



Pacific Islands Sea Level Rise Adaptation Science Dialogues Meeting #2: Management, Policy, and Research Discussion

Sea Level Rise Dialogues Meeting #2 Summary

Thank you to the sea level rise science partners and researchers who took part in the Pacific Islands Sea Level Rise Adaptation Science Dialogues (SLR Dialogues) on July 26, 2021. This Dialogue was the second 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.

In our first meeting in June we heard from our research focus group about recent, ongoing, and proposed research projects, as well as development of related informational products, science tools, and partnerships. At the second meeting, we expanded the group to learn more about ongoing and anticipated science needs from experts throughout the Pacific Islands working in management and planning related to sea level rise adaptation.

The meeting began with panel presentations by resource managers, planners, and other science partners working on sea level rise adaptation efforts in Hawai'i and the US Affiliated Pacific Islands (USAPI). We hosted three unique sea level rise science partner panels focused on general island, urban/infrastructure, and atoll settings. Followed by a full group discussion on where this group would like to go and how boundary organizations can better meet regional needs. All presentations and discussions strived to meet the following goals:

1. Gain a shared understanding of current and potential application of sea level rise adaptation data and tools to inform management and policy.
2. Improve understanding of how science, tools, and guidance are informing or could inform resource management, community adaptation planning, and policy.
3. Improve understanding of barriers faced in adoption of science-based tools and solutions (e.g. costs, alternatives, politics, etc.) for management/policy decisions.
4. Identify key lessons learned and challenges in successfully addressing information needs related to sea level rise adaptation science and discuss outstanding knowledge and capacity gaps.
5. Improve understanding of how boundary organizations can connect and support application of science in resource management, planning, and policy that is appropriate for local needs.

For more details on the information shared, please check out our Jamboard [here!](#)

Workshop Format

Workshop attendees participated in an afternoon of interactive virtual dialogue following the presentations. Organizers facilitated information sharing through active dialogue, Zoom chat, and the use of Google Jamboard, a digital interactive whiteboard. The first portion of the meeting consisted of three panel discussions and led to a full group discussion centered around a couple topics. All attendees were provided equal opportunity to contribute responses to our discussion questions on Jamboard (see below).

Questions from Panel Discussions:

1. Please provide examples of successes in applying sea level rise science information or tools in planning and decision-making. What qualities or factors made the information useful and applicable?
2. What challenges have you faced in utilizing sea level rise adaptation science in your planning or management needs?
3. What do you see as your priority needs for data or planning tools related to sea level rise impacts in the next few years? Can you offer any advice or solutions to these challenges that will benefit your sea level rise planning and management needs in the next few years?

Questions from Group Discussions:

4. How do we better self-organize as a community of practice to more effectively serve community climate adaptation needs and support co-production to meet specific regional science and capacity needs described in this meeting (to be continued in meeting #3)?
5. How can boundary organizations like Sea Grant, PI-CASC, RISA and others continue to help you in meeting science and informational needs and address challenges identified in the panel discussion? Are there more or different things we should be doing to help access, interpret, and use the latest sea level rise science in planning, management, or decision-making?

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

For example,

1. There are many local, regional, national, and international entities conducting research and funding work in the Pacific Islands. Communication and information sharing is poor across this global network, with some exceptions. Therefore, awareness of available science and representation in regional discussions are common needs.
2. The Pacific Islands include the most remote and at-risk areas in the world. This can complicate adaptation for critical infrastructure and the homes of people and wildlife as resources, capacity, and data are very limited.
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, especially atolls where they are needed most.
4. Many Pacific Islands do not have the resources, available staff, or expertise to gather baseline data (ground control points, digital elevation models) or to download, interact with, and understand the inundation models. There is great room for creative and place-based local capacity building both in-person and virtually. In areas with limited internet service, electricity, and technology, building these relationships are vital for respect and resiliency.

Workshop Summary

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

I. General Island Settings

Pacific Islands are remote and limited in resources. Yet, our region is connected through the ocean and rich in biological and cultural treasures. Pacific Islanders embody resiliency and understand the necessity of building strong partnerships to get through the toughest storms. Researchers continue to produce lots of great science products to better visualize the local stories and hazards. However, more needs to be done to address the concerns of islands with smaller populations and manager requests for outputs with SLR impacts for specific time frames.

The rock star product of this panel was the Hawai'i SLR Viewer, which has been foundational to the understanding of potential local SLR impacts. The Viewer has been used in many different applications including State/county/community planning, EIS/EIA analysis, infrastructure review, permitting, and rezoning in Hawai'i. The tool works well in difficult discussions as it features impactful visuals and great context to get the issue across. Next steps for the Viewer include refining existing data layers and adapting the tool for other Pacific Island nations (e.g., American Samoa).

Outside of the science and tools, managers have also found resiliency in the great conversations with the community because of their long-standing relationships with the surrounding environment and communities. By learning about the past, new conversations of philosophy and different interpretations of place and purpose can arise. These types of discussions can help managers prioritize and develop creative and equitable solutions when faced with the uncertainty of SLR.

Solutions/Suggestions:

1. <i>Political will to support coordination</i>	1a. Create uniformity and clarity in regulation across Hawai'i counties through knowledge sharing activities to share lessons learned and best practices.
	1b. Get regulators onboard and in conversations as early as possible in the planning process (i.e., co-production).
	1c. When incorporating data into plans or implementing new policies, ensure that the result has co-benefits (e.g. for ecosystems, city flooding hazards, cultural resources, etc.) to a variety of people or stakeholders in the community.
2. <i>Next steps in research</i>	2a. Management implementation and decision-making support with established models.

	<p>2b. Integration of data into regional and local plans, reports and assessments.</p>
	<p>2c. Improve existing tools with updated scenarios, useful layers, and evolving science (e.g. understand a range of potential impacts for critical planning areas).</p>
	<p>2d. Separate SLR adaptation research outcomes to inform day-to-day vs. future planning management applications.</p>
<p><i>3. Improve understanding of SLR modeling integration into policy and planning</i></p>	<p>3a. More user education from researchers on the following:</p> <ul style="list-style-type: none"> ● Understanding of raw data sources and metadata. ● Various risks of inundation (e.g. SLR-XA depths) to better understand what types of mitigation are feasible in different areas. ● Translation of projections (especially model uncertainties and likelihoods) in a way that can be understood in communities.
	<p>3b. Establish clear and understandable language for use across disciplines, age groups, and Pacific Island cultures. Simple language (jargon-free), graphics, graphs, visualizations, and animations resonate extremely well with locals.</p>
	<p>3c. Decision-making support tools to help managers select the most relevant range of scenarios as it can be overwhelming to consider all potential impacts at once.</p>
	<p>3d. Planners need defensible models when facing judicial challenges:</p> <ul style="list-style-type: none"> ● High resolution models are critical for creating smooth regulatory lines on maps, especially when property may be at stake. ● More regulatory framework needed to adjust existing ordinances.
<p><i>4. Enhance regional awareness of SLR adaptation needs and challenges</i></p>	<p>4a. Researchers need to be aware of different capacities for climate adaptation coordination and limited human resources across the region.</p>
	<p>4b. Need high-resolution tools as widely available multi-regional tools are typically too grainy for applications on islands.</p>
	<p>4c. Science products should be co-produced with local users to ensure integration of localized needs (e.g. differences in socio-cultural hierarchy, land tenure, jurisdiction/mission).</p>

	<p>4d. More coordination on adaptation approach and data/tools used by federal agencies (e.g. USACE) versus local agencies and NGOs in the Pacific Islands region.</p>
	<p>4e. Leverage the revived Pacific Regional Data Sharing Initiative (formerly known as Pacific Islands Regional Planning Body) to ensure the needs of this community are being addressed.</p>
	<p>4f. Amplify SLR adaptation awareness and urgency for islands with relatively small populations to help secure funds and federal investments for critical research (e.g. LiDAR).</p>
	<p>4g. Support and improve information collected from activities and projects implemented in communities as there is a lot happening, but it is not being well documented.</p>
	<p>4h. Host an annual meeting to keep everyone updated on the latest science, introduce the next-generation researchers, and create new solutions, synergies, and partnerships.</p>

II. Urban Settings and Infrastructure

Due to the limited amount of space on Pacific Islands, urban areas and critical infrastructure are often found along coastlines at risk to SLR impacts. Furthermore, planners need to develop sustainable practices to mitigate stormwater to limit secondary inland flooding and infrastructural damage from SLR. Future SLR adaptation plans for urban and infrastructure needs will have to consider a variety of options like managed retreat, coastal hardening, and nature-based solutions. In extreme cases, migration may need to be considered as the expansion of infrastructure is limited by available public space.

Examples of successful integration of SLR adaptation research into planning efforts include Guam’s climate-smart infrastructure planning (e.g. power plant relocation, pump station retrofitting, wastewater management) and Honolulu’s city guidance on climate change information utilization. Urban area planners in the Pacific Islands need to make complex adaptation decisions about capital improvements, zoning, easements, housing, access to services, and more. However, researchers can help communities remain proactive to SLR threats through the continued refinement of SLR adaptation data, research, and resources.

Finally, urban settings have large populations dealing with a multitude of community issues. Therefore, building good relationships with regulators and decision-makers early on is key to effective coordination and maintaining political will for SLR adaptation. However, even with political will at the highest levels, adaptation action may be limited by human and financial resources. So, leaders and planners should prioritize community needs and livelihoods to build public trust in adaptation strategies.

Solutions/Suggestions:	
<i>1. Integrate research outputs into urban regulations</i>	1a. Incorporate complex planning for capital improvements, easements, and zoning into SLR models.
	1b. Investigate new SLR adaptation applications (e.g. parametric insurance based on wind speeds, weather, and storm strength)
	1c. Reframe question from how much SLR to how soon to help managers determine tolerable risk (e.g. intermediate high scenario with wave run-up).
	1d. Survey, CAD, and mapping data may need to be updated to get the appropriate outputs for planning needs.
	1e. Create a risk tolerance exercise as part of the design process to make sure infrastructure can perform under specific scenarios. We need to move decision-makers away from making decisions solely based on color codes of SLR maps.
<i>2. Support multi-agency coordination efforts</i>	2a. Pursue integrated management approach (e.g. One Water) to ensure co-benefits to a variety of people or stakeholders.
	2b. Develop MOU for multi-agency coordination framework for long-range maintenance (e.g. raising roads and updating utility lines) goals and targets.
	2c. Expand discussions to include developers and construction workers to build crucial relationships.
	2d. Create an all in one place 'map' that helps demonstrate how all the projects, partners, and proposed solutions interact.
<i>3. Next steps in research</i>	3a. Some jurisdictions (e.g. CNMI) need critical comprehensive inventory of infrastructure/buildings and valuation information for prioritizing SLR adaptation. SLR visualization and geospatial products are great, but decision-makers need to couple this with urban/infrastructure assets & attributes.
	3b. Create wave run-up models for other parts of USAPI to help managers understand worst case scenarios with storms.
	3c. More research on groundwater dynamics/inundation, sand dune dynamics, and beach migration.
<i>4. Start developing clear plans for community adaptation</i>	4a. Clear policy direction with a plan for different timeline, types of assets, and community conditions.

	4b. For areas not retreating (e.g. Waikīkī, downtown O‘ahu, Kaka‘ako), different solutions at various scales of adaptation need to be assessed (e.g. roadway realignment and utility retrofitting).
	4c. More coordinated community-scale strategy for adaptation whether retreat, physical, etc. Urban planning should take into account population changes due to internal migration and SLR inundation risks.
	4d. Research cost-effectiveness and economic value of nature-based strategies in comparison to conventional methods to garner community buy-in.
	4e. Support for funding adaptation plans once they are in place.
5. <i>Improve understanding of model outputs</i>	5a. Educate users on how natural variability and cycles like ENSO can influence sea levels.
	5b. More co-production with science users to improve their understanding of model uncertainties and better tailor outputs and applications to inform critical decisions.
	5c. More outreach on SLR model outputs to decision-makers, planners, managers, and the public to educate users on the nuances and limitations of the data.
	5d. Researchers should grow relationships with decision-makers to understand how to gear their science to apply easily in their realms.

III. Atolls

The ring-shaped coral reef and inner lagoon are indicative of atolls, which are the final stage of the island life cycle above the ocean. Atolls are isolated, retain heavily localized atoll-specific issues, and do not have the critical information necessary for planning. Islands like Rose Atoll face larger and more frequent overwash events, which threaten the homes of thousands of birds. While more populated atolls like the Republic of the Marshall Islands (RMI), need to consider cross-sector approaches to make difficult planning decisions for the future as sea levels continue to rise.

Since atolls will see some of the most drastic SLR impacts in our region, there have been many great projects to help communities adapt for the future. This includes projects like homeowner handbooks, coastline protection, ridge to reef management, coastal vulnerability assessments, and mental health discussions. In O‘ahu and Kaua‘i, the USFWS has started to

establish long-lived seabird colonies from Papahānaumokuākea Marine National Monument to help familiarize and adapt these species to areas at less risk to SLR impacts.

Managers and residents of atolls will face some of the hardest decisions in the near-term as many atolls face elevational limits. Therefore, the creation of community-based adaptation plans anchored in sound science is vital for their future decisions. Unfortunately decision-makers cannot move entire ecosystems and its connected peoples all together, but managers and researchers can work together to find innovative and thoughtful ways to save the critical components of those ecosystems and the cultures that relied on them.

Solutions/Suggestions:

1. <i>Need to expand critical data of atolls</i>	1a. Generate key digital elevation model (DEM) data to inform SLR models for priority areas.
	1b. Enhance the accuracy and precision of necessary topo-bathymetric, climate, and oceanographic data.
	1c. More meetings between atoll managers, communities, and researchers to support collaboration that considers atoll-specific needs and constraints.
2. <i>Support for infrastructure applications on atolls</i>	2a. Investigate SLR impacts to Midway Wildlife Refuge and airport because if infrastructure is overwashed then wildlife resources will be further constrained and twin-engine planes cannot fly over the Pacific.
	2b. In the Republic of the Marshall Islands, updated building codes with SLR considerations are nearly complete. Now they need help with enforcement considerations.
	2c. Research on structure safety and evacuation methods during SLR inundation.
	2d. Update infrastructure, building, and ecosystem services inventory and maps.
3. <i>Next steps in research</i>	3a. Create integrated cross-sector models of coastal inundation impacts to groundwater, agriculture, and infrastructure to indicate island habitability and guide strategic retreat or migration, if necessary.
	3b. Generate updated SLR projections with new CMIP 6 models.
	3c. Integrate combined risk of groundwater, wave, storm surge, and typhoon inundation in the context of SLR.
	3d. Create tools to translate SLR projections into risks for neighboring atolls, but researchers will need to ensure data availability first.

	3e. Create surface elevation data and SLR modeling for remote atolls to prioritize wildlife resource and management decisions with considerations for future extensive land loss for many atolls.
	3f. Investigate the changes in coastal protection by corals in the context of warmer and more acidic oceans.
<i>4. Gain understanding of atoll research and available data</i>	4a. Synthesize what studies have been done, their associated data, and lessons learned.
	4b. Synthesize localized atoll needs and share with researchers.
	4c. Develop a centralized repository or data portal with available SLR data and relevant information such that managers and decision-makers can easily use (e.g. easily accessible, familiar format, clear language, and regularly updated).
<i>5. Build regional capacity to serve atoll needs</i>	5a. Find ways to build new local employment positions as many agencies are limited by number of staff and are overwhelmed.
	5b. Support coordination efforts in the USAPI to get expertise out to region and involved in capacity building workshops and technology transfer.
	5c. Need for IT capacity support as newer models can strain the current computer systems available on atolls.
	5d. Work with non-DOI partners to employ drone surveys, while the current moratorium is in place for DOI.
	5e. Host meetings with atoll communities to understand unique land tenure and land use considerations and needs.
	5f. Invest in place-based trainings to grow local capacity for data gathering and modeling.
	5g. Create a specific working group to address the urgent needs of atolls in our region.