



Student Handout

Module 1: The socio-environmental context of Maunalua Bay, Oahu

Conflict in paradise: Managing watersheds on a crowded island

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Maunalua Bay, on the outskirts of Honolulu on the island of O'ahu is one of the most degraded ecosystems in Hawai'i. Once abundant coastal fisheries, crystal clear water, and a thriving native Hawaiian fishpond are now gone, victims of development. Urbanization since the 1950s provided much-needed homes for an ever-growing population, but it also converted once-productive agricultural landscapes, including the largest inland native Hawaiian fishpond in the state, and natural habitats, including forested habitat for endangered birds and snails and wetlands critical for endangered seabirds. Pollution and sediment pour into the bay from impermeable surfaces, channelized streams, and inadequate waste systems, killing the fish and corals, and causing unsightly algal bloom that smother coral and choke boating and swimming areas.

Homeowners, business owners, and conservationists all want to restore beautiful Maunalua Bay. Most people and agencies agree on the causes of the problems. Over the past 10 years, the community has collectively acted to remove invasive algae, work with homeowners to reduce pollution, and restore a coastal fishpond. A conservation action plan completed in 2009 set out recovery strategies and goals. Unfortunately, many environmental indicators continue to degrade.

In come the Feds. In late 2014, NOAA's Hawaiian Islands Humpback Whale National Marine Sanctuary (or Sanctuary) proposed that Maunalua Bay become a Special Management Area, bringing new regulations to the area. The Sanctuary is shifting from a single-species focus to an ecosystem-based management approach, which involves a much more holistic approach across a more geographically expansive scope. Maunalua Bay would be one of the first areas where they would implement this new paradigm. The Sanctuary Superintendent, Dr. Malia Chow, "feel[s] like NOAA, with our expertise and resources, can actually work with the community to try to help to restore it and make the bay more healthy."

A public listening session in June 2015 revealed that community opinions are split – and the debate is heated. A major community group, Mālama Maunalua (care for Maunalua), which produced the 2009 conservation action plan and has been active in its implementation since, supports the Federal

involvement: "We see this as an opportunity to help everybody else improve the quality of the bay, help us bring back the fishes that are no longer there, improve the corals, and still allows everyone to enjoy the bay the same way they're doing right now," said Frazer McGilvray, Director of Malama Maunalua.

But, not everyone is as enthusiastic for a new regulatory authority to get involved: "I can't see within the proposal how we'll carry out dredging or how we'll carry out our daily business without disturbing the ocean floor or going near a turtle," said Jeffrey Krants with "Friends of Maunalua Bay." Many neighborhoods and businesses border a large constructed marina that was once a wetland, and which requires regular dredging to maintain its depth and flow.

In this case, you will explore this complex social-environmental system. In addition to gathering information to characterize the system, you will explore questions such as:

- What are the key components and relationships of the social-ecological system?
- Who are the stakeholders and what are their interests, power, and influence?
- What is the management problem?
- Is an ecosystem-based approach appropriate?
- Might Federal involvement help solve some of the persistent problems in the Bay? What management entities need to be involved and what approaches need to be employed to solve the problems?

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¹ <http://www.sesync.org/to-fish-or-not-to-fish-challenges-of-managing-culturally-and-ecologically-important-species-2014-3>

Student Handout – Homework

Module 1: The socio-environmental context of Maunalua Bay, Oahu

Please do the following prior to the start of the first module:

- **Find and explore** Maunalua Bay, Oahu and its upstream watersheds in Google Earth
- **Look** at pictures of Hawaii Kai on: http://www.huffingtonpost.com/2015/01/15/honolulu-history-change-bishop_n_6433372.html
- **Read** main text of the 33-page 2009 Conservation Action Plan http://www.malamamaunalua.org/wp-content/uploads/09-CAP_finalSM.pdf
- **Work through** EPA Module 1: <http://archive.epa.gov/ged/tutorial/web/html/slide0001.html>
- **Review** theory of concept mapping and how to use CMAP software: <http://cmap.ihmc.us/docs/theory-of-concept-maps>
- **Respond:**
 - **List** 10 observations about the site
 - **Identify, briefly describe, and use CMAP to draw** three linkages where the social system affects the ecological system and three linkages where the ecological system affects the social system.
 - Use CMAP to **draw** an interaction and a feedback

Student Handout – Homework

Module 2: Data-driven characterization of the social-ecological system

Please see the Knowledge Domain handout, and do the following prior to the start of the second module:

- **Find** information related to your knowledge domain (see Knowledge Domain handout for details)
- **Document** the process you used to find information and **summarize** your key take-aways
- **Develop** an individual Conceptual Ecosystem Model specifically for your knowledge domain
- **Prepare** any visuals you need to help teach your knowledge domain to your peers
- **Suggest** revisions to the Conceptual Ecosystem Model done in class yesterday

Student Handout – Knowledge Domains

Module 2: Data-driven SES characterization

As homework for the second module, you are responsible for investigating and presenting information about a knowledge domain of your choosing. You will return to class with this knowledge where, in jig-saw fashion, you will act as an expert and relay that knowledge to the class so we can collectively reconsider the conceptual ecosystem model.

Overall Objectives:

1. Choose a specific issue of interest within the case study and identify a cluster of key nodes and relationships within the conceptual map of the social-ecological system, and classify them according to the DPSIR framework;
2. Seek out knowledge (in published literature, public record, interviews, etc.) to establish the evidence for the relationships;
3. Synthesize knowledge in the context of the case study;
4. Revise conceptual mapping according to research findings;
5. Communicate your knowledge orally and in writing.

Individual CEM Guidelines:

Each student will choose a specific issue of interest within the case study, identify a cluster of key nodes and relationships within the conceptual map of the social-ecological system, and classify them according to the DPSIR framework. You will use CMAP to draw a CEM identifying the central node and all of the associated nodes and feedbacks between the critical components. The final individual CEM will have more detailed information about the critical system feedbacks than the class CEM, but be limited to the specific relationships relevant to the issue of interest. You can use CMAP's capacity to link resources (e.g., websites, pdfs, etc.).

Report Guidelines:

A short report (1,000-1,500 words) should synthesize your topic, research steps, and knowledge found (in published literature, public record, interviews, etc.) to establish the evidence for the relationships identified in the individual CEM. You should explicitly suggest revisions to the class CEM according to the findings.

Presentation Guidelines:

In class, you will be responsible for communicating what you learned to the whole class. Think about communicating what you learned across disciplines. Come prepared with some key visuals summarizing your knowledge domain findings, and insights for discussion during a collective CEM revision process.

Assessment Rubric – Individual CEM

Scoring Level	4 – Accomplished	3 – Competent	2 – Developing	1 – Beginning
Sophistication of information in DPSIR-CEM	<p>Formulate novel nodes and relationships, discovered new information, and captured nuances</p> <p>Construct unique CMAP, and effectively link to diverse data sources</p> <p>Formulated new research questions, hypotheses, interpretations</p>	<p>Critique nodes and relationships given evidence you collected</p> <p>Use CMAP include links to your materials (e.g., share on cloud or create links within the class website)</p> <p>Evaluated existing questions, hypotheses, judged evidence</p>	<p>Compare relative importance of influence of different relationships wrt the central node</p> <p>Demonstrate competence to use CMAP tool</p> <p>Criticized evidence/state of knowledge or existing hypotheses</p>	<p>Central node and associated nodes identified and classified using DPSIR</p> <p>Basic CMAP diagram</p> <p>Reported on (some interpretation of) evidence/hypotheses</p>
Clarity of information in CEM	Succinct, nuanced, novel connections made to the network throughout the DPSIR framework	Central node identified with concise relationships networked through the DPSIR	Organized with a clear central node and network identified	Disorganized and extraneous

Assessment Rubric – Report

Scoring Level	4 – Accomplished	3 – Competent	2 – Developing	1 – Beginning
Introduce knowledge domain and why it is interesting	Synthesize the problem, available information, context, and use this to formulate a new question that fills a clear gap	Cogent, succinct writing: justifies the selected issue of interest quickly without a lot of extraneous information	Draw connections among ideas, specifically between the social and ecological aspects of the system	Brief introduction of the case study; focused on the issue of interest
Describe what you did and what you found	Reflect on availability/use of qualitative and quantitative data Developed new interpretations of existing data	Establish the evidence for the relationships identified in the individual CEM Synthesize knowledge found (in published literature, public record, interviews, etc.)	Relate information available in the literature to the individual CEM Compared/contrasted evidence you found across sources	Used basic methods to collect information Interpret evidence found
Take home message	Formulated new research needs and propose revisions to the class CEM	Reflect on the scale of processes in the individual CEM and suggest revisions to the class CEM according to the findings.	Knowledge placed back in context of larger existing class CEM	Knowledge of key nodes and relationships conveyed as part of individual sub-system

Assessment Rubric – Presentation

Scoring Level	4 – Accomplished	3 – Competent	2 – Developing	1 – Beginning
Conveyance of information in DPSIR-CEM	Argues for novel nodes and relationships based on new information, and nuances Clear statement of new research questions, hypotheses, interpretations	Critiqued nodes and relationships given evidence you collected Evaluated existing questions, hypotheses, judged evidence	Explains relative influence of relationships wrt the central node Criticizes evidence/state of knowledge or existing hypotheses	Central node and associated nodes identified Explains and interprets some evidence/existing hypotheses
Clear explanations of key concepts and terms	Effectively construct a framework that conveys transdisciplinary information Clearly defined and explained complex concepts critical to understanding the issue	Design creative ways to communicate what you learned across disciplines. Used multiple ways to explain concepts where confusion likely (or evident via questions)	Communicate across disciplines with a well-defined, logical structure Avoided jargon and use universal language	Basic structure and roadmap Concise language, defined jargon
Presentation style	Practiced, polished integration of figures and mixed media into discussion/talk with effective use of available technology and tools	Figures/visuals well integrated into text/talk, with stand-alone legends	Effective use of figures and mixed media	Presentation (including figures) legible and referenced

Notes:

Student Handout – Homework

Module 3: Stakeholders

Prior to the start of module 3, please:

- **Read** 11-page HIHWNMS management plan revision summary
http://hawaiihumpbackwhale.noaa.gov/management/pdfs/mp2015_dmp_deis_summary.pdf
- **Read** “myth buster” <http://www.friendsofmaunaluabay.org/>
- **Read** first 4 pages of “What is a stakeholder analysis” (World Bank):
<http://www1.worldbank.org/publicsector/anticorrupt/PoliticalEconomy/PDFVersion.pdf>
- (Optional) Watch 28 minute video about the history of the area and the effort to restore the traditional Hawaiian fishpond in Maunalua Bay:
<https://www.facebook.com/MaunaluaFishpond/videos/vb.102012409868829/821020754634654/?type=2&theater>
- (Optional) Read: K. Schmeer “Guidelines for conducting a stakeholder analysis”
<http://www.who.int/management/partnerships/overall/GuidelinesConductingStakeholderAnalysis.pdf>

Student Handout – Homework

Module 4: Governance Institutions

Prior to the start of module 4, please:

- **Investigate** mission and jurisdiction of regulatory agencies: *Federal* (NOAA Fisheries, HIIWNMS), US Army Corps of Engineers, USEPA: <http://www2.epa.gov/aboutepa/epa-hawaii>, USFWS); *State* (Office of Planning: <http://planning.hawaii.gov/>, Coastal zone management program, Ocean Resources Management Plan; Department of Land and Natural Resources: <http://dlnr.hawaii.gov/> including Division of Aquatic Resources, Division of Forestry and Wildlife, Commission on Water Resource Management, and Hawaii Association of Watershed Partnerships; State Department of Health).
- **Read** local rep's comments at <http://www.hawaiifreepress.com/ArticlesMain/tabid/56/ID/15629/Ward-NOAA-should-not-be-given-cart-blanche-over-Hawaii-Waters.aspx>
- **Read** two articles about institutions and institutional match
 - Ostrom, E. 2008. "Institutions and the Environment." *Economic Affairs*. <http://beyondestrom.blog.rosalux.de/files/2013/10/Governance-Ostrom-Adaptive-MLG.pdf>
 - Epstein, Graham, et al. "Institutional fit and the sustainability of social–ecological systems." *Current Opinion in Environmental Sustainability* 14 (2015): 34-40.
- **Briefly summarize** jurisdictions and formal and informal rules in place for one resource of your choice (e.g., fish, reefs, coastal water, streams, watersheds, forests, native species, etc.) or one agency of your choice (e.g., NOAA fisheries, DAR, etc.).
- **Write 1-2 pages discussing** how and why this may or may not fit the resource or social environmental system.