of the Pacific Islands.
4. Many Pacific Islands do not have the resources, or expertise to gather model baseline data (ground control points, digital elevation models) or to download, interact with, and understand the inundation models. There is great room for improvement in local capacity building. This was emphasized during the pandemic.

I. Sea Level Rise Models

For the purposes of these dialogues, a sea level rise model refers to a mathematical or physical simulation or representation of localized impacts resulting from or worsened by rising water levels, which is informed by observed data and enables the inference of patterns and predictions that are critical for planning. Most researchers focused on physical processes/impacts (e.g. wave run-up, coastal erosion, storm surge), some noted the need to consider ecosystem shifts over time (e.g. shifts in coastal mangrove forests). Across the board researchers found that model assumptions and sources of uncertainty should be better communicated with communities and managers to clarify the boundaries of their work. This does not dilute the power of the science, but rather enhances the utility as decision makers can more accurately apply the science to their issues. Finally, researchers agreed that the lack of data, data access, data hosting, and management capacity are all challenges across the region. As models are costly and complex to create and maintain, platforms for discussion with researchers and stakeholders will be critical to build new synergies, learn from each other, and expand their science impact.

Solutions/Suggestions:

1. *Understanding of existing models*	1a. Create a chart of active sea level rise science products (e.g. geographic map).
	1b. Create a product that organizes existing model information by objectives, methodologies, datasets employed for validation (if any), locations being addressed, caveats to be aware of, etc.

	1c. Develop a system to share data (especially field data) and clear metadata with other researchers to assist with other modeling efforts.
	1d. Support an open source code for viewers to allow for more consistency when making projections.
	1e. Ensure model products are framed by well-explained probabilities.
2. *Updates to current models*	2a. Build an integrated coastal monitoring program (e.g. incorporate ecosystem change into wave run-up models and future flood projections).
	2b. Develop inundation likelihood characterization with stakeholder input and look into ways to add return interval information.
	2c. Advance fine resolution coastal modeling research.
	2d. Deepen knowledge of compounding coastal phenomenon (e.g. coastal erosion and wave run-up) to employ in models.
3. *Improve and expand regional data*	This includes expanding regional databases for: ● Regularly updated topobathymetric digital elevation model (TBDEM) with spatially explicit uncertainty information (especially in remote areas) ● Historical wave run-up data ● Shoreline change or vertical land motion ● Locally relevant flooding thresholds ● New or updated remotely sensed datasets ● Improved nearshore bathymetric data ● Recent topographic data to capture coastal change ● Local validation field data

II. SLR Scenario Selection

Scenarios are used to develop and test decisions under a variety of plausible futures. A key discussion point was that sea level rise models require appropriate scenario selection with a clear understanding of management timelines and policy considerations. Currently, researchers cannot definitively say which scenario is the best to follow, but they can provide a range of potential inundation likelihoods based on a range of future scenarios. Scenario selection can be a complicated topic, so clear communications with collaborators are necessary to ensure scenario output, model assumptions, and potential error are fully understood. Additionally, researchers emphasized the need for more sea level rise -related outreach, training, job opportunities, and participatory research to empower and educate the local workforce, community, and collaborators. Overall, the discussion confirmed the need for

researchers to increase engagement with policy makers and improve the utility of sea level rise scenarios. Solutions/Suggestions:	
1. *Increase engagement with policy makers*	1a. Inform localized sea level rise policy and examine its response and effectiveness.
	1b. Create a NOAA-USGS-FEMA working group to look at flood issues and maps.
2. *Improve utility of scenarios*	2a. Engage with stakeholders to determine locally relevant flooding thresholds.
	2b. Provide a range of locally-relevant sea level rise scenarios for decision-makers to consider.

III. SLR Stakeholder Communication and Tools Sea level rise tool users expressed being inundated with too many options as there are various websites, viewers, models, etc. Additionally, there are multiple tools that exist with the same focus (e.g. wave run-up, mean sea-level, inundation). With so many tools out there, it can be difficult to differentiate data input and outputs among the many resources provided to stakeholders. Therefore, researchers need to assess existing tools to find the appropriate method(s) to answer the management question. However, this can be a complicated process as managers may not have a strong enough technical understanding of a sea level rise informational tool to know what resolution, time scale, and uncertainty they can accept in their management regimes. Solutions/Suggestions:	
1. *Strengthen stakeholder input and buy-in process*	1a. Improve data access and availability to more researchers, especially in remote areas.
	1b. Prepare plain language descriptions or figures to explain the tool, its limits, and how to interpret.
	1c. Provide more platforms to gather stakeholder input and buy-in to understand what works and what does not for their needs.
2. *Create SLR outreach resources*	2a. Compile a library with sea level rise model comparisons, essential literature, syntheses, and tool manuals.
	2b. Develop virtual training and support for sea level rise viewer tools, data access, and

	data collection.
3. *Improve the tools we currently have*	3a. Work together to create standardized viewer tool across the region as users can become inundated with too many tools and trainings.
	3b. Create a synthesis product that distinguishes between the different tools, their inputs, and levels of associated uncertainty.
	3c. Make tools accessible on smartphones.
	3d. Conduct survey of sea level rise adaptation tool users to understand what tools work well.
4. *Integrate management and adaptation considerations*	4a. More outreach on how sea level rise scenarios are being applied for climate adaptation planning.
	4b. Support platforms to discuss what management and policy questions the existing data and tools answer along with the applicability of various methods.
	4c. Grow understanding of integration issues for climate adaptation plans.

IV. Boundary Organization Roles

Boundary organizations work in the space between science, management, outreach, and policy where they convene groups, translate science, and facilitate discussion. Boundary organizations play a key role in supporting and sharing about actionable science. Researchers noted that it can be difficult to keep track of the different organizations supporting sea level rise adaptation science in the region. Additionally, lack of communication between boundary organizations can lead to redundancies and missed opportunities for activities like collaborative data collection, stakeholder engagement, and tool development. In response, researchers voiced the following boundary organization roles to better support regional sea level rise adaptation research: (1) help disseminate science and information, (2) support diverse engagement events, (3) connect researchers and managers, and (4) provide support to develop critical sea level rise adaptation capacity.

Solutions and Suggestions:

1. *New tools and platforms to continue the conversation*	1a. Develop researcher exchange to keep each other aware of latest science, resources available to share, opportunities to coordinate for stakeholder engagement, and potential to

	submit joint modeling help requests.
	1b. Create a tool to help managers match tools to their management questions (e.g. gulftree.org).
	1c. Ensure tools adapt to language, technical, and other localized needs for any outputs.
	1d. Create a central repository for sea level rise science where participants can stay updated on regional SLR projects and new research questions.
2. *Grow our pathways for information sharing*	2a. Capture and share about ongoing and planned sea level rise projects by agencies in the Pacific.
	2b. Create a space to discuss latest and planned datasets (e.g. digital elevation models or DEMs) from across agencies.
	2c. Establish technical support or extension networks for sea level rise modeling and application.
	2d. Offer more science translation and manager training opportunities.
3. *Build regional capacity to meet local needs*	3a. Develop training manuals and workshops to expand topo-bathymetric datasets.
	3b. Grow early career and student mentorship efforts.
	3c. Extend citizen science to regions with greater technical restrictions.
	3d. Engage with traditional leadership groups to expand understanding of community needs, build trust in the science, and cultivate a synergistic partnership.
4. *Assist in coordinating SLR research*	4a. Share research results around networks and build off of each other's stakeholder engagements.
	4b. Provide support for science that answers relevant questions.
	4c. Work together to prioritize what sea level

	rise type of research is conducted where and for what purpose.