CORALS & CLIMATE ADAPTATION PLANNING (CCAP) STAKEHOLDER WORKSHOP REPORT

Honolulu, HI
July 8-10, 2014

Lessons Learned

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Introduction

A 2½-day stakeholder workshop to test a draft CCAP framework was convened in Honolulu, HI on July 8-10, 2014. This project is a collaborative effort under the auspices of the Climate Change Working Group of the U.S. Coral Reef Task Force to explore frameworks and methodologies for climate change adaptation planning for coral reef management. The draft CCAP framework (Figure 1) integrates general principles for adaptation to climate change from theoretical frameworks with ongoing advances in assessment and planning by coral reef managers. In particular, it is intended to take the climate change adaptation principles outlined in the Climate-Smart Conservation guide (Stein et al. 2014) and tailor them for effective application to coral reef adaptation planning. This workshop was a significant opportunity to gain feedback and new insights through exploration of the framework with 22 coral reef science and management experts from West Maui, the broader Pacific, the Caribbean and the Great Barrier Reef Marine Park Authority (workshop participants are listed in Attachment 1). Outcomes from the workshop, summarized in this memo, will set the direction for further development and revision of the CCAP framework and for future work.

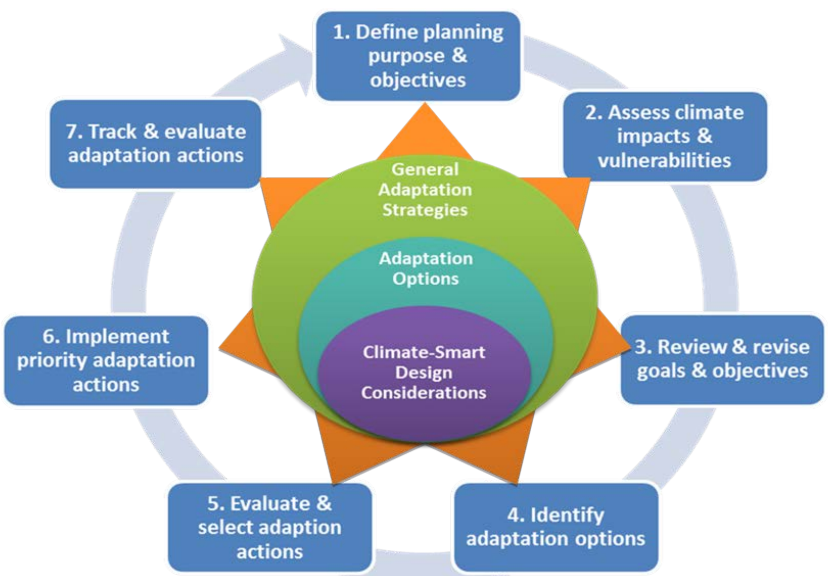

Figure 1. Corals and Climate Adaptation Planning (CCAP) cycle and framework.

Throughout development and testing of the CCAP framework, we have recognized that different organizations and participants are already using established planning processes, and thus it is our intent to provide a parallel structure that indicates where climate change adaptation considerations can integrate into existing coral reef management planning areas. That is, the CCAP framework is focusing on the climate change/adaptation planning side, with the assumption that the information generated from the Climate-Smart cycle can be merged into any planning cycle.

The workshop exercise used the coral reefs of West Maui as a case study, with the workshop participants taking on the role of West Maui decision makers engaged in another round of the planning cycle and having the opportunity to reconsider the existing West Maui plan and apply the CCAP framework. The existing plan (portfolio) could be varied a little or a lot, depending on Climate-Smart inputs, such as revisions to existing options through application of the Climate-Smart design considerations, additional options brainstormed using the CCAP framework table, and even the review and potential revision of goals and objectives (in Step 3) that might be engendered during the implementation of Step 4. The iterative nature of this process is common in planning cycles, but is a hallmark of the CCAP framework. However, our main focus in initial development of the CCAP framework and for the workshop was on Steps 4 (Identify Adaptation Options) and 5 (Evaluate & Select Adaptation Options) of the planning cycle (Figure 1). Thus, the important process of cycling back to earlier steps as new information and insights are gained in later steps (such as in the return to Step 3 for review and revision of goals and objectives) was not our initial or primary focus in this workshop exercise. During the workshop, we focused on exploring the portfolio building and evaluation processes and how they iterate to develop an implementable plan that is Climate-Smart.

Outcomes Regarding Components of the Framework

Day 1 -- Portfolios

Both breakout groups were able to generate one or more portfolios (see Figure 2 example), via a process that was intellectually challenging but conceptually very productive for the participants.

Step 4C: Portfolio Building Worksheet – Zooxanths 1

Categories = Option Types from Table 4B (associated objectives in parentheses)						
Run-off controls	**Water treatment upgrades**	**Non-indigenous spp. removal**	**Fishing restrictions**	**Protected areas**	**Artificial shading**	**Transplantation**
Install water bars, terraces, microbasins, in dirt roads in agricultural areas *(WMP1, WMP2) M*	Treat stormwater using a constructed wetland *(WMP1, WMP2)*	Remove non-indigenous algal species to preserve the integrity of coral reef communities with the super-sucker *(H2, H4)*	Enhance natural recovery processes through replenishment of native grazers that control algal growth on damaged reefs *(H1, H3)* includes restocking	Protect/promote recovery of areas of high coral species diversity and cover. ~~using temporally flexible no-use zones after extreme events~~ *(H4)*	Use artificial shading when corals are exposed to thermal stress, to protect coral sites of specific importance from coral bleaching *(H4)*	Transplant coral reef organisms among locations that are no longer connected by currents *(H4)*
Establish vegetative cover, filter strips in agricultural fields *(WMP1, WMP2)*	Install curb-inlet baskets to filter hydrocarbon and debris from the storm drains *(WMP1, WMP2)*		Increase compliance with all fishing rules and regulations ~~Promote adherence to State of Hawaii catch sizes and bag limits~~[CAP] *(H3)*	Protect adjacent (olewale) or nearby coral reef areas that are hydrodynamically connected and can serve as recruitment sources for coral reefs in West Maui *(H4)*		
Retrofit in-stream dams to collect fine sediment *(WMP1) M*	Reduce the volume of treated wastewater injected into groundwater through reuse *(WMP3)*		Support and review/revise and monitor rules based on old spawning patterns (spatial & temporal) fishing rules and regulations on fishing based on target species ecology and life history [CAP] *(H3)*	Identify and protect ~~species~~ communities with ecological traits characteristic of low sensitivity and high adaptive capacity to climate impacts & species that form foundational framework*(H4)*		

Figure 2. Example portion of a portfolio generated by the zooxanth breakout group on Day 1 of the workshop.

The concept and application of portfolios was problematic for some of the workshop participants, although others embraced the potential value and benefits of using portfolios. Some points that arose regarding portfolios are included in Table 1.

Table 1. Pros and cons of using portfolios that come up during facilitated discussions on Day 1 of the workshop.

Pros	Cons
Temporal scale and sequencing is an important organizing principle that can be addressed through portfolios	There was difficulty in defining organizing themes that would result in distinctly different and "competing" portfolios for comparative evaluation
The portfolio concept emphasizes the importance of, and aids in the development of, an integrated plan that accounts for interactions (synergies, conflicts, prerequisites)	There was some perception that themes are essentially goals, such that developing themes would lead to revision of goals and objectives and competing portfolios under the same goals are not needed or even possible

The concept of comparing groups of options to other groups of options is consistent with situations where multiple groups are developing separate plans for the same watershed (e.g., West Maui watershed group and Army Corps), and need to comparatively evaluate and coordinate or merge their respective portfolios	Some find it more logical that options would be identified, considered in combination, and either discarded or kept through a process of continuous development until the desired plan is reached; i.e., one plan would emerge and there is no utility/it seems forced to create "competing" portfolios for evaluation

These ideas are discussed further in following sections. However, it should be noted that, because the evaluation step was not fully explored, the role of evaluating/comparing sets of options/actions (portfolios) rather than individual options was not fully resolved.

Themes

Many participants had difficulty picking themes for organizing portfolios, but themes were considered important, in that they change what options would be considered for inclusion in a plan. Themes emerged organically during portfolio building, as opposed to being established up-front and driving portfolio building. One difficulty in developing themes in the exercise was seen as an artifact of using the West Maui case study, in that all of the options that came from the West Maui Ridge to Reef planning process had already been through several screenings, and as such were already more limited in scope than would have been the case with a full set of newly 'brainstormed' options. In relation to this, some noted that the opportunity to brainstorm options as part of the exercise for Step 4 of the CCAP cycle would have aided the participants in becoming familiar with the Step 4 process and moving ahead more successfully with portfolio building and evaluation.

A key issue regarding themes was that many of the themes were considered similar to goals and objectives, and alternative themes would have the effect of altering the stated goals and objectives. As part of the planning cycle, this would have required a return to Step 3 to review and revise goals and objectives (Figure 1). Within the CCAP framework, such iterations are integral to the process. But for conduct of the exercise, program goals and objectives were being taken as a given in order to focus on application of the coral reef-tailored Climate-Smart components of Steps 4 (climate smart design) and 5 (evaluation of portfolios). This impacted participant's abilities to conceptualize themes for West Maui that were meaningful and different.

That said, some interesting potential themes emerged from the workshop, including:

- narrow vs broad, where narrow refers to including only options that are 'clear winners';
- ecological vs social /economic benefit focus (e.g., traditional reef management vs people benefits);
- temporal (e.g., what should be done immediately, what in the longer term);
- no regrets (would become an option after evaluation);
- resilience;
- maintenance of ecosystem services;
- persistence;
- key threats (e.g., by option type or by stressor);
- indicators, e.g. biodiversity, fish biomass, coral cover, water quality.

Day 1 – Transition to Evaluation Step (Planned for 2nd Day)

The group was not ready to move on to the evaluation step on the second day. In part, this was due to the perception that picking various valid themes might lead to revising objectives. If objectives need to be revised, then measurable attributes also would need to be redefined, and iteration through that many steps of the CCAP cycle could not be completed as part of the workshop exercise. There was understanding and general agreement that the evaluation would be a locally informed ranking process, using expert consensus, but there was some skepticism that there was enough information for the experts in the room to evaluate whether an option could achieve a certain level of a measurable attribute. It was suggested that level of confidence in an option, e.g., high/medium/low judged based on experience, could contribute to scoring the expected performance of an option. Options with a proven track record would have higher confidence. Scoring in general was viewed as challenging, and some broad alternatives were suggested, including using an x-y plot of high value/high efficacy vs the opposite (although this concept was not elaborated further).

An equally important consideration was the stakeholders' interest in, and desire to delve more deeply into, Climate-Smart design considerations. There was generally expressed input that options had to be developed further into actions in order to evaluate them, albeit with a minimal effort rather than with a full design. This would require more detailed examination of Climate-Smart design considerations, as the central issue is how well actions perform in a climate change scenario. One would need to address how climate sensitive an option is, and how climate change would affect its function over a future planning horizon (e.g., 50 years from now). To do this, more nuanced stressor and climate information would be needed (as output from Step 2) to consider each option. One suggestion was to use worst and best case scenarios over different time periods to inform the evaluations. This would support knowing when stressor impacts would be significant, and would help in thinking about long term performance relative to that climate stressor.

Option development prior to evaluation also would include setting the level of effort that is needed/planned for that action (e.g., how many terraces or basins per acre, etc.), because how effective a particular option is would be affected by the level of effort planned for the action.

Day 2 Re-jigger – the 'Climate Smart Design tool'

A major adjustment at the workshop was the addition of a 'Climate Smart Design tool' (Table 2) that would bridge the gap between having a list of brainstormed options, and being able to develop enough information (through more detailed break-down of Climate-Smart design considerations) on each option to allow comparative evaluation and selection. The draft Climate Smart Design tool that was presented and discussed on the 2nd day was a matrix that linked specific stressor and climate change effects information with each option being considered (the stressor that is the target of that option, and the direction and magnitude of climate change impact on the stressor scored 1 to 3, where 1 is a big change, 3 a minimal change), and also asked whether the option was adaptable (could be adjusted in its design for greater/sufficient effectiveness) in light of the expected climate change effects (again scored 1 to 3 where 3 is easy to modify, 1 is hard to adapt). This tool could potentially be used to help prioritize options/actions, identify options for which more information is needed, and to establish temporal sequencing/priorities.

Table 2. Draft 'Climate Smart Design tool' applied during Day 2 of the workshop.

Option Type	Option	Stressor	Direction of CC impact on stressor	Magnitude of CC impact on stressor (1, 2, 3)	Need to adapt option? (Y/N)	Adaptation potential of option (1, 2, 3)
Run-off controls	Install water bars, terraces, microbasins, in dirt roads in agricultural areas	sediment				
	Establish vegetative cover, filter strips in agricultural fields	sediments and nutrients				
	Treat stormwater with constructed wetlands, terraces, and microbasins	sediments and nutrients				
	Manage watershed sediment and nutrient inputs to reef areas upstream of target reef within the dominant current flow	sediments and nutrients				
	Ban specific herbicides and termaticides atrazine, phipernal/ toxic chemicals	herbicides and pesticides				

One of the first 'sorting' efforts that came up 'organically' during this part of the exercise was to add temporal considerations (time frame) to the screening table (Table 3). Prior to this the CCAP framework had not dealt with temporal aspects of stressors nor been explicit about how to sequence implementation. It was recommended to add columns to the screening table (or Table 4B?) for how long it takes to implement each option (and all the steps needed, including design, permitting, other enabling conditions, construction, etc.), and when it is needed in relationship to the projected time frame of the stressor(s) it is addressing.

Table 3. Example of a portion of the 'Climate Smart Design tool' table as modified (e.g., by the addition of a column to capture temporal information) by the Zooxanth breakout group.

Option Type	Option	Stressor (or thing you're trying to address with the option)	Specific climate change impact on stressor	Direction of CC impact on stressor	Magnitude of CC impact on stressor (1, 2, 3)	How/when/where do we need to adapt option?	Adaptation potential of option (1, 2, 3)	Time constraint (longer or shorter term)	Notes
Run-off controls	Install water bars, terraces, microbasins, in dirt roads in agricultural areas	sediment/nutrients	Due to storm events after dry period	variable	2	Need to adapt the option spatially (but may never be possible?); need to evaluate the extreme scenarios	3	[short term option/urgency-uncertain of increase-need to think about mechanism]	Life of these practices is only about 5-10 yrs. Rainfall in WM generally expect to increas, but John Marra thinks it might decrease
	Establish vegetative cover, filter strips in agricultural fields	sediments and nutrients						[longer term option/use temperature tolerant vegetation mix]	
	Work with landowners to develop sustainable agriculture in fallow lands								
	~~Retrofit~~ Modify and maintain in-stream dams and/or retention basins to collect fine sediment	sediments and nutrients							Built to hold a lot of water, but currently only capturing coarse debris/need not only appropriate maintenance but also proper disposal
	Identify other watersheds to Manage watershed sediment and nutrient inputs ~~to,~~ ie, reef areas ~~upstream~~ upcurrent of target reef within the dominant current flow	sediments and nutrients							May also need to consider upper watershed conservation areas (as another separate option to add)
	Reduce nutrient loads and toxicants from soil runoff using timed and quantified amounts of fertilizers, pesticides and other chemicals from agricultural and landscaped areas, and using other modified agricultural practices	herbicides and pesticides							
	Restore natural streambeds (with legacy sediments)	sediments							

Other suggestions for the Climate Smart Design tool were to modify the 'yes/no' question about whether the option is effective/could be adapted to be effective. The Zooxanth breakout group changed this question to 'where/when/how'. The Zooxanth group also added a column on specific climate change impacts to the stressor. There also was discussion of adding a column for the effectiveness of each option under mid-century conditions, perhaps using a 3-point scale. However, this suggestion was not explored further during the workshop exercise.

As discussed below under Temporal Scale, this Climate Smart Design tool would potentially support evaluation by time frame, essentially providing a basis for setting temporal priorities. Interpreting the score from the screening is important. The screening process was intended to recognize options that need (and deserve) more attention, not necessarily to rank them. Other factors also have to be considered, such as the potential for further improvement of the option given more information/research, as well as cost, social acceptability, etc. Such factors are included in the draft Step 5 evaluation process, but were not fully explored during the workshop. A general observation in applying the Climate Smart Design tool was that general options were more difficult to talk about than specific ones.

Day 2 Re-jigger – 'Outstanding Challenges'

Three emergent challenges were identified as needing to be incorporated into the framework, and were brainstormed further via breakout group discussions. Uncertainty was considered an important cross-cutting topic.

Temporal and Spatial Scale. An emerging concept was that the CCAP framework should promote planning that recognizes and achieves alignment between the timing of the various risks being addressed, and the timing of the needed responses. Understanding the timing of the risk requires defining the time scale over which climate change effects are expected to manifest. This clearly indicated an informational need for more management-relevant time spans for climate change projections, e.g., 20 to 30 years rather than 100 years, as outputs from Step 2 (Figure 1). Actions can then be sequenced, or prioritized for implementation, relative to how they address this timeline of stressor effects. Temporal sequencing in operational planning needs to be based on anticipating when each action needs to be in place to effectively address its target stressor(s), as well as how long implementation would take, including time for activities such as design and permitting as well as for construction or other implementation actions. Figure 3 illustrates the general concept of how this temporal planning could be implemented, by mapping the projected patterns of various climate change stressors over time (temperature, precipitation, and sea level rise shown in Figure 3 as examples), and then laying out distinct project components on the same timeline. Incorporating this timeline tool in the planning process would require working backwards as well as forwards. That is, for most types of actions, planning would have to start with defining the future time when the project would be needed (the endpoint), and working backwards to plan when implementation of enabling steps would have to be initiated. This gives a temporal sequencing of actions that highlights the near/intermediate term (3 to 5 year) as well as the long term.

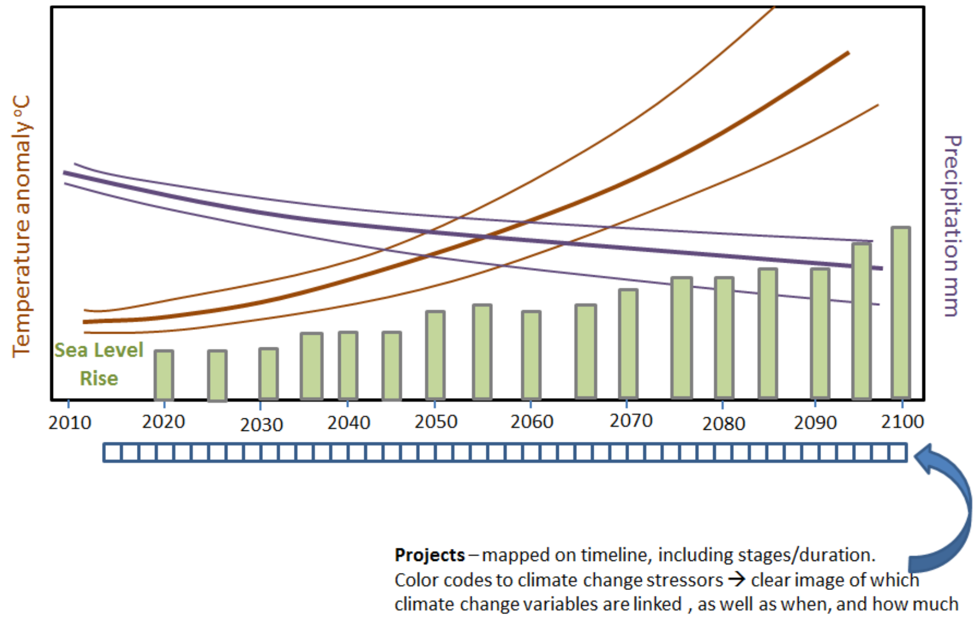

Figure 3. Tova Callendar's temporal planning concept.

Operational plans could then be assembled incrementally and could include the near-term pieces of long-term projects as well as what is most urgent now. This would lay the foundation for some things that might be at a lower level of urgency in the short term in order to set enabling conditions for longer-term needs. Urgency also is an important criterion or filter, and relates in particular to funding cycles. But for plans to have a lasting effect, we may need to implement things now that are not urgent in the short term; i.e. frame the plan in the context of things to come.

Some participants asked how the CCAP cycle can be equally applicable to both short and long term planning scales (i.e. for both longer term strategic planning and shorter term operational implementation). This is addressed to some extent in the next section on Working Across Planning Levels.

For evaluation, we would need to address whether this temporal planning addresses both short and long term key vulnerabilities, and would therefore need the vulnerability analysis (Step 2) to present both short and long term issues. Evaluation would ask if the options align temporally with the timeline of the impact to prioritize the options.

Spatial scale is particularly important with regard to where and how much both climate and non-climate stressors are operating. Not everything is equal everywhere, and spatial variability makes it a challenge to address. The breakout groups did not spend as much time talking about spatial scale although there was agreement as to its importance.

Working Across Planning Levels. Participants brainstormed how to apply Climate-Smart principles at strategic and operational levels of planning. Operational planning is typically on a shorter time scale (e.g., 1 to 5 years), while strategic plans are typically more long-term. Accordingly, there is some overlap with principles discussed under temporal scale (above). For instance, the relatively short time frame of operational plans compared to the long time frame of climate change projections was discussed, highlighting the need for temporal planning that prioritizes actions relative to the temporal scale of the climate stressors being addressed. Strategic plans often already exist, and incorporate policy of the managing entity into the approach for conservation or restoration planning. The participants suggested that CCAP could be used to help inform the needs in strategic planning, which might specifically focus on such temporal sequencing, as well as informing how to move from a strategic plan to a Climate-Smart operational plan and its implementation. Development of a Climate-Smart operational plan may need to incorporate iterations back to the strategic plan to assure key vulnerabilities and needs are addressed; i.e. CCAP may want to incorporate a review of strategic plans in light of CCAP perhaps every 5 years. In discussion, the group characterized such Iterations (between strategic and operational (annual) plans) as within step 4, rather than between steps 3 and 4.

There was discussion about where in the CCAP cycle one would enter depending on whether the application of CCAP was to an existing or new planning cycle. For existing plans, the planning cycle must include both assessment and revision of strategies and options, as well as identification and addition of new options. As a result, the entry would be at Step 4, whereas a new planning effort would begin at Step 1.

Interactions, Dependencies, and Synergies. There was consensus on the need to develop a more systematic process to identify and deal with interactions (synergies, conflicts, prerequisites, etc.). This would be an intermediate step in the portfolio (or plan) development process. Relevant considerations mentioned include whether short-term actions preclude future options; whether multiple actions are needed to address a problem; or whether some actions are needed for other actions to make sense. These outcomes will influence evaluation and selection, in that some individual actions within a related group might score relatively low, but be selected due to their relationship to other needed actions. This is an example of where a relatively lower "rank" in the Climate Smart Design tool would not automatically mean elimination of an option. Consideration of interactions was considered important, and seen as representing what reef resilience programs are all about - a strategic way of applying limited resources with the best benefit, leading to an integrated whole.

Thoughts about the process were to consider possible interactions option by option, and document them. This might be facilitated by numbering each option so that related options can easily be listed (e.g., 1, 3, and 7 must be done together). Different ways of visualizing how options/actions are related were also mentioned, such as conceptual models, results change, and mind mapping.

Uncertainty. There are various components of uncertainty to consider; in particular, uncertainty in efficacy of an option, and uncertainty in climate change projections. It was suggested that for uncertainty in some types of climate change projections, such as bigger storms, expert panels could be used to estimate bounds for the projections, e.g. high/low curves. In addition, some models could be used to account for such uncertainty. For some kinds of uncertain projections, it was suggested that triggers could be planned, so that when a threshold was passed, those related options could be implemented.

The two breakout groups reported different recommendations for handling options with a lot of uncertainty. The Polyp group's consensus was that if an option had too much uncertainty, they wouldn't investigate it. But it was not clear how much certainty was needed; dealing only with certain options can be maladaptive. The Zooxanths took a 'precautionary view' for options that had a lot of uncertainty, making the assumption that the maximum effort possible for the option would be done, and then scored based on that.

Supporting Information from Previous Steps

There were recurrent comments that developed over the course of the workshop (some of which have been mentioned above) that climate change projections summarized in Step 2 needed to be more finely partitioned to support the different spatial and temporal scales at which both other stressors operated and various options might apply. This also would support evaluation of options/actions in the management-relevant future time frame, when climate change effects will most impact adaptation options. Suggestions for refinement of Step 2 included distilling IPCC projections regionally, e.g. using PIRCA; and including different spatial scales for outputs of the vulnerability assessment (local, regional, and global), as well as different temporal scales (short and long term). One could develop a 'climate cheat sheet', which should be short (1-2 pages) and easy to read, and could include future climate scenarios plus site-specific graphics to summarize key climate impacts.

Other Tools:

The U.S. Army Corp of Engineers has a lot of tools on its website for evaluating climate change impacts, e.g., a sea level rise calculator which may be useful in defining vulnerabilities in Step 2. Hind-casting could be used to map out past disasters, extreme events, SLR, etc., and used to estimate thresholds for expected responses to future events. The TNC reef resilience.org website, and their Miradi software, can be used to draw relationships between items. Marxan is a decision support tool regarding conservation areas; it is an optimization tool. But it only works if measures include all sites. Jeff Maynard's color coded worksheets for reef resilience is a visual to go with the conceptual model (Rod Salm has pdf and Word files). Climate Wizard is a TNC tool that can be used to develop regional projections for climate variables; however it is land- focused. Also see the Battelle's work (transferred to Duke Learning Center) on Coastal Marine Spatial Planning (funded by McArthur foundation).

Day 3 - Summary of Lessons Learned

There are several aspects of the draft CCAP framework that were considered very useful, and for which additional inputs and suggestions for revisions were gained from the workshop. There was less focus during the workshop on review of the general adaptation strategies and adaptation options, as these were presented as givens in this exercise; although it seems some review and possible revision/expansion of these overarching components of the CCAP framework may be warranted. That said, the Climate-Smart design considerations were seen as being quite valuable. A task in the further development of the CCAP framework and cycle will be to expand the guidance on how to develop these questions; and to considered the application and tailoring of the Climate-Smart questions, and of the framework in general, to different levels of planning (e.g., goal setting, strategic, and operational). In addition, there is further work needed to more fully consider and explain how these components of the CCAP framework should be applied to each step in the Climate-Smart (or other general) planning cycle.

There are two new (and somewhat related) components that were strongly recommended for addition to the CCAP framework, and which were only preliminarily developed during the work. These will need relatively substantial further effort to refine and incorporate into a revised CCAP framework. One is to add a temporal frame explicitly to the development of options (in Step 4) and their stressors (in Step 2). While a good initial conceptual framework for such temporal planning was presented (see Figure 2), this addition potentially impacts all components of Step 4, from Table 4B (Reorganization of Adaptation Options) through Portfolio building, as well as the Step 5 evaluation, and so will require revision of many of the CCAP framework components.

The other significant new component is the 'Climate Smart Design tool', which may be incorporated as a component of Step 4, because of its role in preliminary development of options into Climate-Smart actions for subsequent evaluation; or as a preliminary component of Step 5 because of its implications for evaluating the potential effectiveness of options in the climate change context and in developing temporal priorities. This tool requires further direct development, as well as consideration of how it will be applied in the CCAP cycle and how it might interact with or modify the evaluation step.

Regarding the exercise itself, future workshops might consider including brainstorming of options as part of the exercise. This represents the beginning of Step 4, and would more fully incorporate application of the general adaptation strategies and adaptation options from the CCAP framework (the center of Figure 1). It might alleviate some of the pitfalls encountered in this workshop, including the tendency for participants to question and revise the options as presented in the exercise in their effort to understand how options were linked to the stated goals and objectives, the climate and non-climate stressors, etc. We speculate this may also allow a more effective exercise in portfolio development and evaluation.

Climate-Smart Design Considerations

As a central part of the CCAP framework, a set of questions are developed for each option in order to encourage and guide the Climate-Smart design of that option. Feedback during the workshop was that these questions were a good component of the CCAP framework. They were seen as an effective mechanism for introducing climate change considerations into the development of adaptation options. Participants were interested in knowing the process used to develop Climate-Smart questions, and wanted to see guidance on writing Climate-Smart questions/design considerations. The participants discussed the possible value of developing different suites of questions to be applied at the goal-setting level, at the strategic level, and at the BMP (action) level. Input was provided that while questions need to be tailored to the site and specific issues of concern, the framework gives guidance on how to form questions. Some further expansion on the existing guidance may be warranted. In general, the CCAP framework requires consideration of two categories of questions in order to make it a well-designed implementable action.

- How will climate change directly and/or indirectly affect the system through alterations in stressor-interactions?
- What are the implications of this information for the location, timing, or engineering design of the management action?

Application of the Framework

There was a widely made comment most agencies or other managing entities have their own planning process which they actively utilize, and so are receptive to a framework such as this one that informs or revises steps in that process but does not require replacement of existing planning methods.

There was strong emphasis on understanding how the CCAP framework informs and modifies each part of a planning cycle. To some extent, the Climate-Smart planning cycle itself (the outer ring in Figure 1) was seen as including common components of a general planning cycle rather than as an integral part of the CCAP framework. Emphasis was put on more fully explaining how the CCAP framework, focusing on how the key components in the middle of Figure 1 (e.g., the general adaptation strategies, adaptation options, and the Climate-Smart design considerations) is applied to each major planning step.

References

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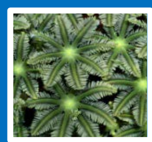
Attachment 1: Workshop Participants

Breakout Group Assignments

POLYPS



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Darla White	Special Projects Coordinator, Hawaii DLNR Division of Aquatic Resources, Maui	Maui
Deborah Solis	U.S. Army Corps of Engineers, Honolulu District, Civil & Public Works Branch	Oahu
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Jeff Burgett	PICCC	Oahu
Mark Deakos	Maui Nui Resource Council	Maui
Natalie Morrison	HI State Planning CZM	Oahu
Peter Houk	University of Guam	Guam
Rob Toonen	HIMB, UH Manoa	Oahu
Robbie Greene	CNMI, Climate Change Working Group	CNMI

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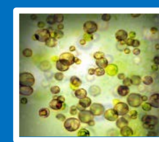

Name	Affiliation	Origin
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John Marra	NOAA Pacific Islands Regional Climate Services Director	Oahu
Kirsten Oleson	UH multidisciplinary reef management scientist/ decision modeler	Oahu
Lincoln Rehm	Palau International Coral Reef Center	Palau
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